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Introduction:

The trade-off between authorship and interactivity in interactive narrative applications has been the subject of interest for scholars. According to Adams (1999) in linear traditional media (theatre, films) the author is fully in charge, he chooses the theme for the message to be conveyed, he has to make sure that the actors are physically and mentally ready to be involved in the dramatic actions, assuring the climax, "*The author takes the reader by the hand and leads him into the world of her imagination. The reader still has a role to play, but it's a fairly passive role: to pay attention, to understand, perhaps to think... but not to act" (Adams, 1999, p.4). On the other hand, in nonlinear media applications (human computer activity), interactivity means "<i>freedom, power, self-expression. It's about entering a world and changing that world by... presence*" (Adams, 1999, p.4). We can say that authorship refers to the supreme control over the theme of the story in linear media, and interactivity refers to the total control over the actions in nonlinear media. One question might be, as designers of interactive narrative, where can we place ourselves? What are our responsibilities as authors and how much freedom should be provided to the participant? Authorship and interactivity "*exist in an inverse relationship to one another. The more you have of one, the less you're going to have of the other*" (Adams, 1999, p.4).

The Greek philosophers have used tragedy to correct man's actions, it is used to purify and direct the society to justice leading to happiness. We can say that tragedy in linear media have been used to heal society. Unfortunately, nature always does not attain perfection and virtuous (good) and vicious (bad) actions do exist in nature, a pertinent question might be; what if linear and non linear media applications are used to convey vicious messages to society? What type of messages can be conveyed? Regrettably linear media have been used and directed to vilify some groups of people in society because of their racial background and believes in life. Over 900 films have been produced to negatively stereotype specific groups of people, such as, *Wanted Dead or Alive, The Delta Force,* and *Executive Decision* (Shaheen, 2003, p.187). On the other hand, in nonlinear media applications many games are produced for the same reason for example amongst many others, *Prince of Persia, Al-Qadim, The Two Thrones* (Santorineos et al. 2006, p.3).

The spectator in linear media is a passive observer; he will only use his mental activities. In order to perceive and interpret the representation, the auditory and visual modalities will be used and not the kinesthetic or the physical activities. Virtue is a trait of being good, and since "*virtue does not exist in us naturally, we have to learn it*" (Boal, 2000, p.16). As a result we have to practice the virtuous actions --"*Who practices wisdom becomes wise, and who practices justice becomes just*" (Boal, 2000, p.16). The ability to practice physically or to use the kinesthetic senses is not available in linear media. Interactive narrative as nonlinear media application may intervene as a solution to the problem; in this case the characteristics of interactivity will play a crucial role. In addition to the benefits of having a kind of authorship that can convey useful messages that may help "heal society", Interactivity will add the advantage of being able to involve the participant actively in the story, it will provide the participant with the ability to practice and take the necessary actions; the more he practices virtuous actions the more virtuous he will become.

Until the present time, researchers attempted to merge interactivity with narrative, to mention some: *The Sims, Erasmatron, and Façade*. The fact is that these applications, lack for providing balanced proportion of freedom of interactivity and narrativity (authorship).

Both authorship and interactivity play equal important role in interactive narrative, therefore providing the participant with an application that implements interactivity and narrativity in balanced proportions would be the ideal choice for developing interactive narrative applications. Additionally the theme or the message to be conveyed should be directed to all societies aiming to unite and not to divide, as a result to lower the barriers between cultures and not the opposite. Furthermore the aspect of interactivity should be utilized; to create applications that provide the user with the ability to practice virtuous actions instead of other kinds of actions such as killings, shootings, and bombings. Thus, our attempt is to invert the concept of traditional nonlinear media applications in such a way, instead of attacking others, the participant will take the role of being attacked. His actions will be based on saving himself as well as the others. The frame work of the presented project will be as follows: first the term narrative and all the related elements will be described. Second the aspect of interactivity will be on focus. After identifying these two terms separately we will analyze both of the terms; interactive narrative and interactive drama. Finally the aspect of engagement will be defined specifically as well as some other concepts such as engrossment, flow, and immersion.

1 Chapter:

1.1 Narrative:

According to Crawford (2005) narrative is regarded as the most important component of culture; all cultures have their own stories. Stories are considered to be the vehicle by which the cultural knowledge is communicated from one generation to another. They play a major role in conveying cultural information. Narrative is defined as "*a chain of events in cause-effect relationship occurring in time and space*" (Bordwell and Thompson, 2003, p.69). It can be "*A story follows an interesting protagonist seeking a clear goal by addressing an ever-escalating set of difficulties*" (Glassner, 2004, p.36).

Bordwell and Thompson (2003) claim that causality and time are central issues, a random string of events is hard to perceive as a story. In their example about the role of causality, considering the following random actions "A man tosses and turns, unable to sleep. A mirror breaks. A telephone rings" (Bordwell and Thompson, 2003, p.69). It is difficult to grasp the sentence as a narrative because the causal and temporal relations among the events are undetermined. A new description of the same events could be, "A man has a fight with his boss; he tosses and turns that night, unable to sleep. In the morning, he is still so angry that he smashes the mirror while shaving. Then his telephone rings; his boss has called to apologize" (Bordwell and Thompson, 2003, p.69). Furthermore narrative is also defined as "a discourse reporting a story as well as the story itself" (Ryan, 2001, p.244).

In order to distinguish the term narrative from other terms such as story and drama, a coherent definition that clarifies the misunderstandings is proposed as: "A narrative is a sign with a signifier (discourse) and a signified (story, mental image, semantic representation). The signifier can have many different semiotic manifestations. It can consist for instance of a verbal act of story-telling (diegetic narration), or of gestures and dialogue performed by actors (mimetic, or dramatic narration)" (Ryan, 2001 ,p2). This definition emphasiez that narrative is a general term, in order to understand it, it must be brocken into two categories; a story, and a storyteller. A type of a storyteller or a signifier can be the dramatic character that convey the story by performing or acting the events out. Thus "The most prominent reason for acting in life is problemsolving. It is therefore the most fundamental narrative pattern" (Ryan, 2001, p.2).

Ryan (2001) claims that there are three types of narratives: sequential, causal and dramatic:

- 1. Sequential narrative can be conceived as a representation of physical event involving common participant e.g. *the king died, then the queen died*.
- 2. Causal narrative can be conceived as an interpretation of events invoking causality e.g. "the king died, then the queen died of grief" (Ryan, 2001, p.244).
- 3. Dramatic narrative can be conceived as a semantic structure meeting certain formal requirements e.g. a development that leads from balanced situation to a crises then to a new form of balanced situation, rise and fall of tension.

Murray (1997) claims that plot consists of sequence of events, the linkage between these events are based on causality. Thus she calls the above mentioned example of Ryan's sequential narrative as story, and the example of causal narrative as plot.

1.2 Plot and Story:

According to Bordwell and Thompson (2003) what constitutes a story, is the sequence of all events in a narrative that are explicitly presented and those the viewer infers. In their example, the story consists of at least two depicted and two inferred events. The depicted events in figure (1) left are, "*Rush hour hits Manhattan*", and the inferred is, "*Roger Thornhill has a busy day at his office*" (Bordwell and Thompson, 2003, p.70). Additionally the depicted event in figure (1) right is, "*still dictating, Roger gets off the elevator with Maggie and they stride through the lobby*" And the inferred ones are "*While dictating to his secretary, Maggie, Roger leaves the office and they take the elevator*" (Bordwell and Thompson, 2003, p.70).



Figure 1 Hurrying Manhattan pedestrians (left)-Maggie takes dictation from Roger (Right) (Bordwell and Thompson, 2003, p.70)

The world of story action can also be called the film's *Diegesis*, it refers to the Greek word "recounted story" (Bordwell and Thompson, 2003, p.70). Bordwell and Thompson (2003) claim that plot includes non-diegetic elements and everything visibly and audibly presented, but not what is presumed or inferred. Figure (2) shows the uncommon and common elements between story and plot.



Figure 2 a diagram shows the uncommon and common elements between story and plot (Bordwell and Thompson, 2003, p.71)

Crawford (2005) states that, story is a linear sequence of events, its architecture is described as a plotline; hence the story content cannot be understood if the story has not been received completely by the user. According to Lillian, cited in (Boorstin, 1995, p.154) *"story is what the character wants to do and plot is what the writer wants the character to do"*.

Plot and story have been described by many scholars, the theories regarding these two topics have one thing in common and it is the plot as a more complex concept than the story (Dannenberg, 2008, p.6). Poetics considered as "one of the very treaties on narrative and dramatic structure" (Stephen, 2002, p.22). Stephen (2002) outlines a series of writings and lectures regarding poetics were carried out by Aristotle. He defines the plot as "being an imitation of an action, must imitate one action and that a whole, the structural union of the parts being such that, if any one of them is displaced or removed, the whole will be disjointed

and disturbed. For a thing whose presence or absence makes no visible difference, is not an organic part of the whole" (Aristotle, 350 BCE). Aristotle considered the plot as the soul of tragedy, by tragedy he refers to narrative, by plot he refers to the arrangement of incidents. Aristotle claims that "Tragedy is an imitation, not of men, but of an action and of life, and life consists in action, and its end is a mode of action, not a quality" (Aristotle, 350 BCE). He argues that without action there cannot be a tragedy, while tragedy can be without a character.

1.3 Cause/Effect and Time/Space:

According to Bordwell and Thompson (2003) the aspects of cause and effect can be usually triggered by characters, but they could also be triggered by events or circumstances. Viewers look for causal motivation and this can create mystery, suspense or other reactions. In linear narrative, characters possess character traits, the traits are designed to play a causal role in the narrative. Character traits might involve attitude, skills, preferences, psychological drivers, detail of dress and appearance. A minor character may have one or more traits, a character such as Sherlock Holmes can be considered as a mass of traits.

The causes and effects in narrative take place in time; time shapes our understanding of narrative. Story time is constructed on the basis of what the plot presents, even though that might not be in chronological order. A flashback is a portion of a story presented by the plot out of chronological order, story time can include the following aspects;

- 1. Story duration is the period of time of the overall story in the film (can be weeks, months, or years).
- 2. Plot duration includes the stretches of time depicted in the film (Elapsed time of events within the story, the sum of all slices of story duration).
- 3. Screen duration is the film's running time on screen.
- 4. Temporal frequency is the number of times an element is presented.

Bordwell and Thompson (2003) in their example regarding the relationship between; story, plot, and screen durations. Stating the *North by Northwest* has an overall story duration of several years, and an overall plot duration of four days and nights, and screen duration of 136 minutes. Moreover Bordwell (1985) states that plot duration consists of the stretches of time which the film dramatizes, the plot might dramatize only few months or weeks, of a ten years of presumed story action, the story action may take ten years, the plot may run from March to May of the final year, but the film may present these durations in the running time of two hours on the screen.

According to Bordwell and Thompson (2003) another important factor is the space where the events take place. Usually the space of a story is the same as the plots, but sometimes it leads us to infer or imagine other spaces as part of the story. In their example, stating that we never see Roger Thornhill's office, thus the narrative may ask us to infer actions and spaces that are never shown.

1.4 Fabula and sjuzet:

Narration is defined as the "plot's way of distributing story information in order to achieve specific effects" (Bordwell and Thompson, 2003, p.83). According to Bordwell (1985) it has been claimed by Eisenstein that narration is an expressive representation of the story action, "The story action is not in the film but in the spectator's mind; it becomes a construction which the viewer puts upon a configuration of stimuli" (Bordwell, 1985, p.14).

Bordwell (1985) assumes a difference between the story that is represented and the actual representation of it, the form in which the perceiver actually encounters it. According to him this distinction may go back to Aristotle, but it has been first theorized by the Russian formalists, "*Presented with two narrative events, we look for causal or spatial or temporal links. The imaginary construct we create, progressively and retroactively, was termed by Formalists the fabula (sometimes translated as "story")" Fabula "embodies the action as a chronological, cause-and-effect chain of events occurring within a given duration and a spatial field" (Bordwell, 1985, p.49). On the other hand Sjuzet which it is translated as the plot, represents "the actual arrangement and presentation of the fabula in the film" (Bordwell, 1985, p.50). Sjuzet is considered as "a system because it arranges components---the story events and states of affairs---according to specific principles" (Bordwell, 1985, p.50). Bordwell (1985) emphasizes that sjuzet patterning is independent of the medium, the same sjuzet patterns could be embodied in a novel, a play, or a film.*

Narration is defined as the way of distributing story information. Sjuzet functions as a narration system, according to Bordwell (1985) the analysis of narration can begin with the tactics of sjuzet for presenting fabula information. It is important to understand the basic task of the sjuzets in presenting the story logic, time, and space. Sjuzet shapes our perception of the fabula by controlling the following three aspects:

- 1. "the quantity of fabula information to which we have access.
- 2. the degree of pertinence we can attribute to the presented information.
- 3. *the formal correspondences between sjuzet presentation and fabula data*" (Bordwell, 1985, p.54).

Regarding interactive media, the *fabula* in video games according to Nitsche (2008) consists of the events that have been created by the interactor on run time; this is not the case in text where the events are provided by the work. An example of *fabula* in interactive applications can be the video game *Myst* where the story of a conflict between a father and two brothers is not predefined by the work, but the player uncovers the story by his interaction.

Nitsche (2008) states that for the *fabula* to be generated the player should be engaged in the virtual world, with other words, in order to the events to occur, the user must be actively involved in different actions. Opposite to the *fabula*, the *sjuzet* in video games are presented by the work, the presentation of events occur by the use of audiovisual, an example of *sjuzet* in interactive media is the video game *Max Payne*, the sjuzet is formed as replays and flashbacks, whenever the detective in the game meets a specific character, he gets different flashbacks that reminds him of other events that happened earlier in the game, these flashbacks are represented either by visual or audio or by both.

1.5 Drama:

The first thing comes to our mind when we hear the term drama is theatre, in order to have a better understanding, let's start to present the term from basic dictionary definitions to more complicated ones. In Merriam-Webster Online dictionary, drama is defined as a "Late Latin *dramat-, drama,* from Greek, deed... from *dran* to do, act" (Webster, 2010). Additionally it is also defined as "*a state, situation, or series of events involving interesting or intense conflict of forces*" (Webster, 2010).

Sam (1990) claims that drama has been defined by Holden as "any activity which asks the participant to portray himself in an imaginary situation; or to portray another person in an imaginary situation. Drama is thus concerned with the world of 'let's pretend'. It provides an opportunity for a person to express himself

through verbal expressions and gestures using his imagination and memory" (Sam, 1990). Role play and simulation are two types of drama activities. Role play has been defined as "an activity which requires a person to take on a role that is real or imaginary. It involves spontaneous interaction of participants as they attempt to complete a task" (Sam, 1990).

Regarding the term simulation, Sam (1990) claims that the term has been defined by many authors, for example Dougill states that it is "a structured set of circumstances that mirror real life and participants act as instructed" moreover, according to Jones it is a "reality of function in a simulated and structured environment…reality of function is the key concept in simulation" (Sam, 1990).

Back to drama, to name some of its important benefits; according to the Australian Catholic University, "Through drama you can become anyone, anywhere, at anytime. By understanding drama you can learn to understand anyone, anywhere anytime. Plays often capture the essence of a culture or a group within that culture. They reveal the attitudes and opinions of their day" (ACU, 2005). Devon (1993) states that "drama is social activity and social activity is drama, whereby each embodies representations of the other" (Devon, 1993).

Drama is also used in the educational field as a powerful tool for learning, it has many benefits, we have chosen the most related ones to our particular project, and the benefits according to Maley and Duff (2005) are:

- 1. It combines verbal and non-verbal aspects of communication; hence it brings the mind and body together restoring the balance between physical and intellectual aspects of learning.
- 2. It promotes self awareness and awareness of others, self esteem and confidence.
- 3. It fosters and sustains motivation through the variety and sense expectancy generated by the activities.
- 4. It promotes an open, exploratory way of learning where imagination and creativity can be developed.

We experience some conflict when our desires are not fulfilled, "*The essence of drama is conflict. Conflict is born of thwarted desire and grows in proportion to the obstacles in its way and the effort already expended towards overcoming them*" (Glassner, 2004, p.74).

According to Glassner (2004) conflict takes place when some force stands between the hero and his desire, Aristotle addresses three forms of conflict:

Man vs. Man: In this form of a conflict, the opposing force is another person that is called the villain; the villain can be an individual or a group of people. Glassner (2004) gives a simple example of a hero and a villain from *Die Hard*, John McClane as the hero and Hans Gruber as the villain.

Man vs. Nature: This form refers to the hero's fight against the impartial forces of the universe, for example the hero is trapped in a desert, dark forest, or the storm at sea that creates trouble.

Man vs. Self: This form refers to the hero's problems with himself. For example, the main barrier that prevents him to achieve his desires is his own heart, his goal may be to rebuild his marriage that is about to end, but he is insecure and causes him to have a violent temper resulting a bitter fight each attempt.

In general good conflict is equal to good challenge, if the challenge is easy for the hero to solve, he would not gather much our sympathy. The villain must appear stronger than the hero; his strength might be physical, mental, moral, or financial. The greater the disparity between the resources of the hero and the villain, the greater the tension is, *"The more that the villain dwarfs the hero, the harder the hero must struggle. If we believe in the hero's quest, then we empathically hope with him, and we feel something of the challenge he faces"* (Glassner, 2004, p.75).

1.5.1 Drama Schematics:

The different levels of the dramatic tension that the hero might go through can be visualized schematically based on two variables; time and complication or suspense. Some of the most known plot schematics are: Aristotle's dramatic arc, Freytag's dramatic triangle, Laurel's contemporary plot structure, and finally Laurel's flying wedge. A short description will be presented in the following sections.

1.5.1.1 Aristotle's Dramatic Arc:

According to Schön et al. (2003) linear stories have been told since the time of Aristotle, the temporal turn of a story line can be visualized schematically, it is also called Aristotle's model of suspense in linear stories. Figure (3) shows that he divides the storyline into four periods: exposition, ascending storyline, climax, and the dissolution

- 1. Exposition: In the exposition, characters, environment, and a problem are introduced to the audience as a basis for further storyline.
- 2. Ascending storyline: Conflicts are introduced and intensified in order to increase the suspense of the story. The arousal of the conflict will be dependent on the ideological differences or different levels of knowledge.
- 3. Climax: It occurs when the main character takes a decision towards solving the problem.
- 4. Dissolution: The audience reaches the same level of suspense as the beginning of the story



Figure 3 the classical lapse of suspense according to Aristotle's poetic (Schön et al. 2003, p.5)

1.5.1.2 Freytag's Dramatic Triangle:

The drama model proposed by Freytag (2005) consists of five parts and three crises of drama, figure (4). It takes a pyramidal structure when its arrangement is symbolized by lines. The dramatic tension rises from the *introduction* to *climax* and falls to *catastrophe*. The parts of rise and fall in tension lie between the mentioned three parts. A part from the climax which is composed of one chief scene, each of the parts may consist of a single scene or a series of connected scenes.



Figure 4 Freytag's pyramidal structure (Freytag, 2005, p.115)

These parts are as the following:

- a) Introduction
- b) Rise
- c) Climax
- d) Return or fall
- e) Catastrophe

Three important scenic effects stand between these five parts. The first important dramatic moment indicates the beginning of stirring action; it lies between the introduction and the rise. The second moment is the beginning of counter-action and it lies between the climax and the return. The third one must rise again before the catastrophe; it lies between the fall or return and the catastrophe. The three moments are called in the following order: the exciting moment or force, the tragic moment or force, the moment or force of the last suspense, *"The operation of the first is necessary to every play; the second and third are good but not indispensable accessories"* (Freytag, 2005, p.115).

1.5.1.3 Laurel's Contemporary Plot Structure:

Looking at Figure (5) which what Laurel (1993) calls the contemporary plot structure, it is obvious that she attempted to combine Aristotle's dramatic arc with Freytag's dramatic arc. Segment (a) represents the *exposition*; it is where the play functions to reveal the context for the unfolding action, at this stage characters, environment, and objects will be introduced. Although section (b) looks as a point, it is in fact a small segment and has some duration; it is where *"the action or event that begins what will become the central action of the play"* (Laurel, 1993, p.86). The rising action follows by the segment (c) where characters take major and convincing actions to chaise their goal. This will be followed by segment (d) where it represents a period of heightened activity and commitment; it is generally proceeds a faster pace than the preceding action, at this segment many probability lines are eliminated. Point (e) represents the climax where one of the probability lines becomes necessity; at this level characters either fail or succeed

to achieve their goal. Segment (f) is the falling action which represents the consequences of the climax. This will lead to segment (g) which represents the resolution, *"the return to ... the status quo of the dramatic world"* (Laurel, 1993, p.87).



Figure 5 Laurel's contemporary plot structure (Laurel, 1993, p.86)

1.5.1.4 Laurel's Dramatic Flying Wedge:

From Aristotelian point of view, the potential of a play is formulated to a set of possibilities by the playwright. As the play progresses the number of possibilities decreases radically. Those possibilities are influenced by the play's enactment. The performed enactments eliminate some of the possibilities and make some others more probable. When the audience knows that *Hamlet's* father was killed, it becomes probable for them that *Hamlet* is going to identify the murderer, later on it becomes probable that *Hamlet* will revenge when he finds the villain. But can he make it? The audience perceives more probable course of events, more probability lines *"creating engagement and varying degrees of suspense in the audience"* (Laurel, 1993, p.69). These events lead to final moment of a play or to the peak of its climax, at this point all the competing lines of probability are discarded except one line in which it is the outcome. At this moment the whole action of a play is completed, it is formulated into possibility, probability, and necessity over time. In order to visualize the process schematically, figure (6) illustrates the "flying wedge" as a progression of the plot from the possible to the probable to the necessary, the progression of the material causality can be read from left to right, and the formal causality can be read from right to left. The climatic point in the diagram is represented by the word "Necessary".



Figure 6 the flying wedge, plot's progression from possibility to probability to necessary (Laurel, 1993, p.70)

1.5.2 Conclusion:

Narrative is an important component of culture; it can be used to communicate cultural knowledge between generations. Time and causality are important elements, the story cannot be perceived without these two elements. The aspects of cause and effect can be triggered by characters or events. The audience looks for causal motivation, and this will lead to mystery, suspense and other reactions. The dramatic character is one of the components of narrative; he can convey the story by the use of gestures and dialogue. With other words the dramatic character acts the events out. Such type of storytelling can be used in problem solving; therefore, it can be considered as one of the most important narrative pattern. The involvement of the dramatic character with causally related events, which rise and fall in tension, this process will generate a pattern over time. This pattern is called plot. Plot is defined as an imitation of action, it is considered as the soul of tragedy, without action there cannot be tragedy, and thus there is no story.

Fabula represents the actual representation of the story in viewer's imagination, the audience look for causal or spatial links progressively. Sjuzet represents the actual arrangement and presentation of the fabula independent of the medium. Since the spectators have different interpretations of representations, different cognitive processes, different intellectual levels; the same presented sjuzet can evoke or generate different fabulas in their imagination.

Drama combines verbal and non-verbal aspects of communication; it brings mind and body together restoring the balance between physical and intellectual aspects. It sustains motivation generated by activities. Finally it enhances the development of the imagination and creativity in an open and exploratory way. Drama refers to act, leading to a series of events involving interesting and intense conflict; it provides us the opportunity to express ourselves through verbal expressions and gestures using our imaginations. Role play and simulation are two types of drama activities. Role play activity involves spontaneous interaction of participants as they attempt to complete a task. Hence, the following chapter will focus on the characteristics of the term interactivity.

2 Chapter:

2.1 Interactivity:

The term interactivity has been described by different scholars; some describe its general use in our daily life. Others describe it in relationship to human computer activities. This chapter will cover a description of the steps of interactivity, the factors that affect the degree of interactivity, the types and principles of interactivity. Finally, interactivity will be presented as communication forms.

2.1.1 Principles of interactivity proposed by Stephen:

Stephen (2002) claims that interactivity can mean many things; it can be described; as an ongoing raise in participation, as a response to response, as a bidirectional communication medium. It can be many things that cannot be done alone. He categorizes the term Interactivity by a set of three principles; these are Input- output, inside-outside and open-closed.

Input /output: According to Stephen (2002) this principle states that an input must generate an output and vice versa. The feedback from the system can determine the quality of interactivity; one element can be the response time between the input and output. A shorter response time enables the user to quickly identify the changes that he applied to the system. Another factor according to Stephen is the user's ability to control the input, in his example, if a person presses a door bell, he expects someone to answer. This input has to facilitate more input and provides the user with other capabilities; hence the line thins between response and stimulus, leading to increase in the depth of immersion, therefore when a person is immersed he cannot do something else.

Inside / outside: It refers to the dialogue created between the internal and the external worlds. The relationship between two sorts of interactivity, they are identified by the terms "inside the skull" (internal) and "outside the skull" (external) interactivities. Inside the skull interactivity is a process of extending of the users knowledge. It is the imagination of the reader of his world, the world of meaning, the art, and dreams, the world of semiotic. Outside the skull interactivity refers to our experience on the empirical or experiential level. It can be the technology around us; it is the element of the craft not the art, e.g. the haptic feedback of the joystick, the hues of the colors.

Open / closed: It refers to the ability of the system. Open systems can give something back which closed systems cannot, therefore open systems are more interesting than closed ones. For example if a person kicks a brick, the brick moves depending how hard he kicked it, the person expects this response. But if he kicks another person, he will not be able to expect the other persons reaction because human is independent and unpredictable. Hence interactivity with the brick is predictable and it is a closed system, and the interaction with the human is unpredictable and it is an open system. An open system is more interesting, more complicated, and less predictable, a closed system is less interesting, less complicated and more predictable

2.1.2 Steps of interactivity proposed by Stephen:

According to Stephen (2002) the structure of interactivity is composed of four different steps, these steps are; Observation, Exploration, Modification and Reciprocal change. Understanding and applying these steps can enhance the quality of the interactive system.

Observation: Before any action can take place, the interactor uses his skills to observe and evaluate the surroundings and determine his abilities in the environment, a type of awareness of first level options is required, the interactor may ask himself, what is possible and what is not?

Exploration: The interactor explores his capabilities, he figures out what he can and what he cannot do. Here the user moves from the first level options to the second level options where he unintentionally discovers his abilities whether he can or cannot make a change in the environment.

Modification: It is the result of the user's applied changes and modifications to the system. The user first evaluates; based on his evaluation, he determines his abilities and intentionally carries out some actions; these actions will result some changes in the system. The user bridges between evaluations, capabilities and decisions. This step represents the transformation from unconscious discovery to conscious action that leads to a change in the system. The user at this step knows some of his abilities and uses them to modify the system.

Reciprocal change: As the user changes the interactive system, the system in return tries to change the user's action. This type of intertwined relationship is considered one of the defining elements of interactivity; without it, the system would not have any difference from any brick that has been kicked or a doorbell that has been triggered. Figure (7) illustrates the steps of interactivity and their sub parts.

irvati	•Skills •Identification & Evaluation •Possibilities
oratio	•Abilities •experience
ficati	•Change •intentional actions
proc	Interrelationship between the user and the system Feedback

Figure 7 illustration of the steps of interactivity

Based on the above definitions, we can argue that any basic interactivity can involve the described four steps of interactivity. In a basic meaningful interaction, the order of the steps is an important issue, meaning that the steps can be described as single directional process and they could also be a continuous circular loop. For example the interactor cannot be involved in the third step of modification unless he has been through the processes of observation and exploration. The participant in the interaction will first observe, evaluate the surroundings and the potential possibilities, then he will determine his skills and abilities. Once this happened the user will be able to execute actions to modify the system. When the

modification takes place, the user gets feedback. The amount of change or the amount of feedback in/from the system will determine to which degree the interactor should change his actions.

Similar to Stephen's steps, Interactivity has been also defined by Crawford (2005), but with other terminology. He claims that interactivity is "A cycle process between two or more active agents in which each agent alternately listen, thinks, and speaks" (Crawford, 2005, p.29). Nevertheless in Crawford's definition, the category of "listen" can correspond to the interaction step of exploration by Stephen, thinking can also correspond to observation and finally speaking corresponds to modification. Additionally he is emphasizing that interactivity is not a binary quantity just like morality, either you are right or wrong, or you have it or not. He means that interactivity is arithmetic quantity just like weight, for instance you can be able to have more interactivity or less of it. He simplifies the degree of involvement in low or high interactivity, an example of low interactivity such as the refrigerator light (the light turns on when you open the door and off when you close it) and a high degree of interactivity such as sex (powerful lovemaking can be considered as the deepest interaction two people can have). The degree of interactivity by Crawford will be further described in detail in the following section.

2.1.3 Degree of interactivity proposed by Crawford:

Crawford (2005) claims that the degree of interactivity can be determined by three factors: Speed, Depth and Choice.

Speed: The aspect of speed is considered as an important element in determining the quality of interaction. An example can be VisiCalc spreadsheet that are designed for personal computers, another example of spreadsheet programs is the patch processing program where you patch your data onto punch cards and then submit your job to the computer center, then pick up your output the next day. Nevertheless we can doubt if these examples are valid enough due to the interactive systems revolutionary developments. Another example could be a bad internet connection that leads to an extension of the expected time to get a feedback.

Depth: Some activities do not require lots of concentration for example searching on a website to find a piece of information, others like video games require a higher level in the degree of concentration but still does not reach deep enough to the crucial areas of you mentality. Some other activities provide deeper interactivity than others, for example strategic games such as chess; it provides deeper interaction than a tic-tac-toe game, as a result the quality of interaction relies on its depth and speed.

Choice: According to Crawford (2005) the quality of any interaction depends of the richness of the choices available for the user, the term richness can be divided into two aspects:

- 1. The functional significance of each choice refers to the degree to which a choice satisfies the user's interest, desire and needs. For instance in games the player is offered the opportunity to wander over a huge region in the virtual world, the player spends hours exploring a dead area that does not offer further possibilities for interaction. Millions of choices and possibilities in terms of where the player might go are offered by the game but not all choices are functionally significant.
- 2. The perceived completeness refers to the number of choices in relation to the number of possibilities the user can imagine. For example, if the user reaches a climax of a story and he

has to choose between leaving his girl friend for the sake of the war or to give up and shirk his duty to go back to his girl friend. Having two choices does not decrease the quality of interaction.

The three described terms above namely; speed, depth and choice, play an important role in determining the quality of interactivity. Concerning the speed the faster the response of the system the better the interactivity is. Regarding the depth, interactivity that requires more concentration by the user, more involvement of the user's cognition and awareness will increase the productivity, thereby increasing the quality of interactivity. The final aspect which affects the interactivity is the choices available; these should be functionally significant. In other words the provided choice by the system should lead the user to the desired goal or direction. Limitation of choices available does not harm the quality of interactivity.

2.1.4 Types of interactivity proposed by Ryan:

Ryan (2001) argues that any interactive work requires a reasonable interactive medium, interactivity can appear on two levels, one constituted by the medium and the second intrinsic to the work itself. The types of interactivity can be categorizes as: reactive, selective and productive interactivities.

Selective: This can be divided into two, random and purposeful. First, in the random selection the user takes a deliberate action but does not foresee the consequences of his action, a good example is the random clicking of many hypertexts. Second, purposeful selection for example in computer games, the player is offered a choice between two paths; the player is not able to predict which of the choices leads to success and which one leads to failure.

Productive: It refers to the fullest type of interactivity; the player is involved in productive actions that leave durable changes and modifications in the environment. The productive interactivity enables the user to sit actively in the driver's seat instead of seating passively in the passenger's seat. In video games the player is both reader and producer, reader of the computer output and producer via input. The player does not enter the game world only but in addition he changes the game world's ingredients.

Reactive: In this type of interactivity, the user does not involve in any type of deliberate action. An example is; a piece of art reacts to noise or to sunlight in a room. For such type of interactivity, the term Ergodic is used. Examples of Ergodic design and sensitivity to user's input regarding digital text, virtual and electronic environments can be seen in Appendix (A), (p.89).

2.1.5 Ergodic participation:

The term ergodic is defined from another perspective, according to Aarseth (1997) "*The term ergodic is appropriated from physics that derives from the Greek words ergon and hodos, meaning "work" and "path." In ergodic literature, nontrivial effort is required to allow the reader to traverse the text"* (Aarseth, 1997, p.1). He suggested the term to describe the differences between the type of interaction of the user's participation in the digital media and other types of engagement. The interactor's participation depends on his physical activities in the real physical world, this will causes various input effects in the virtual world. Some examples of ergodic participation according to Nitsche (2008) are the mouse clicking, pressing a key and moving a joystick. The core of video game experience is the player's activity; game theorists agree that there would be no game if there is no player activity. Due to the nature of video games containing physical activities, the player activity is considered as ergodic or nontrivial.

To be able to get a better visualization of all the mentioned: types, degrees, steps and principles of interactivity; we designed a model that shows the relationships between these aspects. As it is illustrated in figure (8), some of the aspects have direct relationship to others and some do not. For example the principle of inside the skull is linked to the observation and exploration indicating to the activities which take place inside the skull of the interactor, while the principle of outside the skull is linked to the observation and reciprocal change referring to the change occurred in the virtual world.



Figure 8 our model to illustrate the relationships between the steps, types and degree of interactivity

2.1.6 Communication Forms:

According to our previous unpublished work, there are two types of communication forms, verbal and non-verbal. Communication plays a major role in the experience of the presented application in this project.

Through an analysis of different available definitions of interaction, Manninen (2004) observed that the word interaction is mainly related to communication. He follows this observation by the definition of two models of communication form.

The *psychosociological* model of Riva and Calmiberti defines communication as "a global system in which participants construct meaning by using and interpreting not only words, but also intonation, gesture, posture, attitude and the space between them" (Manninen, 2004, p.46). Manninen (2004), points that this model is focusing on the aspects of human nature in the scope of communication.

A second model, the sequential *parcel-post model* of Shannon and Weaver, defines communication as "the transfer of information (message) from a transmitter (source) to a receiver in the form of a signal, which can be affected by disturbance (noise)" (Manninen, 2004, p.46).This model applies more to informatics.

Non-verbal communication has thus taken an important role in video games. Manninen (2004) listed the different types of non-verbal communication categories, and proposes a model for those means of communication. This model can be used in the interaction design phase of a game. This model appears useful in the context of game interaction design, to carry information in a diegetic way through expressive characters. The model of Manninen (2004) of non-verbal communication categories can be found in Appendix (B), (p.90). Example of verbal communication forms can be the aspects of diegetic and extradiegetic sound, more descriptions of these two types of sounds will be elaborated in the next section.

2.1.7 Diegetic and Extradiegetic sounds:

Sounds can be under two categories in the film theory: diegetic and extradiegetic sounds. Diegetic sounds are sounds which sources are present in the fictional world. The characters can hear them and react from them. On the contrary, extradiegetic sounds are the ones which do not exist in the fictional world, that are used for different reasons, informative or aesthetic. Film music is an example of extradiegetic sound.

In nonlinear media, the border between diegetic or extradiegetic sounds becomes blurry. The reason according to Jørgensen (2007) is due to the nature of interactivity of such applications. The player's actions in the virtual world can be influenced by extradiegetic sounds: for example, some games use extradiegetic music to warn the player about incoming danger, which will as a consequence influence the avatar's behavior. In other cases, characters belonging to the virtual world can break the border between virtual and physical world by addressing directly to the player. An example of this case is when the avatar is answering vocally to the player when a command is executed.

Jørgensen (2007) adds a third category for video game sounds: transdiegetic sounds that are breaking the border between the fictional and non-fictional worlds. The transdiegetic sounds can be further divided into two subcategories: **external** transdiegetic and **internal** transdiegetic sounds.

According to Jørgensen (2007) **external** transdiegetic sounds are sounds that are extradiegetic, in the sense that the characters in the virtual world cannot hear them, but that the participant in the experience can hear them for example, a sound of incoming danger that will in turn influence the player's actions in the virtual world. An example of external transdiegetic sound is adaptive music that changes mood depending on the situation in which the avatar is. An example can be the game *Hitman Contract*, where adaptive music is used in this way. On the other hand **internal** transdiegetic sounds have diegetic sources (e.g. character in the virtual world) that are addressed directly to the player in the physical world. It corresponds to characters answering to the player when a keyboard command is made. The strategy game *Warcraft III* is extensively using those internal transdiegetic sounds: every time the player is selecting and ordering a unit, this one is answering by a short sentence. Internal transdiegetic sounds are often heard in games that are not avatar-based, such as strategy or simulation games. Table (1) demonstrates the sound categorization between extradiegetic, external transdiegetic, internal transdiegetic and diegetic.

Extradiegetic	Music in Warcraft III
Transdiegetic (external)	Adaptive music in Hitman Contracts
Transdiegetic (internal)	Unit voices in Warcraft III
Diegetic	Voice of guards in Hitman Contracts

Table 1 game sounds classification (Jørgensen, 2007, p.114)

Conclusion

Interactivity involves the steps of observation, exploration, modification and reciprocal change. Nevertheless the first two steps can be considered as inside the skull activities, while the step of modification can be considered as outside the skull activity and the final one can be represented in both inside and outside the skull activities. All the mentioned steps, principles, and degree of interactivity can be influenced by the factors such as the speed of applications, depth/concentration, and finally the choices available in the system. Computer games, depending on the nature of the game can be considered as both open and closed systems. They can involve predictable and non predictable activities. Non predictable or open systems are more interesting than predictable or closed ones. The steps of modification and reciprocal change involve Ergodic participation. Ergodic participation refers to the physical activities carried out by the interactor in the physical world. All computer games involve Ergodic participations, for instance if a player is waiting on a tower and wants to snipe and shoot his enemy, the passive waiting period freezes partially most aspects of interactivity and the entire Ergodic participation. The input in the application should open to the possibilities for more inputs and provide the user with more capabilities. Another important factor is to guarantee the unpredictability of the system, that is, making sure that the characteristics of the system tend more to being open than closed. Choosing the proper type of interactivity to be integrated with narrative is of extreme importance to maintain user's involvement with the interactive narrative application. Maintaining the speed, depth and availability of choices for the steps of interactivity is important due to the fact that they influence the quality of interactivity in general which will lead to influence the quality of narrative construction process. Finally interactivity can be related to communication, the verbal and non-verbal communication forms play an important role in computer games.

3 Chapter:

3.1 Interactive Narrative:

Interactive narrative has been defined as "a time-based representation of character and action in which a reader can affect, choose, or change the plot. The first-, second, or third-person characters may actually be the reader" (Stephen, 2002, p.62). On the other hand "A plot is a fixed sequence of events that communicates some larger message about the human condition. In interactive storytelling, plot is replaced with a web of possibilities that communicate the same message" (Crawford, 2005, p.85). Moreover, regarding the role of the authorship and the characteristics of interactive narrative, Stephen describes it as the process of narration where the process of interactivity rips off the perspectives of the author and puts new perspectives in the hand of the reader. Thus interactivity accommodates a relationship between reading and writing. Interactivity is the main difference that enables us to distinguish between games and other forms of entertainment. If the user only wants a story he could read a book or watch a movie. In video games the players do not like to be force fed a story which in turn limits their gameplay.

According to Stephen (2002) interactive narrative has different size and shape and its quality can be determined by different means. First, it is considered as a way of reading, it contains character representations. The character representations follow a planned development that occurs over time which it is determined by the author or the reader. Second, interactive narrative follows in general the steps of interactivity; for example observe, explore, modify and change. Finally it follows the principles of interactivity; for example inside/outside, input/output and closed/opened. Stephen outlines that some forms of interactive narrative follow the mentioned criteria's more than others, the more they are followed the higher the level of interactivity and deeper degree of narrativity.

Traditional narrative requires the involvement of the mental state, in addition to the mental state "An interactive narrative is a game world in which the user controlled character(s) can physically and mentally interact with ideally perceived total freedom while experiencing a dramatically interesting narrative which is fundamentally different on nearly every play — dependent on the user's actions" (Barber, 2008, p.1).

According to Barber (2008) characters in linear media might act in contrary to what the audience expected, interactive narrative overcomes this problem by transporting the audience into the story world in which she has the control over the actions to be carried out, and still enjoy a participatory story.

The main challenge in any interactive narrative system is to merge the benefits of strong story and strong autonomy, *"Interactive narrative requires two seemingly conflicting requirements: coherent narrative and user agency"* (Riedl and Stern, 2006, p.11).

According to Riedl and Stern (2006) strong autonomy refers to the idea that interactive narrative can be generated procedurally, and this could be by using autonomous agents that play the role of characters in a simulated environment. On the other hand strong story refers to the dominating role of authorship in choosing the activities of all the characters in the story.

Although Juul (1999) claims that interactive narrative is oxymoron concept and it is never possible, some of the criteria that he is addressing might be of great benefit to highlight. For example he refers to some of the most important aspects to distinguish interactivity from narrativity, these aspects are the time and

space. He argues that there is conflict between the temporalities of the game and narrative. In interactive applications, when the player makes a choice, it has to be "Now" the action is based on real time. But narrative has the trait of being about something in "Past". Similarly, regarding the aspect of space, computer games create spaces for the participant to move around, narratives discard the uninteresting spaces; a journey is only described when something happens. Juul (1999) outlines that the time of the narrator and the time of narrated are distanced in time in a novel, for example a novel raises questions of the identity of the narrator. Interactive applications do not share the temporal split between the time of the narrated, the narrator, and the reading. Computer games merge all these three time to a single "Now".

3.1.1 Interactive Narrative Plot Schematics:

According to Stephen (2002) the plot structure of interactive narrative is rather a system of connections than a curve or a plot arc. Stephen stresses that the visualization of an interactive nonlinear narrative can be more useful than a linear narrative. Stephen (2002) states that Koster claims that there are two forms of interactive narrative, Impositional and expressive. The terms impositional and expressive refers to the level of control on the story that the user is allowed to have. An example could be *"choose your own adventure"* (Stephen, 2002, p.63) as heavily impositional where the user is guided with strict rules that allow the reader with limited decision choices. In simple words, impositional refers to a high limitation by the system and less freedom of interactivity for the user. In the expressive form the reader relies less on the series of events or decisions, he is free to explore, investigate and make changes in the environment. Therefore, expressive refers to low limitation by the system and high freedom of interactivity for the user. An example of this type could be the *"Ultima online"* (Stephen, 2002, p.63), where the player has a high degree of freedom to navigate, explore and take actions. The challenge lies in finding the proper balance between the two forms. Philosophers put major efforts in balancing the limitations and the freedom of the player in the game world; hence focus in this section will be to demonstrate different plot schematics proposed by various thinkers. The following three plot structures are proposed by Stephen.

3.1.2 Plot structures described by Stephen:

Nodal Plot Structure

According to Stephen (2002) this type of plot structure consist of a series of noninteractive events represented by the flow directions or arrows as in figure (9), where the plot flow is interrupted by different points of interactivity or decision points. This type of plot structure is called string of pearls and it provides the most potential support for the classic dramatic arc, thus it gives the author the narrative control. According to Tomaszewski (2005) the way the nodal structure differs from a traditional narrative is that it provides decision points in which the participant has to complete the task in order to advance in the game. The decision points are called (do-or die), the user dies when he fails to accomplish the task, then he has to reload a saved game and try again. Examples that follow this pattern are games such as "Sonic the hedgehog" and "Dues Ex" (Stephen, 2002, p.64). In DeusEx, for instance, there are two possible endings, one of which is hardly ever seen by the reader, the user most likely dies. The other ending will be very hard to reach; it is the interest of the authors that it remains unattainable. These games failed to some extent to take the advantage of their dramatic potential, due to the lack of smooth transition and integration between the modes of active and passive participation in the game.



Figure 9 the Nodal Plot structure (Tomaszewski, 2005)

Modulated Plot Structure

According to Stephen (2002) modulated plot structure figure (10) supports the dramatic arc, but with lesser degree. Interactivity is more plot based than nodal plot structure, it provides the participant "with the option to bore straight through and avoid interaction, or to take a more leisurely route and increase the interaction and participation" (Stephen, 2002, p.65).

Tomaszewski (2005) states that modulate structure has multiple plotlines, any decision the participant take will result in a different sequence of events. The author now all the possible story lines. A disadvantage could be, repeatative playing lead the participant to experience all the different plot lines.



Figure 10 the modulated plot structure (Tomaszewski, 2005)

Open Plot Structure

According to Stephen (2002) an open plot can look like a road map consisting of points of decision that can carry the reader to another point of decision, figure (11). The participant's individual decisions are what allow him to get where he is going, just like as you are driving in a city, your decisions takes you where ever you want to get. Open plot structure is considered the most expressive for the reader and the less expressive for the author. The dramatic arc is almost abandoned for the interests of exploration, modification and investment. It has no starting point; the story depends on the development of the character such as *Ultima online,* or the development of an environment such as the *Sims*. If we consider the open plot structure as a series of intersections in a city, and you are driving, the individual decision allows

you to go where you want to go. The process of going from one place to another is what is important in the plot structure.



Figure 11 open plot structure (Tomaszewski, 2005)

3.1.3 Plot structure described by Crawford:

Foldback Plot Structure

According to Crawford (2005) developers tried to put efforts to solve the problem of branching tree design. The foldback structure figure (12) attempts to reroute the consequences of the decisions. Without additional efforts from the story designer, it gives the user the impression that he has more decision opportunities. The foldback plot cheats and tricks the player into thinking that more choices are available. Crawford (2005) gives an example of a choice available for the player in a game. In this game, a player enters a cave searching for the sword needed to save the maiden avoiding the dragon, while he is inside the cave; he hears a sound of tickling water, the player searches for the source of the sound. His search will either leads him to the hole of the dragon, or to the mouth of the cave. This way the story folds back to a predetermined path, a problem that can occur is when the player repeatedly and unavoidably falls for the trick of thinking that he is making a choice in the storyworld; with the repetition the player simply will discover that he has been cheated.



Figure 12 a simple foldback structure (Crawford, 2005, p.126)

3.1.4 Plot structures described by Ryan:

The Network

Ryan (2001) states that, in network plot structure figure (13) the reader's movement will be neither free to navigate nor limited to a single course. The network structure allows circuits and therefore the duration of the readers visiting of each node cannot be controlled by the system. The narrative continuity can be possible only from a single node to the next or between sequences of nodes with single connections. The reader might go through a node where it is described that a specific character is dead and then the reader moves to another node where the same character is still alive.



Figure 13 the network structure (Ryan, 2001, p.248)

The Tree

Ryan (2001) claims that the characteristic of a tree structure figure (14) is that it does not allow circuits; there is only one way to reach a given node. When a specific branch is taken, there is no possibility to return back to the decision node, *"tree-shaped diagrams...control the reader's itinerary from root node to leaf nodes and make it easy to guarantee that choices will always result in a well-formed story"* (Ryan, 2001, p.248). An example is the children's stories *Choose Your Own Adventures*.

According to Wolf and Perron (2003), the schematic of the tree plot is easy to understand and simple to implement for the developer. But, after just a few steps, the tree will grow rapidly, leading to disappointing results because of the geometric explosion of the branching tree. Making it almost impossible for the developers to determine and identify enormous amount of different conditions. Ryan (2001) claims that, it would take sixteen different plots, with thirty-one different fragments, to make four decision points available.



Figure 14 the tree structure (Ryan, 2001, p.249)

Action space, Epic Wandering, and Story-World

According to Ryan (2001) the overall diagram space represents the geography of the virtual world, the nodes, the bidirectional links between the nodes and the access ways to different sites as it is shown in figure (15). The interactivity occurs on the macro level and the dramatic plotting on the micro level. It is

free for the user to take any road. When the user reaches any site; the system will send him into a self contained adventure, this process is represented by bidirectional arrows in the diagram. The model discards the idea of having an overarching dramatic narrative in favor of epic structure where the role of the user is passive. The overall determined narrative by the user's activity is sequential. On the other hand, the small narrative events or micronarratives that are specified by the system can be dramatic. The geography of the virtual world consists of distinct subworlds; each subworld offers different adventure. For example in one site you ride a horse towards saving the queen in the castle; in another you climb a mountain; in another you are flying in a spaceship. The numbers of the choices are limited to take the ride, and when the user takes a decision, the system takes control over the user and provides him with an experience that has a direction of the Aristotelian narrative structure. Landow has a similar structure which he calls the "story world". The concept is based on the fast reproduction of narrative where small stories take over the attention from the macro level of the plot. Ryan (2001) states that Landow uses Hypercafé as an example for such model, the user moves aimlessly in a crowded café, he chooses a table where some others having a conversation, after selecting the conversation the user listens to it. The video unfolds; the role of the user is passive in this case. Ryan (2001) stresses that in such systems the narrative coherence can be maintained at the cost of interactivity.



Figure 15 action space, Epic Wandering, and Story-World (Ryan, 2001, p.256)

The structures of Nodal, Modulated and Foldback have common functionality in the sense of providing the user with opportunities with multiple paths at the middle, and a single end. While the tree plot structure has a single start point and infinite ending possibilities, this would demand huge efforts and maybe almost impossible for designers to implement. A solution could be to develop a system that can generate a tree plot structure than designing it. The network graph functions in a similar way as the tree but allows circuits. Finally, the plot structures of action space and Open graph have different shapes but they are similar in the sense that they provide multiple starting points and multiple endings.

3.2 State of the art:

Some approaches towards interactive narrative and interactive drama will be on focus, the aim is to investigate various techniques used in this field as well as describe the strength and weaknesses of each application. The following sections will demonstrate the characteristics of life simulation *The Sims*, *Erasmatron*, and the interactive drama application *Façade*. A brief discussion regarding the pros and cons of each of applications will also be addressed.

3.2.1 The Sims:

According to Crawford (2005) a work has been developed by Will Wright to simulate a household life, the Sims is considered as an environmental approach to storytelling, even though it does not offer explicit storytelling. The players in the Sims guide their characters in house activities such as taking shower, preparing meals, eating, washing dishes, cleaning the house and sleeping. All the mentioned activities are claimed by not to be dramatic by Crawford. The drama has been defined by Alfred Hitchcock as *"life with dull bits cut out"* (Crawford, 2005, p.137). In this regard, Crawford (2005) describes the Sims as life with the dramatic bits cut out. He concludes that the Sims is not interactive storytelling Finally, Sansone (2004) stresses that the Sims has no plot, drama or emotional depth.

The criticism made by Crawford seems to be to the older version of *The Sims*. The latest version, *The Sims 3* was released in February 2009, and has more interesting functionalities. The player is able to choose and assign different traits (amongst 63 traits available) to his character. A combination of these traits can create complex personalities. The assigned traits and lifetime wishes can be developed by some activities such as training, exercise and reading. These lifetime wishes gives the player's Sims the ability, to for example, get married with other Sims. Additionally, daily maintenance is also required, for example it is important that the player maintains hygiene and assures proper eating and sleeping for his character otherwise the Sims get sick and die. One can imagine such a tragic ending for a marriage and argue if the same criticism by Crawford can still be valid. Indeed the developments that took place in *The Sims* can be considered as revolutionary. In *The Sims 3*, for example, the player is able to experience adventure and travel to Egypt. But, there is no a specific goal, and the events in the game are lacking causality.

3.2.2 Erasmatron:

Erasmatron is another approach towards interactive storytelling. It is developed by Crawford (2005) and he called it the future of interactive storytelling. He argues that some of the basic laws of drama can be easily constructed; he refers to the aspects of space and time. The dramatic space is discrete, not continuous like the physical space. It is divided into sub-spaces which are called stages; the actors interact with each other on the stages. The dramatic time on the other hand behaves differently than the physical time, it is possible with the dramatic time to jump any time interval that is necessary for the story. This jump is event driven and not clock driven. The fundamental components of Erasmatron according to Crawford (2005) are: Actor, Verb, Stage and Event. Brief description of each of the components can be seen in Appendix (C), (p.91).

3.2.3 Façade:

Façade is an immersive interactive drama developed by Mateas and Stern (2002). *Façade* combines the gamelike pleasure of continued interaction and the storylike pleasure of participation in long term dramatic progression. The player has a first person view in a simulated real time 3D world with animation and sound; the participant is able to directly interact with the surrounding by navigating and picking up objects. The characteristic of *Façade* is that it contains theatrical drama, instead of saving the world and shooting the

invaders, the characters in *Façade* express their mode by the use of emotional gestures, facial expression and the use of natural languages.

It has been claimed by Szilas (2005) that Ryan criticizes Façade from the interactivity point of view, she claims that interactivity is limited because the user is more *"active observer rather than being cast as the main protagonist"* (Szilas, 2005, p.194).

According to Mateas and Stern (2008) the story is mainly about human relationship, namely the relationship of a couple where their marriage is about to an end. The actions take place in an apartment where the structure of events follows the Aristotelian arc of tension, exposition, ascension, climax and denouement/resolution. The player carries out different small actions, the story progresses through the responses of the virtual couples to these actions. These discourse actions contain criticism, praises, provocation and flirtation. The player chooses to have the name of Brenda, where she is an old school friend of the couple Grace and Trip. The couple has invited Brenda for drinks because they have not seen her for long time. Brenda is able to move around in the apartment, pick up objects and use gestures with the use of the cursor controlled by the mouse. The user can communicate to the couple by using text inputs and receiving prerecorded audio outputs from the couple. If the interactor inputs and uses provocative sentences, he will unnerve the two virtual characters which might result in an end of the conversation and probably being asked to leave the room.

As we mentioned earlier that the challenge lies in having the proper balance between the impositional (limited interactvity) and expressive (unlimited interactvity) aspects of the game, with other words the balance between strong story and strong autonomy. Although *façade* puts great efforts and focuses on the necessity of containing the element of drama, it seems that it lacks the needed balance between the dramatic elements involved and the user's freedom of interactivity. In fact *Façade* allows less expressivity for the user; the movement of the user is constrained and limited to being in an apartment. It is important to mention that user's expressivity is an important factor which should be taken to consideration.

3.3 The strategies proposed by Jenkins:

According to Mateas (2002) some theorists attempted to find middle ground position between interactivity and narrativity, for example Jenkins (2004) claims that not all games tell stories, therefore believes that some strategies are available for narrative elements to be woven into the game worlds. According to him *"Environmental storytelling creates the preconditions for an immersive narrative experience in at least one of four ways: spatial stories can evoke pre-existing narrative associations; they can provide a staging ground where narrative events are enacted; they may embed narrative information within their mise-enscene; or they provide resources for emergent narratives, and emergent narratives. A brief description with an example of each of strategy as follows.*

3.3.1 Evoked narratives

According to Jenkins (2004) evoked narratives are the elements from a known linear media in which the participant has visited in his imagination or fantasies. These elements can be included in the special design of the game. The use of evocative spaces "may either remediate a pre-existing story (Back to the Future) or draw upon a broadly shared genre tradition (Disney's Haunted Mansion)" (Jenkins, 2004). Evoked narratives refer to the spatial design that can enhance our sense of immersion within a familiar world.

Jenkins (2004) in his example states that the Star Wars game may not retell the story of Star Wars, and it does not have to, although we know the story we still buy the game version, we get frustrated if the game version offers us the same original film experience. But, *"the Star Wars game exists in dialogue with the films, conveying new narrative experiences through its creative manipulation of environmental details"* (Jenkins, 2004).

3.3.2 Enacted Narratives:

According to Jenkins (2004) games as stories enable the player either to perform or to witness narrative events. The narrative can be seen in such games on two levels; first as goals or conflicts, second as localized incidents in which the player can observe. The first level refers to the principle of environmental storytelling, designing the geography of imaginary world, thus "obstacles thwart and affordances facilitate the protagonist's forward movement towards resolution" (Jenkins, 2004). By Localized incidents Jenkins (2004) refers to the micro-narratives that can be used in games in the form of flashbacks and cut scenes.

According to Jenkins (2004) cited by Costikyan that "*a story is a controlled experience; the author consciously crafts it, choosing certain events precisely, in a certain order, to create a story with maximum impact*" (Jankins, 2004). Furthermore, enacted narrative can be "*organized around the player's movement through space (e.g.adventure games)*" (Mateas, 2002, p.46).

3.3.3 Embedded Narratives:

According to Jenkins (2004) detective stories a good example to illustrate this principle, they can tell two stories, one relatively chronological e.g. the investigation story itself. The second is told thoroughly out of sequence e.g. the motivating and leading events to the murder. For the narrative comprehension viewers make hypothesis about the narrative developments based on the information drawn from textual cues and clues, moving through the film "spectators test and reformulate their mental maps of the narrative action and the story space" (Jenkins, 2004). The participant in games are forced to act upon these mental maps, Jenkins (2004) in his example of a game situation, if we are wrong about the bad guys lurk behind the door, we will find out shortly by being blown away and perhaps start the game over.

Embedded narrative depends on "scrambling the pieces of a linear story and allowing us to reconstruct the plot through our acts of detection, speculation, exploration, and decryption" (Jenkins, 2004). The designer can develop two kinds of narratives; the first is more or less unstructured and controlled by the participant by exploring and unlocking the secrets of the game space. The second is pre-structured and embedded within the mise-en-scene awaiting discovery. In this case the game world becomes an information space or a memory palace. Myst is a good example of such kind of embedded narrative. The participant may have to overcome the antagonist, navigate through mazes, and find out how to pick locks in order to explore what so called narratively-impregnated mise-en-scene, "Such a mixture of enacted and embedded narrative elements can allow for a balance between the flexibility of interactivity and the coherence of a pre-authored narrative" (Jenkins, 2004).

3.3.4 Emergent Narratives:

According to Jenkins (2002) emergent narrative are neither pre-structured nor pre-programmed; they are also not unstructured and chaotic like real life. *The Sims* is a good example to represent this concept, Will Wright the designer of *The Sims* describes it as a sandbox or dollhouse game, he suggests that it should be understood as a kind of authoring environment in which it makes it possible for the participant to define his

own goals and write his own stories. The term emergence has been defined as, "the notion that complex systems can produce behavior that surprises us with its organization" (Crawford, 2005, p.84). Regarding the interactive story telling Crawford underlines that "Just as the alchemists had to understand the basics of chemistry before they could start cooking up interesting chemicals, storybuilders are just going to have to understand the basics of drama before interactive storytelling works" (Crawford, 2005, p.138). Furthermore "Emergent narrative in the strong sense is concerned with the emergence of well-defined high level narrative forms from the interaction of smaller scale elements (eg. game characters) in a system that does not contain any representation of that high level form" (Lindley, 2005, p.24).

According to Louchart et al. (2008) the concept has been introduced by Aylett in 1999 as a convincing solution to the narrative paradox in virtual environments. The term narrative paradox refers to the contradictions between the independency of the user (his freedom to move in the virtual world) and the wish to convey a satisfying plot structure. In order to accomplish an interactive narrative experience two parts need to be involved, the interactor and the system play. Moreover, Laouchart et al. (2008) states that the system offers the interactor with definite amount of options so he is able to reshape the spectrum of actions and define the story development.

The flying wedge proposed by Laurel (1993) described in the narrative chapter is a good example of emergent narrative, according to her Discovering the dramatic potential or what is possible in a representational world, for example in drama, film, or television is considered twofold source of pleasure for the audiences. That is due to two reasons, first because the uncertainties that are cautiously produced stimulate imaginations and emotions. Second, the closure of a completed and successfully constructed action provides certain type of satisfaction. Discovering the possibilities is an important issue in designing interactive representational worlds whether it is interactive theatre or virtual worlds in human computer activities.

Actions in a play comprise a sequence of causally related incidents. The incidents are specified in the script of a play and enacted by actors in the performance. Computer programs can be similar and correspond to the script of a play, except computer programs can lead to a wide variety of actions that differ from session to session; these actions depend on the choices made by the human agents. As a result computer *"programs generally contain more potential for action than plays"* (Laurel, 1993, p.68). Hence understanding the nature of dramatic potential and how it is formulated to action is necessary.

Potential refers to something that can develop or become actual; the dramatic potential is *"the set of actions that might occur in the course of a play"* (Laurel, 1993, p.68). Practically anything can happen at the beginning of a play, the set of potential actions are very large. From the moment that the first light ray falls on the set, even before the actor enters the scene the potentiality for actions begins to narrow, what actually happens constrain what could happen in the future, meaning that character actions begins to constrain further what other actions may follow. As incidents lead to other incidents patterns of cause and effect begins to be perceived by the audience, signs of the whole action begin to emerge. Audiences begin to have expectations about the direction of the play or what is the play basically about.

Laurel (1993) outlines that in human computer activities; the shape of the potential over time is similar to the flying wedge. A completed plot in a play represents the whole action. The whole action in human computer activity can be defined as having a beginning, middle, and an end, the beginning is made up of

incidents in which they are part of the whole. Therefore playing a computer game from the beginning until it ends is a whole action. A session with a word processor can be considered as a whole action. Human computer activities are similar to drama in the process of formulating the potential through progression from possibility to probability to necessity, figure (16). Opening the display in a computer game begins the process of delimiting the potential. Unlike plays, due to the interactivity nature of computer games, the formulation of activity will be unique every time it is performed. The main source of variability is the users, with their different skills, styles and capabilities, different choice and actions will be made, hence reflecting different goals.

In a play, the results of the rehearsal processes can be considered as many aspects of Enactment. The directors and actors agree on what type of lightings and technical effects should be used, when and where to move. If these creativities were occurred in real time rather than in the process of rehearsal, then the enactor's relationship to the script would be seen more dynamic. Usually actors and directors are neither able to change the order of events, the words spoken by the characters, nor they are able to invent new events. A program can be equivalent to a playwright changing the plot in real time; in the sense it formulates the potential for action, producing new possibilities and probabilities. As a result *"the way in which human-computer activity is more dynamic than drama is in the aspect of formulating the action (playwriting) rather than in its enactment (performance)"* (Laurel, 1993, p.73).



Figure 16 the flying wedge in interactive form, (Laurel, 1993, p.72)

Causality is "the connective tissue of plot" (Laurel, 1993, p.74). It refers to the cause and effect relationship within the represented action. An incidents' causal relation to the whole action is a necessity for inclusion. Causes are placed sometimes after effects in order to orchestrate audience's response through suspense and surprise. If there is no causal relationship between the incidents and the whole action, then they are called *Gratuitous*. Gratuitous incidents do not explain why things happened or happened the way they did, they might represent effects of other causes that are not being represented at all. Such type of incidents does not influence the plot; it is useless to include a scene in which Hamlet brushes his teeth. We all have experienced the annoyance of gratuitous incidents in films and TV shows as well as in human computer activities. The presentation of extraneous information can be considered as gratuitous in human computer activities, for example the manifestation of menus, prompts, and helps disregarding whether we want them or not.

Characters goal represent the primary source of causality in the dramatic incidents, it is mainly what the characters want and attempt to do. Various courses of actions are tried by characters in order to achieve their goals; they encounter obstacles and conflicts which force some changes in their plans, behavior, and goals. In human computer activity, the agent's goals are the strongest source of causality, what the human and computer based agent is trying to achieve? What conflict or obstacles arise? How conflicts constrain what the agents do? In both drama and human computer activity, plans must be formulated in order to achieve the goals; these plans provide the basis to understand the action, the formulation of plans, the implementation, the failure and the revision represent the meat of the action, for the action to be probable "goals and plans must be plausible in terms of the characters that generate them" (Laurel, 1993, p.77). Dramaturgy is made of the orchestration of probability and causality, probability can be considered as the key quality of dramatic action. The playwright by manipulating probability forms the plot, the dramatic world and the audience's involvement with it. In human computer activity, manipulating probability can be deployed by designers to shape what people feel and do in the context of a virtual world. Laurel's model basically combines the techniques used in drama and relates them to human computer activities. Thus, the term interactive drama will be elaborated in the next section, first the role of drama to social and ethical issues will be presented, secondly the relation of the drama components to human computer activity will be on focus.

4 Chapter:

4.1 Interactive Drama:

The term interactive drama is defined as: "a first-person experience within a fantasy world, in which the user create, enact, and observe a character whose choices and actions affect the course of events just as they might in a play" (Laurel, 1986, p.10). This definition brings the characteristic similarities between the dramatic character and the participant in an interactive media; it can be considered as an attempt to merge an important element from linear media and map it to human computer activities. This element is the dramatic character or the protagonist. The protagonist involves in different actions, his actions might influence the other characters actions and vice versa. This characteristic is almost identical with the characteristic of the participant's representation (avatar) in the virtual world in interactive media. With an exception is that the avatar is controlled by an external force which it is the user. This can also be confirmed by the fact that one of the types of the drama activities is the role play activity; we have mentioned in the narrative chapter that the role play involves spontaneous interaction of participants as they attempt to complete a task. In the following section an analysis of Aristotle's tragedy system will be on focus, we will investigate how the tragedy system can be used for other issues than pleasure and entertainment, for example the aspects of social or ethical issues. At this stage a recall can be necessary to one of the most important facts that have been mentioned in our introduction, namely, the fact that the use of both linear and nonlinear media field has been abused. Therefore we find it important to see how the tragedy system can be used to eliminate such tendencies. Furthermore Aristotle's drama components will be also investigated, the aim is to see to which degree the drama components can be applied and adapted into interactive applications.

4.1.1 Boal's analysis of Aristotle's tragedy system:

Due to the characteristics of our particular project that deals with the elements of drama and social or ethical issues; we found it necessary to refer to the work of Augusto Boal that deals with these important elements. In this section we will present a review of the most important aspects from his work (Theatre of the oppressed). He analyses Aristotle's tragedy and investigates whether it has a relationship to politics or not. Boal (2000) as a writer and a politician, speculates on art if it should *"educate, inform, organize, influence, incite to action, or should it simply be an object of pleasure?"* (Boal, 2000, p.Introduction). According to him art is affirmed to be purely contemplative phenomenon, it is also regarded to present a vision of the world in transformation. As a result it is unavoidably political since it shows the means of carrying out or delaying that transformation.

Scholars have different opinion regarding art, for example it has been cited by Aristophanes that "the dramatist should not only offer pleasure but should, besides that, be teacher of morality and a political adviser" (Boal, 2000, p.Introduction). Additionally Strabo outlines that "Poetry is the first lesson that the State must teach the child; poetry is superior to philosophy because the latter is addressed to a minority while the former is addressed to the masses" (Boal, 2000p.Introduction). Some others on the other hand contradict with their meanings, for example Eratosthenes argues that the "function of the poet is to charm the spirits of his listeners, never to instruct them" (Boal, 2000, p.Introduction). Plato claims that poets must be expelled from a perfect republic because "poetry only makes sense when it exalts the figures and deeds that should serve as examples; theatre imitates the things of the world, but the world is no more than a mere imitation of ideas --- thus theatre comes to be an imitation of an imitation" (Boal, 2000,

p.Introduction). And finally Aristotle considers poetry and politics as completely two different disciplines and they must be studied separately. According to him each has its own law and serves its own purposes and aims, he simply declares the independence of poetry (lyric, epic, and drama) in relation to politics, despite of Aristotle's argument; he constructs extremely powerful poetic political system for intimidation of the spectator, for elimination of the illegal tendencies of the audience. He states that this system is fully utilized not only in conventional theatre but also in the TV soap operas and in the Western films.

Boal (2000) argues that according to Aristotle, understanding the work of tragedy depends on how we define art. For Aristotle art is an imitation of nature. Boal (2000) analysis this definition and states that, for us imitate means to make a possible perfect copy of an original model, and the word nature refers to the whole created things. Therefore art means a copy of created things. This definition has nothing to do with Aristotle, for him to imitate or mimesis has nothing to do with copying exterior models. Mimesis refers to re-creation, and nature is not the whole created thing but the creative principle itself. Therefore "Art imitates nature" means "Art re-creates the creative principle of created things" (Boal, 2000, p.1). For better understanding it is necessary to refer to some theories that have been developed by earlier philosophers than Aristotle. According to Boal (2000) for Heraclitus the world and all what it contains are in constant flux. All things change into fire, and fire into all things, just as the gold is transformed into jewelry which in turn can be transformed into gold again. In this case gold is not transformed by itself, but the jeweler who makes the transformation which is foreign to the matter itself. Heraclitus used a concrete example to show the constantly changing nature of all things. In his example he states that nobody can step into the same river twice, because on the second attempt the running water in the river will not be the same, neither will be the same man who attempts, because he will be aging even with few seconds. His student Cratylus on the other hand says that nobody can step on a river even once, because the water of the river is already running, so which water he would be stepping on? And the person will also be aging, so which one will be stepping on the water, the older or the younger one? Cratylus adds by saying that only the movement of the water and the aging are eternal. All the rest is appearance.

Heraclitus point of view could be very interesting to be taken into consideration as an ultimate type of interactivity, for example, in our particular project; the nature of the created environment must be in constant change pr movement, meaning all the objects in the environment must be in constant flux. In this case the participant will interact with objects that are changing constantly; this process will increase the unpredictability of interaction. The role of predictability and unpredictability in interactive systems has been mentioned in the interactivity chapter. We can ask the same question of Heraclitus. Which participant is going to interact, and with which object? First the objects in the environment are in constant movement, which object the interactor will interact with? Second the participant is aging in experience, the more he explores, interacts the more experience he gets, so the more experienced or the less experienced participant?

Nature according to Aristotle tends to perfection; it does not always attain it. Body tends to health, but it might become ill, men in collection tend to the perfect state, but wars can take place. Thus nature sometimes fails to reach perfection. From this point the purpose of art and science follows. Art and science correct what nature fails by re-creating the creative principle of things. An example could be that: The body tends to resist rain, wind and sun; in fact it does not because the skin is not resistant enough, therefore, to protect the skin the art of weaving and the manufacture of fabrics are invented. The art of architecture for
constructing buildings, hence men have shelter. The art of architecture for constructing bridges so men cross rivers. The medical science prepares medications to protect men from diseases. Finally politics that tend to correct the faults of men. The purpose of art and science is to correct the faults of nature by using the suggestions of nature itself.

For the sake of simplicity, the rest of Boal's analysis of Aristotle's tragic system can be seen in Appendix (D), (p.92). The following will present a summary and a brief discussion of his work, it will mostly focus on one of the necessary aspects in the problem presented in the present project, namely the role of tragedy regarding the social and ethical issues.

Summary and Discussion:

Human actions in general can be under three categories *faculties, passion, and habits*:

- 1. *Faculty* refers to the participant's abilities. He might not carry out some actions, but still he is able to do so.
- 2. *Passion* is a concrete fact and not possibility. When the faculty is enacted, it becomes a concrete act, a *passion*.
- 3. *Habit* is the constant passion. It should not be by chance; it is the constant ability of the participant to carry out the action.

Any action must be rewarded; the most valuable reward is from the virtuous actions. Naturally, virtue does not exist in us; we must learn it. Who practices wisdom becomes wise, and who practices justice becomes just. As a result who practices virtuous actions will have the tendencies to have high virtuous manners, and it will be the other way around with the one who practices vicious actions. In order to determine any given action whether it is a vicious or virtuous, four conditions must be fulfilled: *willfulness, freedom, knowledge, and constancy.* **Willfulness:** Is the opposite of accidental. **Freedom**: It excludes the exterior coercion. Virtue is completely free behavior without external pressure. **Knowledge:** It contradicts ignorance. Ignorance practices are not considered as vice nor virtue. **Constancy**: Vices and virtues are considered as habits and not passions; therefore it is necessary that these behaviors be constant, chance or accidents are excluded. The role of the dramatist should not only be limited to provide pleasure; it must exceed to be as a teacher of morality, as well as a political advisor.

Tragedy is for Aristotle: "*imitates the actions of man's rational soul, his passions turned into habits, in his search for happiness, which consists in virtuous behavior, remote from the extremes, whose supreme good is justice and whose maximum expression is the constitution*" (Boal, 2000, p.24). The repressive function is a fundamental aspect of Aristotelian system of tragedy, the main reason according to Aristotle being that it provokes catharsis.

A definition of catharsis from Aristotle's point of view can be that, nature tends toward an end, man as a part of nature has certain ends from the point of view of: health, happiness, virtue and justice. When man fails to reach these objectives, the art of tragedy intervenes to correct it; Aristotle calls this correction of man's actions "catharsis". Catharsis is correction, purification. It represents the center, the essence and the purpose of the tragic system. Catharsis could be used as purgation that heals the soul, corrects the errors, and as a result brings happiness to society.

Regarding to the present project, the aspect of catharsis is an important issue; it will be used to communicate the theme of the project. The main character (the protagonist) will create the strongest catharsis in the experience.

The character's action can be presented by two aspects, **ethos** and **dianoia**. Ethos refers to the action itself, and Dianoia refers to the justification of that action. It is important to stress that all the passions and habits of the character must be good except one, a single trait should be bad; this bad characteristic is called hamartia. Hamartia refers to the tragic flaw, it causes the conflict, and it is a single impurity which exists in the character. This single trait must be destroyed so the other traits of the character fit in a harmony with the called "desirable society". During the performance of the character a relationship between the protagonist and the spectator is established, and this is called empathy, we live vicariously all his experiences. Although we don't act, we consider that we are acting on the stage. We love and hate with the character when he does so. Empathy with other words makes us feel what others are experiencing.

When the spectacle or the show starts, the protagonist comes out; a sort of empathic relationship will be established between him and the spectator. The hero surprises the spectator by exposing a hamartia or a flaw in his behavior. The hamartia is stimulated in the spectator through empathy, and the hero is on his way to happiness. Now a sudden event happens and changes everything, a radical change that changes the hero's destiny. The character climbs so high to reach what is called a perpeteia, the hero is on the way to misfortune and the fear grows in the spectator because of the stimulated hamartia.

The stage of perpeteia is important; it stretches the path for the hero from happiness to misfortune, the longer/higher it is, the bigger impact of the fall is. At the point of perpeteia which the hero suffers, the spectator in turn suffers as well because of his empathy with him. But the spectator might also detach himself from the hero, to avoid that, the hero passes through the point of anagnorisis, at this point the hero accepts his errors and hopes to gain the spectator's empathy again.

Finally, the spectator would imagine the horrible consequences of the error committed by the hero. Tragedy must have a terrible end; a happy end is not permitted, something which is called a catastrophe. In catastrophe, the hero should not necessarily die, it might happen to the loved ones; to experience the death of the beloved ones is worse than to die. The ultimate goal of the three interdependent parts, namely; perpeteia, anagnorisis and catastrophe is to provoke catharsis in the spectator; their purpose is to produce purgation of the hamartia, with other words to correct what is wrong. These three events can be summerized in three stages:

Stage 1: This stage involves the stimulation of the hamartia, the hero goes through an ascending path to reach happiness, and the spectator is linked to him empathically. The reversal point (perpeteia) follows this step, the character moves from happiness towards misfortune, and that's what it called the fall of the hero.

Stage 2: The hero identifies his error (his hamartia) this step is called "anagnorisis". The hero gains the spectator's empathy.

Stage 3: This stage is called catastrophe, the hero suffers and pays the price of his error with either his own death or by the death of the beloved ones.

These three stages lead to a catharsis, the spectator through his empathy with the hero is exposed and terrified from a catastrophe, this will purify his error or hamartia. The cathartic function was the most important for Aristotle, for him it was a function that purifies the citizen, his theories form a harmonic whole that demonstrates correct manner of purging the audience of all tendencies that are capable of modifying the society.

A good character that comes to a happy end inspires neither pity nor fear, the drama will be missing; the spectator will observe him acting his destiny. A completely bad character that ends in a catastrophe will not inspires pity which it is very important element for the mechanism of empathy. A good character that ends in catastrophe violates the sense of justice. A totally bad character that comes to a happy end would stimulate evil and it would be contrary to the Greek tragedy. Now, three possibilities are left:

- 1. *"character with a flaw, that ending in catastrophe;*
- 2. character with virtue, coming to a happy end;
- 3. *character with a virtue, but insufficient, ending in catastrophe*" (Boal, 2000, p.48).

The stages mentioned above that lead to catharsis must be taken into consideration, as we mentioned earlier that catharsis will play an important role for communicating the theme or conveying the message. It is clear that for the participant to become acquainted more to a particular ethical issue, he must have the chance to practice virtuous actions. Interactivity can provide the participant with such opportunity. The relation between interactivity and drama will be on focus, and that will be the topic of the next section.

4.1.2 Laurel's analysis of Aristotle's notion of causality in relation to drama and HCI:

This section will present a review of Aristotle's notion of causality presented by Laurel (1993), it is important to stress that Aristotle has applied the notion of causality to many general aspects including life and living organisms. Laurel attempts to take advantage from the general understanding of Aristotelian causality and uses it specifically in the frame work of created or made things, she first relates it to theatre and then suggests its use in human computer activities.

Laurel (1993) states that, concerning the aspects of design and creation of things, it is very important to understand how things work, what is its nature and what it has to do. If work is not called successfully; it is not because of poor skillfulness. For example, architects designed beautiful buildings, but collapsed and didn't stand up in the actual process of implementation. Playwrights wrote solid dramatic structured plays, but didn't last more than one night on stage. The cause of failure is due to the lack of understanding of the intrinsic form of the created thing and its purpose. In the process of creating a specific thing Aristotle's four causes namely the formal, material, efficient, and end causes work simultaneously, "*The four causes are forces that operate concurrently and interactively during the process of creation*" (Laurel, 1993, p.41). A description and examples of each of the four causes is as follows:

Formal cause: The form or the shape of a thing defines its formal cause, for instance the formal cause of a building is the buildings blue print or the architect's idea that made that building take that shape or form. It operates through the idea of the completed whole thing. A reciprocal change will exist between the formal cause and the work in progress. In theatre the formal cause refers to the completed plot; it is the representation of the whole action by the playwright. It includes the idea, form, genre and pattern that define them. The formal cause of a specific human computer activity is the form of what it is attempting to be. Human computer activity lacks predictable formal categories provided by drama. Hence it has been

defined as a "representation of action with agents that may be human, computer based, or a combination of both" (Laurel, 1993, p.47).

Material cause: The material cause of a thing is the material in which it is made of, for example the material cause of a building is the stones, concrete, wood, mortar, nails and glasses. The properties of the materials have direct influence on the properties of the structure. *"The material cause of a human-computer activity, and also of a play, is the enactment---that which unfolds before a person's senses"* (Laurel, 1993, p.47). By material cause Laurel claims that plays employ the sights and sounds that are produced by actors moving on stage. And computers employ graphics, sound, tactile, and kinesthetic effects.

Efficient cause: According to Laurel (1993) it refers to the way in which a thing is causally made; it contains the maker and the tools, for example if two buildings that have the same architectural plan and the same materials are created by two different builders that have different skills and tools. The two buildings will differ in the terms of their efficient cause. In theatre the efficient cause is the techniques of a playwright, the skills, tools and actors. The efficient cause of human computer activity is the tools and the skills of its makers. The design of theatre and the design of human computer activity are collaborative disciplines, they depend on range of artistic and technical contributions, and the available tools influence the quality and nature of these contributions. For example theatre artists nowadays depend more and more on computer based tools, for scene design, lightning, and costume design.

End cause: It refers to the reason or the purpose of the made thing. What it is intended to do once it is made, for example a building is intended to accommodate people. The end cause in theatre is the catharsis, the pleasurable arousal of a particular set of emotions in the audience. The term pleasurable is very significant to understand catharsis; the aroused emotions in a play is different from emotions aroused in real life events, in a dramatic context even negative emotions can be pleasurable. Pleasurable emotions determine the success of film genres as suspense and horror. The end cause of a human computer activity is *"what it is intended to do in the world once it is completed"* (Laurel, 1993, p.48). As a result functionality is involved in the end cause; a person should understand the activity very well in order to do something. Experience is an important aspect in the end cause, a person's feelings and thinking about an activity is a part of its reason for being the way it is. He must be engaged and be pleased with the experience.

To sum up we can say that there are many elements in Laurel's descriptions are useful; listing these elements might lead us to those that serve and have relation to the present project. But, unfortunately in our point of view, some of her thoughts lack consistency and coherence concerning the Aristotelian causality. As an example she claims that the material cause of both of human computer activity and play is enactment. We agree with her statement that the material cause of a play is the stuff a play is made of, but we disagree on the way that she uses the term material metaphorically; by saying that enactment or the unfolded actions before a person's eyes are materials. A more logical plausible and classical interpretation of Aristotelian causality regarding theatre would be as the following; the materials of a play are the stuff of the customs, the textile, the flesh and bones of both actors and audience, the wood of the stage, the material of the seats, wood, stuff, scissors, and hammers, all the material constituents of all the elements that are involved in the construction. In addition to Laurel's descriptions, the efficient cause would be the skills of the carpenters, the skills of actors, and all the elements that help all the material constituents to take form. The formal would be all the custom design, scene design, and the playwight with all the

specifications, the director's instruction for the design. Finally the end cause would be the outcome, the public's understanding, the author idea being understood or being criticized for interacting with the public.

Furthermore Laurel relates the notion of Aristotelian causality to the components of drama; the next section will demonstrate how Laurel in addition contributes a schematic illustration explaining the functionality of the Formal and Material causes and their influences on the drama elements.

4.1.3 Laurel's analysis of Aristotle's elements of drama:

Laurel (1993) claims that a finished play according to Aristotle is considered as an organic whole, the term organic is to evoke an analogy with living things "*a whole organism is more than the sum of its parts, all of the parts are necessary for life, and the parts have certain necessary relationships to one another*" (Laurel, 1993, p.49). The components of drama have been identified by Aristotle qualitatively, he also suggested the causal relations among them in the terms of material and formal causalities. Aristotle's elements of drama are important for two main reasons, first because of the robustness of the components and their causal relations. Second the model helps in the design of constructing the activities of a play. Human computer activities have fundamental similarities with drama; it can be described with similar model with the same utilities in the design and analysis. The qualitative elements of drama are listed in a hierarchical order as it is illustrated in figure (17), the functionality of the elements are as follows; each element is the formal cause of all elements below it, and each element is the material cause of all elements above it.



Figure 17 the elements of qualitative structure and the causal relationship among them. (Laurel, 1993, p.51)

Enactment

According to Laurel (1993) enactment or spectacle is one of the fundamental materials of drama described by Aristotle; spectacle refers to all that is seen on the stage, it includes the actions which makes it possible to expand the definition to contain other senses such as kinesthetic. The senses that are addressed in the enactment can be considered as one of the differences between drama and human computer activity, plays are available only for ears and eyes; we are not able to touch, smell or taste them. But there are some exceptions, for example, Belasco in 1920s used odors to achieve the performance of realistic plays. Later on he abandoned this idea because he noticed that the smell of frying bacon distracted the audience from the performance on stage. Furthermore in 1980s directors in the field of theatre attempted to increase the sensory dimensions of the audience, the audience were allowed to touch the actors, and move freely on the stage. An example is the interactive play of Tony and Tina wedding, the audiences were able to follow the actors from room to room involving the kinesthetic senses. Additionally the audience was able to touch the props and sit on the furniture to share the wedding banquet involving the senses of tactile, kinesthetic, smell and taste.

Regarding the involvements of different senses, "Computer games incorporate notions about character and action, suspense and empathy, and other aspects of dramatic representation. Almost from the beginning, they have involved the visual, auditory, and kinesthetic senses" (Laurel, 1993, p.53).

It is necessity to maintain the causal relations in the use of multiple sensory modalities. For example, the natural sound as an aspect of the environment, the sound must be employed consistently; meaning that to preserve the causal relation between sound and other modalities, this will promote integration and synergy among modalities, *"close coupling of the visual and kinesthetic senses permits very convincing and engaging representations of motion through such techniques as motion parallax"* (Laurel, 1993, p.161).

For example, in head mounted displays, what makes a person sense of being surrounded by the representation of environment, is mainly the coupling of visual and kinesthetic modalities, when a person turns his head, the room moves accordingly, when he moves forward the world flaws by in visual realistic way, *"Tight linkage between visual, kinesthetic, and auditory modalities is the key to the sense of immersion that is created by many computer games, simulations, and virtual-reality systems"* (Laurel, 1993, p.16).

Pattern

In the sensory phenomena the perception of pattern is a source of pleasure for human. As a second component of drama, pattern has been described by Aristotle as melody; it is called as a type of pattern in the realm of sound. In Poetics Aristotle describes it as one of the greatest pleasurable accessories of tragedy. Spectacle expanded to cover all the sensory elements of enactment as described earlier in the previous section, hence, *"The notion of melody as the arrangement of sounds into a pleasing pattern can be extended analogically to the arrangement of visual images, tactile or kinesthetic sensations, and probably smells and tastes as well"* (Laurel, 1993, p.55).

Patterns according to Aristotle are pleasurable to perceive in and of themselves, whether or not if they are formulated into semiotic devices or languages. He regarded them as pleasurable accessories and not only as the material for language. Hence *"the use of pattern as a source of pleasure is a characteristic of dramatic representations, and one which can comfortably be extended to the realm of human-computer experience"* (Laurel, 1993, p.56).

In human computer activity, an important aspect is the symmetry in representation; symmetry in representation refers to the relationship or the balance between the auditory and visual representations. We obtain pleasure from patterns in representations. An example of bad symmetry representations is applying naturalistic human voices and environment sounds to a simplistic cartoon style animation. Another example is applying little beeps to a breathtakingly high resolution computer game with high speed animation. Additionally we also expect symmetry in systems input/output modalities. For instance, if we talk to a computer we tend to expect that the computer talks to us and vice versa. If we push on a part of a system, we expect that the system will push back, and this is what is called the key element to effectiveness of force feedback controllers, *"Working toward symmetry in input and output channels in*

human-computer activities can vastly improve our experience of engagement and agency" (Laurel, 1993, p.165).

Language:

The component of Language is defined by Aristotle as "the expression of their [the characters'] thought in words" (Laurel, 1993, p.57). This element is also known as diction, diction in the traditional view refers only to words and their arrangements. This definition is a bit problematic in the world of human computer activities in which words do not take place in general. There are some elements in such nonverbal works (games) that can be described as language, an example of nonverbal works in theatre could be when signs are used in a play for deaf audience; there is no doubt that the visual signs functions as language. In this case the element of language has been expressed in a way that the sensory modalities available for the audience have been taken into consideration. Therefore, in human computer activities, symbols, graphical signs and animation sequences might be used as the means for explicit communication between the user and the system. In the context of human computer activity, gestural languages take many forms and present some benefits and challenges. Creating gestures to convey information and emotion can be considered as central feature of actor's art, "Gesture can be used to reinforce, disambiguate, or replace spoken or written language" (Laurel, 1993, p.157). Gestures seem to be used as the only component of language in human computer activity; the technical challenges in creating gestures are quite less complex compared to complete natural language processing. According to Kurtenbach and Hulteen, "Gestures are especially useful in establishing, orientation, pointing, making connections, and grouping objects" (Laurel, 1993, p.158). Furthermore Schmandt and Hulteen state that, "Gestures are effective as a secondary channel in disambiguating speech" (Laurel, 1993, p.158). Postures and body languages can be employed to suggest character traits, and strengthen explicit communication. That human computer activity must involve multisensory representation; this does not mean it should involve all modalities all time.

Thought

Laurel (1993) states that, the element of Thought in drama can be described as the process that leads to action and choices, a process that involves character's emotion, cognition, reason and intention. Despite the fact that Thought might be explicitly expressed in a dialogue form, in fact it is inferred from character's actions and choices. Hilton compares the aspects of theatre with the field of artificial intelligence and argues that "What the audience does is supply the inferencing engine which derives the plot, obeying Shakespeare's injunction to eke out the imperfections of the play (its incompleteness) with its mind" (Laurel, 1993, p.57). This definition can be extended to the field of human computer activities leading to a familiar question and that is: are computers able to think? Computer agents are just like the dramatic characters and they do not necessarily think, they must "provide a representation from which thought may be inferred" (Laurel, 1993, p.57). A desktop folder which responses to us by revealing its contents when we double click on it, the system understands the input and does what we want. The most important thing is that the representation succeeds in getting us to make the correct inferences about its thought; on the other hand it succeeds by representing to us that it made the correct inferences about our thought. What it matters the right mutual understandings between the character and the system, "Thought is the formal cause of language; it shapes what an agent communicates through the selection and arrangement of signs, and thus also has a formal influence on pattern and enactment" (Laurel, 1993, p.58)

Character and Agency:

Laurel (1993) claims that according to Aristotle "We maintain that Tragedy is primarily an imitation of action, and that it is mainly for the sake of action that it imitates the personal agents" (Laurel, 1993, p.60). Hence actions represent the objects of drama rather than characters. This emphasizes the primacy of action. Characters in drama can be defined as "bundles of traits, predispositions, and choices that, when taken together, form coherent entities. Those entities are the agents of the action represented in the plot" (Laurel, 1993, p.60). In human computer activities agents are part of the represented action, agents in fact are functionally and structurally similar to the dramatic characters. An agent in the pure Aristotelian sense is the one who takes action, and since Aristotle himself admits that a play can be possible without characters and it cannot be existed without action; this emphasizes that agency as a part of a representation must be embodied strictly in characters. Based on these facts, all computer programs that execute actions that are recognized by people show signs of agency.

An agent in the social terms is one who is allowed to act on behalf of another; this definition is also valid for agents in the mimetic world. Hence computer based agents perform actions undertaken on behalf of others; therefore for a person's needs and goals to be inferred, an implicit and explicit communications should take place between him and the system. Therefore a broader definition of agents can emerge as they are "entities that can initiate and perform actions. Like dramatic characters, they consist of boundless of traits or predispositions to act in certain ways" (Laurel, 1993, p.61). Traits circumscribe the actions that the agents are capable to perform, leading to define his potential. Nevertheless, there are two types of traits; internal and external traits, the internal traits determine how an agent can act. The external traits are the representations of those internal predispositions. Moreover, "traits function as a kind of cognitive shorthand that allows people to predict and comprehend agents' actions" (Laurel, 1993, p.61).

Inferred internal traits are elements of both the dramatic probability as a part of the plot, and the ease of use in terms of minimizing human errors with computer systems. A great challenge in both the dramatic characters and computer based agents is to select and represent the external traits that reflect precisely the agent's potential for action.

According to Laurel (1993), Aristotle outlined four criteria for the dramatic characters, these criteria can also be applied to human computer agents, and these are:

- 1. The characters are good or virtuous; Aristotle's definition of virtue is that, good characters successfully formulate their thought into action, meaning, characters that fulfill their function successfully. They do what they intended to do in the context of the whole action.
- 2. The characters are appropriate to the performed actions, meaning there must be a good balance/match between the traits of the characters and what they actually do.
- 3. The characters idea, meaning that there are causal relations between their thoughts, traits, and actions which makes it close to the dramatic probability.
- 4. The characters are consistent all over the whole action, meaning that the characters traits should not be changed accidentally or arbitrary.

The whole action:

Laurel (1993) describes action as the object of the dramatic representation and it can be represented by the character, for example, Hamlet represents the action of a person that tries to find his father's killer to revenge; other characters are required to represent the action. An action is "made up of incidents that are causally and structurally related to one another" (Laurel, 1993, p.63). Hence the form of a play is obvious in the pattern shaped by the arrangement of the incidents within the whole action. The whole action should have a beginning, middle, and an end, as another definitional property of the plot. The beginnings and endings are valuable; we can notice that kind of unpleasant feelings when we enter a movie in the middle of the show, or being forced somehow to leave the movie before reaching the end. Viewers rarely have pleasant feelings when they see "to be continued" at the end of particular suspenseful movie or a TV program. Two rules of thumb can be suggested regarding a good beginnings, first; the potential for actions should be placed or arranged effectively in a particular universe. Second, the first incidents must setup promising lines for more future actions. A good ending on the other hand, beside that it provides a completion of the represented action; it should also provide the emotional closure that is implied by the concept of catharsis. Another criterion that Aristotle has applied to the plot is the notion of magnitude. It implies that the action should not be so long that before getting to the end you forget the beginning. In order to enjoy it, you must perceive it as a whole. In designing what so called an ideal human computer activity, this criterion must be taken into consideration, for example deciding what a person should be required to do, or what a computer based agent must be represented as doing in the course of action. Achievable actions with distinct beginnings and endings must occur within the limits of memory or attention of the user.

Conclusion and Discussion:

In the process of design and creation of things, understanding the Aristotelian causality can be helpful in understanding the nature and the functionalities of the created things. This way of understanding causality can also be used and applied to the elements of drama in the creation of an interactive drama application that provides the potential for actions. In such applications, programs are the means for creating the actions; they provide more potential for actions in the mimetic world than other linear media such as theatre. Mimesis is a made thing and not an accidental one. The participant must be engaged in the mimetic world in order to achieve the End cause or his final goal. All that is seen in the mimetic world has been called Enactment by Laurel; Enactment is related to the sensory phenomena and involves all the senses, namely the visual, auditory and kinesthetic senses. Tight connection between these sensory modalities is the key to the sense of immersion. These modalities are advantageous only if they are appropriate to the represented action.

Pattern can be many things, the perceived pleasure is called pattern by Laurel originally called melody by Aristotle, it refers to the arrangement of, sound, visual images, tactile, and kinesthetic sensations. In designing the pattern the aspect of symmetry in representation is an important aspect, this can be done by balancing and proper linkage between the audio visual senses. The sensory modalities that are available for the participants should be taken into consideration, for example in human computer activities, symbols and graphical signs can be used as communication forms between the participant and the system, namely as

Language. A central aspect in conveying information and emotion can be by using gestures; gestures can be considered as alternative means to spoken or written languages, therefore multisensory representations should be involved in human computer activities.

Actions have the primacy of importance on the character, actions are taken by agents, and therefore agency should be embodied in the characters. The agent's choice and actions can be predicted from the representation of their visible appropriate internal and external traits; appropriate traits establish successfully the probability and causality. Characters are more coherent when their traits are well integrated, and this will result dramatic engagement and elicit empathy in the participant. The overall whole action is consisting of a beginning, middle, and an end. Beginnings and endings are important aspects to be taken to consideration; the actions must occur within the memory or attention limits of the participants. Action is the main component of human computer activity. Objects, environments, and characters are subsidiary to it, therefore an important aspect is to consider what kinds of incidents and in which order they should occur.

Laurel describes the element of Thought in drama as the process that leads to action and choices, Thought involves mental activities. It is not clear who's thought that has been addressed. Is it the thought of the character, actor, audience or the playwright? The thought process has great influence on the end cause, for example regarding to the present project, the thought of the designer by defining the theme, takes the participant to a world of his own choice, the participant is introduced to different characters and event, he is introduced to another reality. The thought of the participant will play also an important role, his experience and his way of thinking determines the events that he is going to be involved with.

Although Laurel describes Aristotle's four causes and gives examples for each in relation to theatre and human computer activity, it seems that she discards the representation of both Efficient and End causes in her model. This could be due to her abandonment of the role of authorship in human computer activities despite of her claim that some portion of the functionality of a computer is predetermined by the designer described earlier. This could be because of the notion that interactivity gives complete freedom to determine and influence the plot, so the End cause might not be predictable and it relies completely on the interactor.

We believe that there are two aspects that influence the End cause in the application presented in this project, the first aspect is the participant's ability to interpret the surroundings, the different events that he is involved in, leading to influence his choices and his actions. The participant's choices and actions will be constrained by the second aspect which is the role of authorship, and that is the designed environment for the theme in order to convey a specific message. Therefore the End cause would completely differ depending on the designer in choosing the environment, the customs, the period of the theme whether it is from medieval or contemporary ages, etc. The later is very much related to the efficient cause, the skills of the designer and the tools he is using will have great impacts on the designed environment of the theme.

We consider that Laurel's model could be enriched by adding both efficient and end causes to it as it is shown in figure (18).



Figure 18 the Efficient and End Causes are added

Since the role of authorship is playing an important role, it can be considered as the tool to convey messages to the audience; this could be by using the pleasurable arousal of a particular set of emotions in the audience, namely the catharsis. Catharsis is considered as the end cause in linear media. The end cause could also include the assimilation of the authors "message". The pleasurable arousal in linear media can be to some extend be predictable depending on the theme of the content. Therefore the end cause due to the amount of authorship used in interactive media can be also be to some extend be predictable, it can be considered as the end goal for the participants, the participants should actively be involved in the activity, and their experience will determine the final outcome. It is necessary to reiterate that the participants "should be engaged, pleased, or even delighted by the experience" (Laurel, 1993, p.48). Moreover, the participant in the mimetic world should be engaged in order to achieve the end cause or his final goal. Another important aspect is the characters traits, well integrated characters traits will lead to dramatic engagement and elicit empathy in the participant. Hence the term engagement will be elaborated more in the following section. Additionally some related concepts will be also investigated, such as engrossment, flow, and immersion.

4.1.4 Engagement:

In this section, descriptions of the term engagement by given different authors will be presented. Some of these are described in relation to nonlinear media, for example computer games, and others are described from a theatrical point of view. Furthermore the major characteristics of engagement will be analyzed and based on the definitions proposed by the different scholars. A more general description of the term engagement will be proposed in order to cover both the linear and nonlinear media fields. Based on the proposed definition, the characteristics of engagement will be outlined and it will be compared to some of the related concepts mentioned above.

In nonlinear media applications such as computer games, Brown & Cairns (2004) state that the participant's involvement in a computer game can be categorized under three levels: engagement, engrossment, and immersion. They claim that "*The first stage of immersion is engagement*" (Brown & Cairns, 2004, p.1298).

Brown & Cairns (2004) claim that engagement, is the lowest level of involvement and the first to take place before the other two levels. In order to access each level certain barriers must be exceeded. They use the term gamer in their work limiting their descriptions only to computer games, in the process of interpretation of their work the term gamer will be replaced with the term participant in this report in order to cover some other fields such as interactive narrative or drama.

According to Brown & Cairns (2004) for the participant to be engaged, he needs to invest time, effort, and attention. Access is an initial barrier for engagement; the participant must like the style of the application and be familiar with the main controls to get the correspondent appropriate feedbacks for his actions. Investment is yet another barrier for the participant; this refers to both the time he must invest in the experience, and the effort or the energy so he becomes familiar with the experience, the invested effort of the participant should also be rewarded, so there is a linkage between efforts and rewards. The participant starts to be engaged when the barriers of access and investment are lowered.

Engagement has been defined as "*a person's involvement or interest in the content or activity of an experience, regardless of the medium*" (Dow et al. 2007, p.2). According to Seay and Kraut (2007) engagement has been defined by Charlton as "*the state of being delightfully attracted to and enwrapped in an experience*" (Seay and Kraut, 2007, p.2). Furthermore they define engagement as "*a state of deep interest in and involvement with a medium*" (Seay and Kraut, 2007, p.3).

Lindley (2004) argues that the procedure of engagement is tightly related with exploration, choice, and performance of game progress. Engagement occurs due to the participant's structuring and selection of activities. Some of the aspects that can interrupt it are the cut scenes in some of the games which force the participant to wait for a certain amount of time and then re enter the experience again.

Lindley (2004) states that, in games that contain predefined narrative elements, engagement facilitates the discovery of schemas and narrative forms, participants "*need to engage more heavily to create and sustain their own purposive behaviors. Narratives and games provide purposes and modes of action that can be activated in order to meet those purposes*" (Lindley, 2004, p.10).

Regarding the relationship of engagement to other concepts such as presence and immersion, Dow el al. (2007) claim that increasing the sense of presence in immersive AR experience do not necessarily increase the sense of engagement of the participants with the game.

Some scholars relate engagement to emotions and they define engagement as "*a feeling of deep emotional involvement in a game, where they tend not to notice time passing*" (Drennan et al. 2004, p.2). Others claim that it took place when the participants "*were motivated to learn to play the game*" (Haywood and Cairns, 2005, p.14).

Laurel (1993) states that engagement has cognitive components and it can be understood as emotions. She mostly defines the term from a theatrical point of view, and for her, engagement is similar to the notion of suspension of disbelieve which was introduced by the critic and poet Coleridge. The willing suspension of disbelieve is a state of mind that a person has to reach to enjoy a representation of action. It can occur very likely in drama and computer games, in a very similar way we feel for the characters, also when we are represented by the characters. With a representational context we experience more pleasure and enjoying feelings than we experience in real life, while with the first we avoid the pain and the harm which we might experience in real life situations.

In the field of education, Revee (2006) defines engagement as a multifaceted concept stating that *"Engagement refers to the behavioral intensity, emotional quality, and personal investment in a student's involvement during a learning activity"* (Evertson and Weinstein, 2006, p.658). According to figure (19) Revee (2006) characterizes engagement as full range of on-task behavior, positive emotion, invested cognition, and personal voice, and it functions as the engine for learning and development.



Figure 19 engagement as multifaceted concept by Revee (Evertson and Weinstein, 2006, p.658)

In the learning process Revee (2006) defines the concepts mentioned in the figure above as follows:

Behavioral engagement: It occurs when the students show attention, effort, and persistence.

Emotional engagement: It refers to the student's emotional atmosphere of interest, enjoyment. Revee (2006) calls it a sense of "wanting to" during one's investment of attention, effort, and persistence.

Cognitive engagement: It occurs when the students go beyond the basic requirements of an activity by committing themselves to being strategic, and purposive during the learning activity.

Voice: The students with their voice offer suggestions during the task involvement, express their interest, participate in discussions, ask questions, and influence constructively the flow of class.

Another coherent definition of the term engagement is proposed by Schønau-Fog (2010) where he attempts to unite almost all the elements of engagement in the earlier mentioned definitions. Regarding non linear media he claims that "Engagement in video games is a motivated, goal-oriented, rewarding, cyclic and recursive activity, where activities are performed to reach goals in order to achieve rewards. Furthermore, engagement is caused by one or several types of intrinsic or extrinsic sources of engagement, namely advancement, completion, exploration, sharing, intellect, modification and interfacing. Emotions, physiological reaction and absorption are special types of engagement, which can both cause and result from engagement" (Schønau-Fog, 2010, p.7).

Schønau-Fog (2010) claims that there are intrinsic and extrinsic goals that enhance the participant's engagement, by intrinsic goals he refers to the goals that are assigned by the game, for example the challenges that have to be overcome. Extrinsic goals refer to the participant's self made goals, for example, he is curious to explore a specific area in the game, or the participant would like to advance his skills and feel self satisfaction.

In the present project the framework of the investigation regarding engagement will be at two levels. First, engagement will be investigated based on Brown & Cairns (2004) way of categorization as a part of different stages or levels to be overcome. Second, the elements of engagement proposed by Schønau-Fog (2010) will be taken into consideration, and based on his work another definition of engagement will be proposed in order to cover both linear and non linear media applications.

4.1.5 Engrossment

According to Brown and Cairns (2004) the participant become engrossed when he is further involved in the experience. In this case the construction of the game features influence and affect the participant's emotions. The construction of game features refers for example to the quality of visuals, interesting tasks, and plot. The participant invests time, effort and attention; he reaches a level of immersion because a high level of emotional investment takes place in the experience. As a result the participant wants to keep playing and feels that he is emotionally drained when stops. The emotions of the participant are directly affected by the game experience; the experience takes the most important part of his attentions, so he becomes less aware of the surroundings, the surrounding is there, but it is irrelevant. The participant is simply suspends his disbelief of the game world, and this leads him to the total immersion.

4.1.6 Flow:

According to Berthouze et al. (2007) it has been claimed by Malone that challenge, curiosity, fantasy and flow are the qualitative aspects for engaging game play. Flow has been defined by Csikszentmihalyi as "*a state of mind in which a person feels so engaged by an activity that his/her actions and awareness merge*" (Berthouze et al. 2007, p.2). Petersson (2006) outlines that flow activity requires the participant to be actively engaged. Additionally "*Engagement and immersion facilitate the player entering a state of flow, which provides a form of playing pleasure based upon the pattern of interaction*" (Lindley, 2004, p.10).

According to Petersson (2006) the state of flow has been defined by Csikszentmihaly as an autotelic activity that contains seven elements, such an activity can be performed depending on the participants inner goals, hence it *"leads to unification and order of the participant's consciousness" hence "an integration of physical, emotional and mental functions"* (Petersson, 2006, p.53). Csikszentmihaly's seven elements are:

- 1. "Clear goals and immediate feedback.
- 2. Challenging activity.
- 3. The paradox of having control in an uncertain situation.
- 4. Merging of action and awareness.
- 5. Concentration.
- 6. Melting together of doing and self-consciousness.
- 7. Transformation of time" (Petersson, 2006, p.53) .

Petersson (2006) states that the state of flow according to Csikszentmihaly occurs when the activities are designed in a way that optimal experiences are possible to achieve, a sense of discovery for example leads the participants to higher level of performances. In order to visualize the state of flow schematically Csikszentmihaly developed a model, figure (20) illustrates the relationship between the participant's skills and challenges to the flow experience in an activity:



Figure 20 the flow activity and its relation to the participant's skills and challenge (Petersson, 2006, p.54)

Petersson (2006) states that when there is a balance between the stress and boredom the sense of flow occurs. When the participant has lots of abilities and faces less challenge, then he becomes easily disengaged because the goals are too easy to reach so it becomes boring to do the same thing. On the other hand when the participant faces lots of challenges that are out of his capability range, he becomes stressed and anxious. Finally, when there is a balance between the skills and challenges the participant will experience engagement and that can vary between low and high, low engagement when the participant is comfort and relax, and high engagement when he is in the edge of surviving, *"Flow occurs when the experience is targeting the edge of the skills, and stretches the person a little bit beyond his or her limits. By this, the sense of flow contains a total engagement"* (Petersson, 2006, p.54). The characteristics of flow has been described by Csikszentmihaly as a *"state as being absorption in the activity, i.e. the activity become almost automatic, which allows the participant's consciousness to melt together with the actions"* (Petersson, 2006, p.98) moreover Leont'ev describes *"actions as consciously performed and operations as unconsciously and automatically executed"* (Petersson, 2006, p.98).

4.1.7 Immersion:

Total immersion has been described by Brown and Cairns (2004) as presence; it is the sense of being cut off from the surroundings. Despite the fact that it is a fleeting experience, it has been described as the sense of being there. In such level of immersion the most important aspect for the participant's thoughts and feelings is the game itself.

Empathy and atmosphere are the barriers for presence; empathy is defined as "the growth of attachment" and atmosphere is defined as "the development of game construction" (Brown & Cairns, 2004, 1299). Empathy or attachment is when you feel attached to a main character. The atmosphere refers to the game construction, the combination of graphics, sounds, and plot that determine it. The atmosphere is important because it triggers the participant's attention, "Attention is an important part of immersion and in the case of total immersion the extent and location is important. The games seem to play with three elements of attention: visual, auditory and mental" (Brown & Cairns, 2004, p.1299). The more attention and effort the participant invests the more immersion he experiences. Usability and controls are important aspects for engagement; "engagement, and therefore enjoyment through immersion, is not possible if there are usability and control problems" (Brown & Cairns, 2004, p.1300) in order for the total immersion to take place, the participant should feel that the controls are almost invisible. Any fail in the usability and the controls will give negative impact on immersion. Immersion has been defined as: "The experience of being transported to an elaborately simulated place is pleasurable in itself, regardless of the fantasy content.We refer to this experience as immersion. Immersion is a metaphorical termderived from the physical experience of being submerged in water. We seek the same feeling from a psychologically immersive experience that we do from a plunge in the ocean or swimming pool: the sensation of being surrounded by a completely other reality, as different as water is from air, that takes over all of our attention, our whole perceptual apparatus...in a participatory medium, immersion implies learning to swim, to do the things that the new environment makes possible...the enjoyment of immersion as a participatory activity" (Murray, 1997, p.98). According to Murray's definition, immersion refers to the process of substituting the real environment with completely another more exciting reality, disregarding the medium whether if it is interactive or not, audio visual or a book. The definition here emphasizing the importance of involving the mental state of the participant, it involves the participant's imagination, cognition, psychology and perceptual apparatus. The experience of immersion can be experienced only when the participant is exposed to a mimetic work. A mimetic work is defined by Ryan (2001) as the process of emerging the virtual world in the imagination of the participant that is exposed to it. The participant's psychology and experience with the mimetic work is an important issue, each individual experiences or perceives the work differently, and therefore the mimetic state of a work can be considered as subjective.

Regarding interactive media, according to Wolf and Perron (2003) cited by McMahan, three conditions that can create the sense of immersion in 3D computer games are:

- 1. "The user's expectations of the game or environment must match the environment's conventions fairly closely;
- 2. The user's actions must have a non-trivial impact on the environment;
- 3. The conventions of the world must be consistent, even if they don't match those of "meatspace"" (Wolf & Perron, 2003, p.69).

These conditions will have direct effect on the believability of the virtual world, in the sense that, to some extend has the characteristics of real world conventions. The participant's actions must have logical consequences and influence the virtual world in a way that closely fit with the real world conventions.

Concerning the narrative in the textual world, Ryan (2001) claims that three forms of involvements with narrative that can be generated from textual features and mental operations are:

Spatial immersion: The response to settings which triggers an old event in the mind of the person who is exposed to. It can be an image, a word, or a name can be enough to make the person transport his imagination to another place.

Temporal immersion: The response to plot; it refers to the desire of the reader to know what is going to happen at the end of a story. Suspense is an important element of temporal immersion

Emotional immersion: The response to character; this can be by eliciting the emotional reactions of the reader by empathy, sadness, relief, laughter, admiration, spite, and fear.

Ryan (2001) distinguishes four degrees of immersion: concentration, imaginative involvement, entrancement and addiction.

- 1. **Concentration**: it appears when the exposed information is too complex to be immersed.
- 2. **Imaginative involvement**: *"The split subject attitude of the reader who transports herself into the textual world but remains able to contemplate it with aesthetic or epistemological detachment"* (Ryan, 2001). Applied to interactive media or games, it would happen with a game upon which the player still have a critical look (how good or bad are the graphics, interactivity, narrative, etc).
- *3.* **Entrancement**: it can be described as total immersion where the participant is caught up in the textual or virtual world so he loses the sight of the surroundings or the physical world.
- 4. **Addiction**: this category refers to the attitude and the willing of the reader to escape from reality and being able to find a home in the textual world, and this could be because the reader traverses the textual world too fast and too compulsively. (Ryan, 2001)

Some other scholars limit the concept of immersion and presence to be applicable only to the display technology, for example Slater (2003) defines immersion as being a quantifiable aspect of display technology depending completely on the form of media (the technologies used) and not the content (e.g. narrative). Slater et al. (2003) argues that the level of immersion depends on four factors of the media, the computer display are extensive, inclusive, surrounding, vivid and matching.

- 1. **Extensive**: The more sensory modalities are accommodated by the system the more extensive it is. A system that represent visual, auditory, tactile is more extensive than a system that has visual only.
- 2. Inclusive: It refers to the system's ability to shut out real world's external signals.
- 3. **Surrounding**: how much panoramic it is, 3D directional sounds can be an example of auditory, and a stereoscopic view as an example of visual, the participant is able to physically turn his head 360 degree and see all around.
- 4. **Vivid**: It refers to the richness and fidelity of the represented information. How real it sounds and looks, for example the colors, lightings, shadows and textures.

5. **Matching**: It refers to the accuracy of matching the participant's proprioceptive actions in the real world to the virtual world, for example a head turn to the left must cause an immediate flow of optical data to the right in the virtual world, maintaining auditorily and visually the objects position in the virtual environment.

Slater (2003) states that immersion is what the technology delivers from an objective point of view, the more sensory modalities the system delivers the more immersive the experience it is. Slater in his example about the color states that a color can be objectively described in terms of wavelength distribution, but the perception of color includes the notion of metamers, different wavelength distributions can be perceived as the same color by the human eye. Hence immersion according to Slater (2003) is analogous to wavelength distributions, and presence is analogous to the perception of the wavelength. "*Presence is a human reaction to immersion*". (Slater, 2003, p.2)

According to Slater (2003) one sign of presence can be the illusion of being there. With the same immersive system provided, different people might experience different levels of immersion. And different people might experience the same level of presence in different given immersive systems.

A broader definition of immersion is "to focus mentally on something other than the immediate surrounding reality... to experience a story world while shutting out the real world" (Gander, 1999, p.1). Immersion can be enhanced through two aspects, the first is to provide more sensory information and the second is high level of active participation by the user.

To summarize, immersion is a cognitive process that corresponds to being transported to the virtual world of a mimetic media. Presence is a concept specific to representational media and corresponds to how much one can perceive that the information (sounds, visual elements, etc) represented by these media are present in the physical world.

Conclusion and Discussion:

The main source of confusion in defining engagement stems from the characteristics of the linearity and nonlinearity of the different applications, some definitions of the term are proposed by scholars focusing on nonlinear media, others define engagement in relationship to linear media. In order to have a comprehensible and better understanding of the term engagement, we have to first identify and separate the definitions and clarify which ones belong to linear media and which ones belong to nonlinear media. Furthermore, a more general definition of the term engagement must be proposed in order to cover the fields of both applications.

Before analyzing the various definitions of engagement, it is important to determine to who the term engagement is applied to. Most certainly it is the participant or (user) in nonlinear media, and the audience in linear media.

Brown & Cairn's (2004) definition of engagement as being the first stage of immersion brings a bit of confusion in understanding the term. There is no doubt that the definition in itself is correct, it is also true that they didn't claim to have a general definition and in fact their work was concerning computer games, therefore in defining engagement, it would be more coherent and complete if they explicitly stressed and limited their definition to nonlinear media applications.

In nonlinear media applications such as computer games, the participant invests time, effort, and attention. There are various elements that can enhance engagement. One can be for example the controls in the system that assures immediate feedback to the participant's actions. The participant puts an effort that can be rewarded. Another element that enhances engagement is the participant's motivation and willingness to be involved with the experience; he must be attracted and deeply interested in the experience. The engaged participant explores, chooses, and performs the desired activities with the medium. Engagement can also be related to emotions, where the participant is emotionally involved in the experience in which he loses the track of time. The deepest type of engagement can be called "flow". Finally we will regard the definition of engagement in the educational field as interactive because of the participant's (students) constructive influence on the flow of the activity.

If we would like to analyze all the various definition of the term engagement previously mentioned with regard to interactive media, we can see that all the definitions contain a single and central element, this element has been described implicitly and in most cases explicitly: This single hidden trait is the physical activity performed by the participant in specific, and the aspect of interactivity in general. None of these definitions deny the fact that the participant is involved in taking actions. We can see for example, the participant puts an *"effort"* (Brown & Cairns, 2004, p.1298) and gets *"feedback"* to his *"actions"*; additionally *"engagement… is strongly associated with the exploration, choice and performance of game moves"* (Lindley, 2004, p.5). And finally *"Engagement in video games is a motivated, goal-oriented, rewarding, cyclic and recursive activity"* (Schønau-Fog, 2010, p.7). Naturally in any basic and simple goal oriented task, the mental and physical activities are involved in the action to achieve that task; thus it is necessary to distinguish between the mental and physical activities.

A distinctive difference between linear and nonlinear media can be visible from the requirements of involving the participant's mental and physical states. For example, in linear media the audience is involving only the mental state (the audience is physically passive). On the other hand, the participant in nonlinear media applications is required to involve both the mental and physical activities. Taking both elements into consideration will help us in understanding the characteristics of the term engagement, as well as distinguish it from other concepts such as immersion.

Let's investigate if the physical and mental activities can be applied to the general use of the term engagement in our daily life. We hear the term engagement in the battle field, the commander and the soldiers involve both mentally and physically to overcome the enemy. Other cases such as the politician's political engagement to solve various issues, mental and physical activities take place. In learning, students physically take the actions of taking notes and mentally try to understand the various subjects with the aim of having a better future.

With simple words we can summarize the general use of the term engagement as: the participants are taking actions to reach a specific goal, that goal is being rewarded by for example, declare victory and overcome the enemy, and having a better future.

We can realize that engagement involves both mental and physical activities with the aim of reaching a goal; the goal can be rewarded with at least the minimum level of self satisfaction. Regarding the use of sensory modalities, it is important to stress that vision and auditory sense modalities can enhance

engagement but they are not a must conditions, for example a blind/deaf person can be engaged in an exercise using only the mental and the physical activities.

It is obvious that the definitions of engagement that have been mentioned have many common elements with the actions taken by the dramatic character in tragedy. A reminder of the definition of tragedy from our conclusion in the previous chapter would be necessary at this stage: *"Tragedy imitates man's actions that are determined by his rational soul, the goal of man's action is the supreme good leading to happiness"*. It is clear that the dramatic character's physical and mental states are involved in the taken action; he has a goal to achieve and that can be rewarded with the emotion and the state of happiness. It is important to underline that most certainly the action taken in tragedy (linear media) is carried out by the dramatic character and not by the audience. The characteristics of the dramatic character match very closely with the characteristics of the term engagement.

If we analyze the characteristics of both linear and nonlinear media applications in terms of actions executed to reach the goal. In nonlinear media, we can see that the actions are carried out by the representative of the participant (avatar). On the other hand, in linear media, the actions are executed by the dramatic character (protagonist).

For Laurel (1993) the term engagement refers to the willing suspension of disbelief, according to her it is "*a* state of mind that a person has to reach to enjoy a representation of action" (Laurel, 1993, p.113). This definition is based on experiences in linear media such as theatre and films. According to this definition, which emphasizes the state of mind, it is obvious that only the mental activity of the audience is involved in the experience to perceive the whole action and not to execute the action itself. It is important to mention the state of mind of the audience is not influencing the flow of the represented action. Laurel admits in her definition that the aim is to enjoy a representation of action. We might ask which action she is talking about. It is most certainly the action that is carried out by the protagonist as determined by the author and not the audience of linear media. At this stage bringing another definition that concerns nonlinear media applications would be necessary, "gamers are involved with more than just the physical aspects of the game and have, in a sense, suspended their disbelief of the game world. This enables gamers to move towards total immersion" (Brown & Cairns, 2004, 1299). Additionally the term immersion is defined by Mateas (1998) as an aspect that is related to Colridge's notion of "Willing suspension of disbelief" when the participant is immersed in an experience, he is willing to accept the internal logic of that experience, even though if this logic differs from the one in real life.

From this point of view, we disagree with Laurel's definition of engagement for two reasons: The first is that, Laurel's definition lacks the aspect of involving the participant's physical activity (interactivity) in the experience. Involving only the mental activity can be considered as poorly covering the experience of engagement. The second reason is because of the fact that the aspect of "suspension of disbelief" is more related to the concept of immersion than engagement. Based on these, a general definition of the term engagement that can cover both linear and nonlinear media applications can be:

"ENGAGEMENT is the process that results from the consistency of the actions performed by the participant based on his external observation and/or his rational processing when trying to achieve a certain goal."

For further understanding of the term engagement, it is important to analyze and see how it differs from the characteristics of other concepts such as immersion and presence. We can conclude that the minimum requirements for engagement is to involve both the physical and mental activities, engagement is strongly related to the executed actions, Interactivity is a significant element of engagement, without it, the experience of engagement is in danger. A question might be, can we ever be engaged in watching a movie or a play? Movies and theatre in general are under the category of linear media. Except the physical requirement of turning on the TV, and the performed physical activity taking the person to the theatre; linear media requires only the activities of the mental state; the participant is a passive observer. What makes the audience continue watching can be called mental involvement rather than engagement. Slater (2003) differentiates involvement from presence as, "One can be present but not involved (as in many situations in everyday life). One can be involved but not present (e.g., watching a soap opera, reading a book)" (Slater, 2003, p.2). For Slater involvement is equal to interest, the audience's interest or motives with the content of the movie makes him continue watching, he is not taking any action and cannot influence the content of the movie. Therefore we cannot be engaged with a movie but we can be involved with it.

Immersion and presence are cognitive processes; the minimum requirement for the two experiences is the use of mental state only. Nevertheless they can be enhanced by involving physical activities, especially in nonlinear media applications such as computer games. The sensory modalities (auditory and visual) in the experience of immersion/presence in interactive applications play a significant role, and they can be considered as a must.

In nonlinear media, engagement can enhance immersion but not the other way around, this is confirmed by Dow et al. (2007) stating that, increasing the sense of presence in immersive AR experience does not necessarily increase the sense of engagement of the participants with the game.

Going back to Brown & Cairns (2004) definition, engagement is the first level of immersion. If we ask ourselves, can we be engaged without being immersed? and can we be immersed without being engaged? The answer most certainly will depend on the characteristcs of the media, whether it is linear or non linear media application. We can colclude by saying, "Yes" engagement is the first step leading to immersion in nonlinear media (games) because the executed physical actions are performed by the participant (user) in the experience. And "No" engagement is not necessarily the first step of immersion in linear media, because the executed actions are carried out by the protagonist in the movie leading to immerse the audience in the content of the experience, the audience being a passive observer. The engaged person is the one who takes the action. Who takes the action in nonlinear media is the protagonist in the movie, as a result, the engaged person is the protagonist and not the audience.To sum up, in computer games we cannot be immersed without being engaged, and in linear media we can be immersed without being engaged. Immersion is a "feeling" a "sensation" (Murray, 1997, p.98), it is a result in itself, it is less likely goal oriented, therefore it can be considered as internally driven activity, and more goal oriented, the reward is the motivating force.

Regarding the characteristics of the goals in the proposed application in the present project, since the events in the experience are causally related, the participant will be engaged in different events. Each event is an effect of a given cause, so when the participant sees the effect, he will be curious to discover the

cause. In the course of this investigation, he might be influenced by other effects; therefore his goal might change due to his way of prioritizing the different actions. Another reason for the goals to be slightly changed is the functionality of the IDM: when the participant is taking a specific action, the IDM will assign a specific event to be available accordingly; the assigned event will be causally related but not necessarily make the expected goal by the participant available. As a result his goals will be in constant change. The assigned goals from the author's point of view will be on micro and macro levels, the micro level goals are the goals in the small events, the macro level goal will be to reach the climax and see the final outcome of the story.

Beside many other aspects, it is necessary to summarize the overall most important and problematic aspects in the work of the present project. First, it is the intended theme that can be provided by the author, more specifically the social or ethical issues. In designing an interactive drama application, social or ethical issues have to be taken into consideration, choosing the theme will have great impact to the daily life of individuals and society in general. Another important aspect is to provide the participants with the ability to actively interact and engage with such issues. Indeed, interactive drama applications can be considered as powerful tools that merge the benefits of both narrativity (providing the participant with the intended theme) and interactivity (Allowing the participant to practice and be active as a part of the provided theme). Using interactive drama applications allow the participants to become acquainted to the intended theme by the author. At this point we can present our problem statement, which states:

"Can the narrative paradox, be overcome in an interactive drama application and still maintain the necessary participant's engagement during the mediation of a particular social or ethical issue?"

4.2 Test Strategy:

Our problem formulation comprises three aspects. First, we focus on the content or the theme that is provided by the designer, since many contributions in the field of interactive drama do not consider the role of authorship. By using the proposed application we would like to test whether the participant becomes acquainted with the theme intended by the "authors", in this case social or ethical issues.

Secondly, in order to assure that the conveyed message through "authorship" reaches the participant, we have to first test if the participant is more or less engaged with the experience. And then we have to test whether he understands what was intended to be communicated.

The third aspect concerns testing whether the subject can get the impression of having to do with a series of events as if they were infinite potential outcomes, without knowing that there is only a finite number of predetermined dramatic events. In this way we would like to originate the sensation of an emergent narrative, and by that, guaranteeing a unique reading each time the subject traverses the narrative network.

In other words, our purpose for testing this particular application is to investigate and find the elements that engage the participants. Additionally, we want to test to which degree the proposed interactive drama application can be used to involve the participant with a particular dramatic even. The test results will also show the validity of the proposed definition of engagement. Finally we would like to see whether the emerging causal relations between the different events can be used to provide new spontaneous or unexpected goals, which trigger curiosity and desire of exploration in the participants.

The level of engagement will be based on the action, goal, and reward. The goals will be based on causality and will comprise two levels: micro and macro level. The micro level, or local, goals will be provided directly in each event. The macro level goals will be completely dependent on the participant's choices and they can be reached at the end of the experience at the level of climax. Nevertheless, we assume that the participant will take the action based on the provided information in the small events (micro goals).

5 Chapter:

5.1 Solution Design:

The main objective of this section will be to design our proposed solution; the design will be concerning the three aspects of our presented problem in this work. Meaning that, we have to create a model that is consisting of three components: the flying wedge, the drama manager, and the causally related narrative elements. The model should provide the participant with balanced proportion of interactivity and narrativity. The strategies proposed by Jenkins (2004) will be taken into consideration, with other words the aspects of evoked narratives, enacted narratives, and embedded narratives will be adapted to our proposed model. These narrative elements will be controlled by a drama manager based on time and space. The proposed model will be called, interactive drama model (IDM), thus the following section will elaborate more on the functionality of proposed model.

5.1.1 The functionality of Interactive Drama Model (IDM):

The IDM consist of seven scenes with total amount of forty two narrative elements. These events cab be presented as dramatically acted videos by actors, other elements are presented as diegetic sounds. The participant starts his journey with many possibilities (possible events), meaning that, there will be various narrative elements that spread around on his way; these elements can be visualized in figure (21) as small circles. The functionality of the narrative elements will be mostly time and space based, therefore a fourth dimension of time will be added to the three dimensional environment. The time will be controlled by the use of a drama manager; the drama manager will trigger a number of evocative narrative elements after a specific amount of time, and depending on the user's location in space, for example in case if the user is in a specific location and he do not know what to do, an audio based narrative element might be triggered to guide him further in the story, e.g. a mobile phone call.



Figure 21 the (IDM), composed of the flying wedge, narrative elements, and the drama manager

The further the user progresses in time and space towards the end of the story, with other words the more actions the user executes to unfold the story events the less amount of narrative elements will be available by the drama manager, the number of elements will be determined and eliminated by the gradual sharpening of the triangle or the wedge. This process will be used to make the player be involved and guided through different causally related events, the assigned time by the drama manager will vary from event to another event, for example the time for some events to be triggered will be shorter than others

and vice versa, depending on the progress of the story. Some general narrative elements will be static, for example the space and the objects in the virtual environment will always be the same. Other narrative elements will be dynamic, for example projecting animation of cut scenes. The main interaction with characters in the experience will be based on projecting 2D videos from the performance of real actors. The projection of this type of dynamically appearing elements will depend on the following factors:

First, the actions executed by the user, since all the events are causally related to each other, the executed action by the participant will influence the appearance of the projected videos.

Second, the amount of time the participant spends in a specific location and his distance from the projected videos, when the participant approaches and crosses a specific distance the video will be triggered.

Additionally if the user spends more time in a specific area than the assigned time by the drama manager, the drama manager will trigger and assign corresponding narrative elements based on his previous action. The goal is to motivate the user or guide him to take other meaningful actions that are causally related to previous executed actions. Pictures or text based narration will also be used, for example information carried out by the use of mobile phones.

Despite, the freedom of interactivity the user is provided, there will be some constrains and authoring aspects, the user will be constrained with some general real life aspects such as gravity, for instance he will only be able to walk or run in the virtual environment. Other authoring aspects will determine the overall theme of the experience, for example he will start his journey in a specific place where he might like or dislike.

In order to have a better understanding of the functionality of the (IDM), it is necessary to project an example of a possible plot line on Laurel's contemporary plot structure (LCPS), which we have briefly described in the narrative chapter. Figure (22) (LCPS) illustrates a slightly modified version of Laurel's model, an additional point to represent the starting point has been added in order to fit the starting points in the (IDM). As we mentioned earlier that there are several narrative elements or events that are spread over the (IDM), these events are assigned from the authorship point of view, there are total amount of 42 events placed in the environment, the representation of the events can be found in Appendix (E), (p.98).



Figure 22 a possible plot line representing the participant's involvement with the events reaching a climax

Some examples of possible events are assigned to (LCPS), the plot line represents a possible story path the participant might follow. The plot represents the player's involvement in different incidents over time, let's imagine that we are looking at the plot structure and to the time and complication process from a side viewpoint, we can surely see the rise and fall in tension over time. If we look at the same plot line from a top viewpoint, it will appear as a straight line over time, but if we look at the same plot line space based rather than time based, and then we project it in the flying wedge, the plot line development will take another shape depending on the different locations and narrative elements that the player was involved in. Figure (23) illustrates the initial state of the story that participant is about to take the first action represented by the green dot, it is projected from a top point of view on the flying wedge, the progress of time and complication can be read from left to right. The grey circles are possible narrative events that the drama manager might trigger depending on the time and the location of the participant. The blue triangle is the flying wedge that moves according to the player's choice of a specific event, the functionality of the wedge is based on the fact that it keeps the participant always in the middle. The green dot represents the initial event in (LCPS) in which the participant is in the war zone, and Miriam sends a text message to him.



Figure 23 the player (represented by the green dot) in the initial state of his journey

In figure (24) bellow, the green arrow is the direction and the story path of the participant. He takes the first action and chooses a narrative element among many possibilities that are available. Accordingly The blue triangle (the flying wedge) is influenced by this action and moves slightly upwards to keep the player always in the middle; thereby, the number of available narrative elements is reduced and determined by the triangle's new position, consequently the determined elements will only be triggered by the drama manager so they are in the range of the player. The dashed grey triangle is the old location of the flying wedge. The participant reaches the inciting incident represented by the dashed red line, it represents the threshold between many event possibilities and probabilities, indicating that many possible events are furthermore reduced due to the nature shape of the triangle. The new generated green dot represents the event in (LCPS) of a guy on the way says to the participant that he saw his brother has been arrested by some gunmen.



Figure 24 the player takes the first action towards a possible narrative element

The participant crosses level of inciting incident, figure (25). The participant has to choose between the three narrative elements that are left for him, his choice again will influence the flying wedge and the number of narrative elements in the next position. This step corresponds to the event in (LCPS) of a lady which she looks very upset; she tells the user that some soldiers arrested all men in the village.



Figure 25 the player chooses one of the probable narrative elements

The player in figure (26) takes another action; the number of probable elements is further reduced by the triangle. This step corresponds to the event in (LCPS) which the participant founds a mobile phone and a suite case; he listens to the phone and hears that some gunmen arrested a girl.



Figure 26 the number of narrative elements is reduced for the player

In figure (27) the participant is involved in an intense activities and crises. The flying wedge sharpens and makes it available for the drama manager to trigger only a single narrative element. This level is described in (LCPS), a spy is whispering to another guy and points to the participant indicating that they are talking about him.



Figure 27 player takes another step that can lead him to a story end with either success or fail

At this step, as it is shown in figure (28) the participant reaches the final position that represents the story end (climax). His journey either succeeds or fails to reach his goal. If we want to see the representation of this point in (LCPS), it can represent, Miriam is sitting and tied to a chair in a dark scary room, she asks for help.



Figure 28 the player takes the final decision towards a story end (climax)

For better understanding of the procedure, a 3D illustration of the story path for the same example is presented in figure (29) bellow. We can see how the (IDM) (the bottom images with the triangle) is always keeping the new position of the participant in the middle, resulting angularly story path, at the same time the rising of the path can represent the rise in tension reflecting the story developments in the side images of (LCPS). In traditional linear narrative there is a fall in tension, as the illustration of (LCPS) shows that there is a fall in tension with a resolution, in the case of flying wedge, there is no fall in tension, the story ends at the level of climax, therefore in the example presented in (LCPS) there is no further description of the resolution part of the story. For better understanding we will illustrate 3D view of the process of creating the story path from both of the perspectives of view of the (LCPS) and the (IDM). Figure (9) shows that there is a gradual increment in the complication or the tension in the story, as well as it shows how the story path travels angularly over space from the (IDM) perspective of view.



Figure 29 illustrates (reading from left) the rise in tension of an example of possible story path

The concept of (IDM):

Based on the facts and the finding in the analysis chapter regarding the social and ethical issues, and that is linear and nonlinear media have been used to deepen the gap between cultures, vilifying specific ethnics, encouraging violence, and giving the opportunities to practice non virtuous acts from the period of childhood. We believe that the concept provided in (IDM) will be used for completely the opposite of all what we have mentioned. Far away from the traditional concepts that nonlinear media have used over decades, for example the concept of shootings, individual and mass killings, destroying building, and bombings. The concept of (IDM) will attempt to completely invert the traditional one, it will place the participant in the ground with the people who are suffering in the war zone, it will make the participant as close as possible to the massive destruction of the bombs, to hear the damaging sounds, to see how destructive it is, to feel how much pain it causes to the innocent civilians. By doing so, and according to the facts that states the more you practice justice the more justice you be, the (IDM) will give the opportunity to interactively practice justice in which no linear media is able to provide. Although the proposed experience concept is different than other interactive media concepts such as games, we took into consideration some of the elements that have been used as game design concepts. We found inspirations from Jesse Schell's book "The Art of Game Design" (2007). Some of these elements are considered as useful for the creation of an interesting storytelling application:

Add more verbs: It refers to add more operative actions, the interactivity between the operational actions lead to resultant actions, more operational actions leads to more resultant actions. For instance, in general game creation concepts, the availability of walking, jumping, shooting, create more resultant actions than only walking. Nevertheless this aspect was inverted in our application, in order to make the participant feel

and suffer with the civilians, the ability of shooting was not possible, instead of shooting; he will be under constant attack by the others.

Many objects: If an interactive application consist of one protagonist and one antagonist, the experience will not be interesting, having different characters with different role increase the number of resultant actions, for example, to involve more enemies (villains) with different capabilities in the experience and on the other hand to involve other characters as helpers. It is also important to mention that the villain must be one level stronger than the participant's representative (character) in the virtual world, this will increase the level of empathy with the protagonist.

Side effects that change constraints: taking actions in the experience have side effects on the participant himself and the opponent, for instance when the participant enters the enemy zone results the change in position, direction and actions of the enemy, this leads to a very interesting resultant actions in the experience. Schell (2007)

5.1.2 The design of communication forms:

In the application of the present project, most of the actions that the participant carries on will be influenced from the verbal and non-verbal communications. An example of verbal communication is, when the participant is in the war zone, on his way to escape from the danger, he will meet different characters that might, guide him to go to a safer area, or convey to him some important information regarding his beloved ones. An Example of nonverbal communication is when he gets information by the use of body language, for example in the case of meeting with the gunmen, the gunmen will use a warning sign, threatening with a weapon, and they use direct verbal conversation.

5.1.3 Game design principle of affordance:

Affordance is considered as an important concept in interactive design. Affordance corresponds to the action that is allowed by the designed interactive device, the action that the user can *afford* to do: is this button *clickable*, is this object *movable*, or *bendable*, or *breakable*? A key to interaction design is to make those affordances obvious for the user: "*The psychological idea of affordances says that things may suggest by their attributes what you can do to them*" (Dix et al. 2004, p.217). Dix emphasizes that the user must know where he is going or what will happen when he clicks on a button. Feedbacks communicated to the user permit the evaluation of the system's state after the execution of an action. Making affordances and feedbacks obviously comprehensible for the user are keys for an effective and accessible design.

Concerning the present project, affordance has been taken into consideration in designing the shape of objects. In order to emphasize the concept of affordance; colors and lightings will also be used to direct the participant's attentions to the objects, for example an affordable object will have a color slightly higher in contrast and eventual light might be casted on it as well. Audio is yet another important aspect, affordances can be carried by both vocal cues and non-vocal cues, thus the model for nonverbal communication proposed by Manninen described in the interactivity chapter is an adequate tool to find the means of communication for such information, Appendix (B), (p.90).

5.1.4 The design of Diegetic and nondiegetic sounds:

The four types of sounds that have been described in the interactivity chapter are: Diegetic, extradiegetic, internal transdiegetic, and external transdiegetic sounds. Three of these ategories will be used in our

particular project, namely; extradiegetic, diegetic and internal transdiegetic sounds. An example of extradiegetic sound will be in the form of background sound that gives the impression of a war situation, and it will be played during the entire experience as a loop. The sources of diegetic sounds will be the voice of characters, and all the others sounds from the virtual world, for example the sounds of (explosives, air raid bombs, birds, cars). The source for the internal transdiegetic sounds will be the voice of the characters that are addressed directly to the participant in a communication form, meaning the transferred sounds from the virtual world to the physical world, as a result influencing the actions taken by the participant.

6 Chapter:

6.1 Implementation:

The process of implementation of the application proposed in the present project involved the following steps; Modeling, texturing, recording actions of real characters to be adapted, and finally programming. Maya as 3D modeling software was used in order to create the environment, and the game engine Unity was used for the development of our application. Unity is permits scripting in JavaScript and C#. It relies on a high level integrated graphical environment. The following section will be concerning the process of modeling.

6.1.1 Modeling and texturing:

Based on our solution design, the first draft of the 42 events were sketched, the events were assigned and arranged on a specific area in order to create the environment. The next step was to model all the requirements as 3D objects in Maya. The first place that all the initial events take place in a room, figure (30) illustrates basic 3D objects that have been modeled.



Figure 30 modeling the interior part of the room

With the same method an entire environment that contains a village and a town was also modeled. Figure (31) shows the initial stages of creating the environment.



Figure 31 modeling the environment

The overall environment requires the creation of many different objects and props, an important issue that has been taken into consideration was the amount of polygons used. The higher amount of polygons the

slower the rendering process. In order to obtain more realistic looking objects with low resolution of polygon, we decided to use real images taken from real environment for the texturing process. Before applying these textures to the 3D models, a process of adjustment and modification was necessary in Photoshop as graphical editing program. Figure (32) shows the final outlook of the room where the story starts to unfold.



Figure 32 the room after the texturing process

Figure (33) presents different images of the environment after the texturing process. The texturing process was an important issue, because many things can be inferred from the overall outlook of the environment, whether it is a deserted or not. Some of the techniques was also used such as embedded narratives i.e. footprints, blood, signs of bullet attack, and signs of explosions.



Figure 33 different scenes from the deserted town

6.1.2 Recording the videos:

Most of the events in the provided applications were 2D based rendered videos. In order to represent the different actions, actors were used to perform various events. The actions were took place in front of a green screen, moreover the chroma key technique was used to remove the green background. Figure (34) "left scene" shows that the first stage of recording the action of shooting, in front of a green background. The second stage is where the gunfire is added "the middle scene" by using digital motion graphic software such as adobe after effect. The same process was applied to the third "scene to the right".



Figure 34 shows the different steps that have been applied to a single action

The next step after modifying the videos' was to add the sounds to the recorded actions. the sounds were recorded directly from the actors and modified by the use of a digital audio editor software such as "adobe sound booth". Some other sounds were taken from the sound library (freesound, 2005).

6.1.3 The implementation of IDM:

As mentioned earlier Unity as a game engine was used. JavaScript was used for the functionality of the drama manager, figure (35). Some of the events are designed to be constantly running in the environment independently from the participant's actions, these events are the explosions, and the ambient sounds. The drama manager controlled six scenes in total; each scene consisted of seven events that can be triggered. Each of the single events in scene (column) A, is connected to five possible events in scene B, furthermore each single event in scene B is connected to four possible events in scene C. this process continues further until a single event , this single event represent the climax in scene F.



Figure 35 presents the different scene from A-F; each scene consists of seven events.


Figure 36 illustrates the process and the functionality of the IDM

In the presented application the participant starts his experience in a room; the role of the IDM manger is to assure the availability of triggering all the assigned seven narrative elements in scene A. This can be seen in figure (36) "right" in the first row by the green "ON" signs. When the participant triggers any event, the IDM will eliminate the other events in the same row, and makes four other events available in the following row. This can be seen in figure (36) "left", the first row shows that a single event is triggered by the participant and all the rest are "OFF", and the second row shows that four new elements are available for the participant. Triggering a single event can be for example, when the participant approaches a single object in the room such as the radio, a thin red light attached to the radio goes on. This indicates that the interaction with radio is affordable, when the participant clicks on the radio; he gets an audio feedback to his interaction. The audio feedback contains information about the overall situation, and encourages the participant to take other actions. The moment the participant triggered the radio, all the rest of narrative elements in the room becomes unavailable or dead objects, and some other elements will be in turn available to interact with in scene B "outside the room". This process can be described from the programming point of view as the following: Regarding the same example, triggering the radio will make all the other elements (assigned for the same scene) to be set to false condition. Some other elements in the next row or scene will be set to true. Figure (37) shows an example code written in JavaScript to represent the interaction with the radio. The code is indicting that a collider has been used for the radio, in case if the participant approaches the radio, the red color will be highlighted affording the participant to further interact with the object. Additionally we can also see in the code that another condition is assigned, for example if the participant clicks on the radio, he gets an audio feed back from the radio. The same code shows that after the radio has been triggered, the rest of narrative elements in first scene are set to false, and some other four elements are set to be true in the following next scene.

```
if(hit.collider.gameObject.tag =="rd")
{
RadioColor.renderer.material.color = Color.red;
if (Input.GetButtonDown("Fire1"))
{
Scene1Event1.gameObject.SetActiveRecursively(false);
Scene1Event2.gameObject.SetActiveRecursively(false);
Scene1Event5.gameObject.SetActiveRecursively(false);
Scene1Event5.gameObject.SetActiveRecursively(false);
Scene1Event7.gameObject.SetActiveRecursively(false);
Scene2Event1.gameObject.SetActiveRecursively(false);
Scene2Event3.gameObject.SetActiveRecursively(false);
Scene2Event3.gameObject.SetActiveRecursively(false);
Scene2Event3.gameObject.SetActiveRecursively(false);
Scene2Event3.gameObject.SetActiveRecursively(false);
Scene2Event3.gameObject.SetActiveRecursively(fure);
Scene2Event6.gameObject.SetActiveRecursively(fure);
Scene2Event6.gameObject.SetActiveRecursively(fure);
Scene2Event6.gameObject.SetActiveRecursively(fure);
Scene2Event7.gameObject.SetActiveRecursively(false);
}
```

Figure 37 an example of programming code from JavaScript for the interaction process with the radio

As mentioned earlier, the environment contained 2D video animation of some characters, the process of interaction with the characters are as follows: The behavior of the characters are consist of two states; first, the normal or neutral state where it consist of looping state of standing, looking at the surroundings, and in some cases two characters talking to each others. This state is triggered the moment they are in the participant's range of view. Second the talking state, this state is triggered when the participant crosses the normal state towards the character, the character starts to face the participant all the time, meaning if the participant tries to walk around him, the characters will always be facing him. Additionally the character's 2D video animation zone. We can call the overall situation as a space or distance based process.



Figure 38 illustrates the 2D video characters two states

The second part in the IDM is the Gunman AI, in this case the gunman has three states that can be triggered, first the normal state of guarding the gate, second the state of warning when the participant crosses the normal state, and finally the attack state. The attack state will be triggered when the participant ignores and crosses the warning state. Figure (39) illustrates the three states of the gunman AI.



Figure 39 shows the three different states of the gunman

The behavior of the gunman in figure (39) is based on switching between different states. Hence, it has been coded through a finite state machine (FSM). The following table (2) shows the state transition of the Gunman AI.

Current state	Condition	State transition
Neutral	The participant is visible and in the warning zone	Warning
Neutral	The participant is visible and in the attack zone	Attack
Warning	The participant leaves the warning zone, or is not visible anymore	Neutral
Warning	The participant enters the attack zone, or stays too long in the warning zone	Attack
Attack		No state transition

Table 2 the state transition of the gunman AI

The same procedure was applied to the friendly characters as well, but only with tow states, namely a normal state and a talking state. Unlike the Gunman IA, The friendly characters will not show any sign of hostility when the participant will get closer to them.

The next step after the implementation was to conduct a pilot test; the aim was to detect the flaws and correct them until the application is judged as being adequate. Some of the comments were addressed by the test subjects, all the comments have been taken into consideration. For example the test subjects in the pilot test showed a bit of uncertainty in interacting with the objects in the first scene, namely in the initial starting point of the experience (the room). The aspect of affordance was implemented in order to trigger the participant's curiosity. After the adjustments and corrections the application was ready for the final test, thus in the next chapter the aspects of the test process will be addressed.

7 Chapter:

7.1.1 Test Method:

For the test, the choice has been made to make a qualitative and quantitative test. The quantitative test will be on two aspects. The first is the objective recordings of the participant's involvement with the events, i.e. his/her pathway. This recording will include the order, and the number of events. The second aspect will be based on a quantitative questionnaire inspired by the (GEQ) game experience questionnaire by Ijsselsteijn et al. (2010). We took inspirations from the (GEQ); we adapted some of the questions and created some new to make it more relevant for the assessment of our project. The chosen questions will be related to the above mentioned six categories. The original scale of the questions in the (GEQ) was replaced by the Likert scale *"The Likert technique consists of a series of statements to which one responds using a scale of possible answers: Strongly Agree (5), Agree (4), Neither Agree nor Disagree (3), Disagree (2), and Strongly Disagree (1)"* (Craighead and Nemeroff, 2001, p.884).

The questions for the qualitative test will be based on the elements of engagement proposed in the definition of Schønau-Fog (2010), together with some other general questions. Due to the characteristics of the application and the theme of our particular project, only seven categories from the mentioned definition will be chosen to conduct the test upon, namely the elements of: Completion, Exploration, Interfacing, Emotions, Physiological Reactions and Absorption. Completion in our case refers to the participant's level of interest to complete the entire experience, moreover, it refers to whether the participant overcomes the challenges opposed to him from the environment, for example air raids, explosives, being arrested by gunmen. We have mentioned previously in the section of drama that there are three types of conflicts, and here we have to do with the type of conflict between man vs. man. **Exploration**, refers to the participant's desire to explore the scenery, his curiosity and interest in seeing the story unfold. Interfacing refers to the accuracy of the reciprocal process between input and output, whether the participant is getting adequate feedback to his inputs or not. Emotions, refers to which degree the participant felt empathy with the characters in the environment. Physical reactions occurs when the participant is going through a dangerous situation, for example a bomb explodes beside him, or watching someone else has been tortured, and as a result the participant might experience some physical reactions such as cold sweat or adrenaline. Finally **absorption** is when the participant is losing the track of time, and the feeling of the surroundings. In addition to the elements of engagement, the qualitative test will concern the narrative construction of the individual participant to assess how coherent the experienced story is and whether the participant linked or connected the different events to each other.

It is important to mention our hypothesis regarding the overall test. We assume that providing the participant with an application that implements interactivity and narrativity in balanced proportions will have a positive impact on the aspects of his engagement and narrative construction.

7.1.2 Test Analysis:

Based on our test strategy we conducted a quantitative and a qualitative test, the analysis and the interpretation of the test results of each method will be presented in the following sections.

7.1.2.1 Analysis of the "Quantitative" test:

A quantitative test was conducted on thirty test participants, the test subjects were students with different semester backgrounds from the department of Medialogy Copenhagen. The participants were asked about their, gender, age, preferred game type, and how often they play games per week. They were asked a question of *"How often do you play computer games per week?"* and they were provided with the choice options of: (Never, 1-5 times a week, 5-10 times a week, and 10-20 times a week). A number of thirty three questions were mainly used and indirectly covered the following aspects: Sensory and imaginative immersion, Flow, Tension, Challenge, Psychological involvement (Empathy), Psychological involvement (negative feelings), and finally Negative experience. Some other questions were also related to social or ethical issues, see Appendix (F), (p.99).

Table (3) presents the questions that have been asked, see Appendix (G), (p.105). The number of test subjects, the average and standard deviation values. The level of game play per week among the participants varied in the following manner: out of thirty people a single participant answered "10-20 times a week", two participants answered "Never", 8 participants "5-10 times a week" and finally 19 participants answered that they were playing "1-5 times a week".

In order to obtain more reliable results, we have chosen the test participants who were in the category of weekly play of "1-5 times a week", they were in total 19 participants, see table (4). The rationale for this choice is that including the other test participants, namely the hardcore players and non-players would influence the average values for the questions. Moreover, the values of the standard deviation regarding the questions of the chosen 19 participants in table (4) indicate that some of the questions cannot be used as conclusive. The reason is that the values of the standard deviation for these questions are high and cannot be counted as significant answers. Thus, the questions with low standard values will be analyzed further.

Descriptive Statistics	N	Mean	Std.
1-While progressing in the experience, I could find answers to some of the	19	3,47	1,124
questions in my mind.		64	0.00
2-1 was interested in the overall story.	19	4,21	,713
3-1 was interested in exploring the environment.	19	4,42	,507
4-The more the story was unfolding the more I forgot my surroundings.	19	3,53	1,073
5-1 had to concentrate deeply, in order to understand what was going on.	19	2,95	1,079
6-It was not hard for me to escape from the town.	19	3,32	,946
7-1 am motivated to meet more characters	19	3,84	1,259
8-1 want to keep experiencing the world	19	4,16	,688
9-1 want to get away from the experience	19	2,26	1,195
10-I think it is boring	19	2,00	,745
11-I want to try again	19	3,95	,705
12-I felt that it was like a nightmare and I was really in the war zone.	19	3,58	1,216
13-I did not have enough time to decide where to go, I felt frustrated.	19	2,74	1,046
14-I had to put lots of efforts in order to reach my goal.	19	2,47	,905
15-I was curious to get information from other characters, in order to decide	19	3,95	1,268
where to go.			
16-When I was discovering the reasons for the events, I was deciding something	19	3,11	,994
new.			
17- Each time after talking to the characters, I was deciding something new.	19	3,21	1,273
18-I felt as I was exactly in the other character's situation.	19	3,42	,838
19-I wished that I had a gun to stop the bad guys from threatening the other	19	3,79	1,134
characters.			
20-I wished that I could stop the air bombs.	19	3,58	,902
21-I wished that I could help the other characters when they asked for help	19	4,26	,733
22-1 was sad when the other characters were sad or in trouble.	19	3,47	1,020
23-When I was worried, the other characters were also worried.	19	3,05	,780
24-My actions depended on the other characters' actions.	19	2,95	1,129
25-The other characters actions were dependent on my actions.	19	2,84	,898,
26-The other characters paid close attention to me when I was approaching them.	19	3,68	,885
27-I paid close attention to the other characters when they talked to me.	19	3,84	1,167
28-What the other characters did affected what I did.	19	3,58	,902
29-1 influenced the mood of the other characters.	19	2,68	1,003
30- My mood was influenced by the other characters.	19	3,47	1,219
31-I wanted to revenge from the gunmen because they were torturing the other	19	3,58	1,071
characters			
32-At the end of the experience I felt bad because I couldn't save some of the	19	4,00	,943
characters.			
33-At the end of the experience I felt guilty because I couldn't help the others	19	3,32	1,157
much.			
			l l

Table (4) presents the questions, number of 19 test subjects, average values, and the standard deviations.

7.1.2.2 Test results and interpretation of Quantitative test:

In the following, the most conclusive collected data from the quantitative test will be presented. These questions concern the elements of engagement as well as social or ethical issues. Additionally we will present the interpretation of the average values and the standard deviation regarding the answers of each question. The following question was asked to the test subjects:



Question 2: I was interested in the overall story.



The results of question (2) which was related to "sensory and imaginative immersion" showed that the test subjects more or less agreed that they were interested in the overall story in the experience figure (40). The conclusion to be made from this result is that the test subjects were interested in the theme that has been assigned by the use of authorship.

Question 8: I want to keep experiencing the world.



Figure 41 shows an average value of (4,15) and a standard deviation value of (0,688)

Question (8) was also related to "sensory and imaginative immersion" the results showed that the test participants had the tendencies to keep exploring the overall environment in the experience, figure (41). The average value of the answers indicates the overall tendency is towards "agree" to the statement in the question with a slight tendency towards "strongly agree".



Question 10: I think it is boring.

Figure 42 shows an average value of (2) and a standard deviation value of (0,745)

Question (10) examined whether the test subjects encountered negative experiences, figure (42). The results indicated that they disagreed with the statement. A positive conclusion can be made from this result, meaning that the test subject did not encounter negative feelings, namely boredom during the experience.



Question 11: I want to try again.

Figure 43 shows an average value of (3,94) and a standard deviation value of (0,705)

Question (11) meant to be asked in order to see if the test subjects are willing to come back and try the experience again; this element is related to engagement. The results, figure (43) indicated that the answers of the test subjects were varying between "neither agree nor disagree" and "agree" with a high tendency towards "agree". We can also count the result as promising. Since the application is a prototype version

and needs to be improved technically, the participants were still willing and had the tendency to try it again despite of all the encountered flaws in the experience.



Question 21: I wished that I could help the other characters when they asked for help.

Figure 44 shows an average value of (4,26) and a standard deviation value of (0,733)

Question (21) was related to Psychological Involvement (Empathy), additionally it was related to social and ethical issues. The results of this question was very important for us, empathy is related to the theme of the experience presented in our particular project, it is an important element of the drama which has been used in linear traditional media such as films. The nature of the question is also related to social or ethical issues, the result indicates that the test subjects were willing to help other characters that needed help in the experience, figure (44).

7.1.2.3 Analysis of the "Qualitative" test:

A qualitative test was conducted on ten test subjects, the chosen test subjects had moderately game playing experiences, the most common game types for them were for example FPS, strategy and story driven games. Due to their experience in games in general, it was important for us to know their feedback to which degree interactive application concepts can be manipulated. All test subjects were students from the department of Medialogy Copenhagen. They were from different semesters with a rate of game playing of one to five times per week.

As mentioned in the test strategy, the questions to be asked were primarily based on the elements from the definition of engagement proposed by Schønau-Fog (2010). The elements were: **Advancement**, **Completion**, **Exploration**, **Sharing**, **Interfacing**, **Emotions**, and **Absorption**. Additionally some other questions regarding the overall experience, drama techniques and social or ethical issues were also has been asked. The questions that have been used to interview the test subjects can be found in Appendix (H), (p.106). The answers of the test subjects were recorded and saved in specific folders, the time and the name of the folders will be provided with each answer in the following section. The sound folders can be found in the CD provided with the report.

7.1.2.4 Test results and interpretation of Qualitative test:

Regarding how motivated the test subjects were to try the experience, a question was asked as: "Were you interested in trying this?" the overall tendencies indicated that the test subjects were motivated to try the

experience, some were interested in the story of the experience, to mention some of the reactions to the question; a test participant responded by stating that for her "*it was a new experience*" [00:30, Rad] another replied: "*I really like story driven games, plus the whole theme, I am very interested in that as well*" [00:07, Nie] furthermore "*the whole them was very nice, the whole scenery, and people with guns, very interesting war scenario*"[01:50, Mic] others were motivated because of the overall environment; one participant stated that "*I was very interested in the game environment*"[00:10, Ste] and another answered: "*I was interested to see all the effects and the landscapes*"[00:34, Dav]. Some participants were motivated because of curiosity "*I had to discover what it was all about*" [00:22, Lon]. And "*there was something going on, and I want to figure out what it was*" [00:26, Cla].

The participants realised the overall situation, one stated that he "experienced a start of a war" [00:21, Ste]. Another added by saying "I couldn't say what country I was in but it was a war torn country... It was a suppressed city. They were suppressed by probably foreign government" [00:25, Nie]. Others described it as "an occupied country... civil war, terrorists and soldiers who restricted your access" [02:15, Mic]

As an element of engagement, for example concerning **Advancement** in the experience, the participants were asked the question: "*Did you want to learn more about any of the characters*?" In general the test subjects were able to identify the characters, for example to distinguish the enemy from the friend, a test subject wanted to know the "girl which kept in a building, she was tied and there was a guy torturing her" [04:38, Rad] another participant said: "*I was hoping that I would have gotten to talk to more of them. Or get more information out of them... who were the suppressers*" [06:58, Nie]. Another identified them as "victims... in occupying scenery" [05:22, Mic]. Finally another participant wanted to have "a flow of communication" with the characters [04:39, Lon].

Regarding **Completion** a question was asked as: "Did you want to see how it ended" one test subject directed his answer in relation to save a particular girl at the end of the experience, he said: "I am hoping that I would manage to save her out of it, but somehow... I didn't expect to have a happy ending" [07:26, Nie]. Another stated "I would really liked to see how it ended, because it did trigger my interest" [03:02, Cla]. Exploration was an important element of engagement, the question was raised as: "Did you want to see more of the locations?" All the participants were interested in exploring, to mention some, an answer was as: "I would liked to see more of the country as a whole" [07:50, Nie]. Another stated that the: "map seemed very big, and I wanted to explore, I felt that I was in a path and I didn't reach it yet to see where it ended" [03:31, Cla]. Sharing is yet another element of engagement; the test subjects were asked a question regarding their opinion if they want to share the experience with others, the question stated: "What do you want to tell your friends about this?" the answers of the test subjects were indicating that it was a new experience for them, one participant stated that it is a "new experience, I don't think that any other game provide" [05:45, Rad]. Another participant described it as: " as sort of unique experience, it is a different take on war in games, because you take such a completely different perspective, it was completely seamless in the sense that I never realize that I was influencing what I was doing. It happened in a sort of natural way" [08:45, Nie]. Finally a test subject related it to a new way of experiencing stories, "I would tell them that I tried this new way of playing, exploring the territory and figuring out what it is, there was more story, more narrative you should explore yourself and figure out" [06:05, Lon]. Regarding Interfacing, a question was asked as: "How were the controls?" the answers indicated negative results in general, for example one participant described the controls referring to the mouse as it "was very sensitive" [11:35, Nie]. Another

participant said that the overall controls were fine but "The mouse was really sensitive. When I was getting shocked, I was rotating 360 degrees" [06:46, Dav]. The speed of movement in the virtual environment was another critical aspect, one participant stated that "the only thing is I looked for a sprint control, that would have been nice to have" [06:31, Ste] another test subject added by saying "I think that I would like to move a little bit faster" [11:35, Nie]. The test subjects were also asked about their Emotions, "Did you encounter any feelings?" The answers of the test subjects indicated that they encountered different types of feelings, some described it as frustration, others as suspense and intense, and others as fear. Other answers were critical due to the nature of the experience, for example one participant stated: "I didn't feel scared because they couldn't shoot me" [8:48, Lon]. Regarding frustration a test subjects stated the following: "I got frustrated that I couldn't save the girl and the guy hanged out there, I was helpless I couldn't do anything" [06:50, Ste]. Another added the "helplessness when I couldn't do anything" [8:52, Lon]. Others stated the following: "It was more of suspense in the sense that, I was always anxious to figure out what was waiting around the corner" [12:14, Nie]. And "It was intense all the way through, because there was constantly explosions, gunfire, it kept really high level of intensity" [07:06, Dav]. And "I felt scared, from the sounds and the bombs" [01:11, Rad]. Concerning the element of Absorption, the raised question was: "How realistic was it?" some compared the experience with a game, and stated that: "Pretty realistic, much more realistic than most of the games even big budget like call of duty, you have normal stuff, a cell phone perhaps or a car, but everything was broken. So I couldn't use anything, it is a serious realistic game as I see it" [07:42, Ste]. Others stated the following: "It was realistic, the explosions were really effective" [08:01, Dav]. "The sound really fitted well with the visuals, I was getting shocked" [04:52, Dav] Some criticized the realism by stating that: "Lots of things looked in a computer way realistic but then the combination with real people that made me realized that it wasn't real, so having real people in there, became less realistic" [09:38, Lon]. Another question was asked regarding the same element of absorption as: "How was it to "play" the character?" In general the test subjects indicated that it was interesting, one participant found, "Not being able to do something about the bad guys... interesting...because you didn't know what was going on, and you couldn't do anything you could just run or hide" [10:10, Ste]. Another participant stated that: "It was interesting to, I liked the theme, it caught my attention definitely" [06:55, Cla]. Others stated: "I felt I am down there" [09:15, Rad] and "I am just the character, and that is my life, I am scared" [02:27, Lon].

As we mentioned earlier some other questions were also asked, for example whether the participants wanted to keep playing and come back to play. A question rose as: "Was there a certain point, where you really wanted to continue?" One participant admitted by saying: "Yes it happened all the time almost, that I wanted to go somewhere but I was held by the guards, I really wanted to get into that building but I couldn't, and similarly at the end I wanted to get the girl out of the...but I couldn't" [13:53, Nie]. Others answered as: "At the end, I wanted to get all my questions answered. And see what else, to further explore the town" [09:35, Mic]. And "Yes, because I wanted to be able to do something" [11:05, Lon] and "I think I was not done exploring" [09:06, Dav]. The participants were asked also if they wanted to come back to the experience again, "Do you want to try again?" There were some critic regarding this questions, the participants wanted to come back again, but they requested more interaction, for example one participant stated that: "I would but not...for entertaining" but "to understand a given situation...learn about how things practically work" [11:26, Ste]. Another participant stated: "I want to see what happens if I do

something else" [14:16, Nie] finally "I really would like to play again, but if there were no more interaction I would get frustrated" [11:26, Dav]

Some other questions were also asked from other theories that attempts to merge narrative elements into interactivity, such as evoked narratives. The participants were asked the following question: "*Have you ever visited such places in your fantasies or imaginations*?" Most of the answers indicated that they have visited such places in their imaginations especially in "*films and games*" [03:19, Ste], [03:18, Dav], [06:05, Nie], and [04:12, Lon]. Regarding embedded narratives the test subjects were asked, "*Did you see any visual clues*?" the overall participants were able to interpret the visual clues, one participant stated: "*I noticed and I stood looking to them for a while because I didn't know if that was her but I saw some bloody footprints. I tried to follow but the track kind of disappeared… and there was some blood over the door as well and I didn't know if that was her or not but at least I followed because I thought it might be something to do with her" [04:11, Nie]. Regarding the social and ethical issues, a question was asked as: "Would you liked to help the other characters?" regarding to this question, all the participants had the tendency to help others that need help, to name some, one participant stated: "<i>I wanted to help but I couldn't enter the building. Because you can hear someone screaming there as well so you wanted to go inside to see if you can help people, but it was not possible*" [03:30, Lon].

7.1.2.5 Analysis of the narrative construction:

As mentioned in our test strategy, the third aspect to be tested was the participant's narrative construction. Our strategy was to record the constructed story path of each participant in the experience. Figure (45) shows the recorded narrative events in IDM, the start and the end points. Reading the model from left to right, the story starts in column A and ends in column F, the numbers from 1-7 represents the possible events that the participants are able to interact with, any triggered event in column A leads to make other possible event available in the next column, in this case column B, and so on, until reaching the end of the story in column F. As we mentioned earlier, there were thirty test subjects, each line represents a story path or a plot line for each participant. We can see that some narrative events were triggered more than others, with other words, as an example, the events "2A" and "7A" were mostly triggered by the participants as starting points. Moreover, the events "3F" and "4F" were reached as a climax or end of the story.



Figure 45 illustrates the participant's plot line in IDM from a top point of view

7.1.3 Test Conclusion:

The results from the qualitative test showed that the overall test subjects were motivated to try such an experience with another concept that places him in the role of the suppressed. They were able to describe the overall situation in the environment. The participants were willing to get to know the other characters, and seek for more information. The participants were willing to know how the story is going to end, although they were not expecting a happy end. They were willing and interested to explore the environment, because they had the tendency that they didn't explored enough and they wanted to explore some other places. Regarding the controls, the speed of the mouse influence the experience negatively, the majority of the test subjects complained about the sensitivity of the mouse. Regarding the aspect of emotions, the participants were experiencing frustration most of the time, the reason was because of the lack of ability to do something in the situation, they were constrained to take some necessary actions by either the gunmen (shooting at them) that prevent them to approach a specific area they wanted to explore. They mostly preferred to have a tool such as a gun to change some of the events in the experience. Using real videos helped the participants to get information in the environment, but on the other hand they took the participants a bit away from the realism of the experience. Another aspect is taking the role of the character was an interesting experience for the participants, but again interactivity was a big request. The participants were willing to do something; they lacked a flow of communication with the other characters. Nevertheless, the participants were willing to keep playing and come back to play it again. An important issue can be concluded regarding the social and ethical issues; the participants were really willing to help the other characters, it was interesting to get the responds from the participants, which they were willing to help the others even if they were being attacked by the gunmen. In fact in many cases the call for help triggered their attention before any other audio visual threats by the others.

Concerning the quantitative test, we can say that some positive results have been detected. First, the participants in the experience were interested in the overall story, and they were willing to explore the environment. The participants to some extend didn't encounter negative experiences such as boredom; additionally, they had the tendencies and interest to try such an experience provided in this project. The participants felt empathy with the other characters, they were willing and put efforts in order to help them in the experience. This means that the participants were willing to practice the virtuous actions, which it is an important aspect regarding social and ethical issues.

Regarding the narrative construction, we can conclude that there was overlapping or repetition of story paths, according to our recordings of the events; we can clearly see that some of the events were triggered more than others, and that is due to the fact that some narrative elements were affording to be triggered more than the others. For example: one narrative element was a lady screaming for help from a building, most participants chose that direction aiming to help her. Another reason is that some other narrative elements such as the video animation of different characters were affording more than objects in the environment, indicating that the participants were more willing to communicate and get information from other characters than interacting with objects i.e. riding a car. Some other events were time based; the assigned time for these events seemed to be very long, resulting less chance for these events to be triggered. Finally, the space based events were also lacking to be placed in the proper locations; the closest events to the participants were triggered more. To summarize, we can say that all the technical flaws in

designing and arranging the events were the main reason of obtaining higher variations in the answers of the participants to the test questionnaire. As a result out of thirty three questions, only five counted to be conclusive to be analyzed.

7.2 Conclusion:

Throughout the process of this project, the decision has been made to choose the type of storytelling with the use of dramatic character, as an important narrative pattern. As a result these lead us to elaborate on the term plot, plot is considered as the soul of tragedy, plot and tragedy share the same definition in which it is an imitation of action. Thus without action, there is no tragedy and story. Another reason for choosing the term drama is that it shares many aspects with the concept of engagement. The characteristic of the actions that the dramatic character carries on is very much similar to the characteristics of the term engagement. Both involve mental and physical activities, both concepts are goal oriented and rewarding. Yet another reason for the choice preference of drama, is that one of its characteristics is that it involves the aspect of interactivity. Indeed, drama can represent the meeting point; bringing together the two oxymoron concepts of narrativity and interactivity.

In relation to the presented problem formulation, which it is "*Can the narrative paradox be overcome in an interactive drama application and still maintain the necessary participant's engagement during the mediation of a particular social or ethical issue?*"

The first aspect was considering the role of authorship. Based on the overall test results, the indication was that the participants to some extend were acquainted to the overall intended theme by the author. The majority of the test subjects were interested in the theme; they were willing and showed interest in trying the experience again, as a different take on war in interactive applications. Moreover, regarding the aspect of social or ethical issues, the participants wished to have more power to help the victims. This indicates that the willing of executing virtuous actions was a common element among the majority of the participants. The willingness to carry out virtuous actions must be utilized in other future applications.

Engagement was yet another important aspect. Despite of the fact that our proposed application suffered from some technical inefficiency, we can conclude that to some extent the participants were engaged in the experience.

Regarding the narrative paradox, the test results indicated that more interactivity was required, although our claim was to provide the participants with a balanced proportion of narrativity and interactivity; the test results showed that our presented application did not provide the participants with the needed freedom of interactivity. Hence the test results indicated that the application did not succeed in providing the participants with balanced proportion of interactivity and narrativity. Another fact was, the participants were not able to link the events in terms of cause and effect, a recall to some of the facts from the narrative chapter might address the reason of why the causal relations were not adequate: the plot as *"being an imitation of an action, must imitate one action and that a whole, the structural union of the parts being such that, if any one of them is displaced or removed, the whole will be disjointed and disturbed. For a thing whose presence or absence makes no visible difference, is not an organic part of the whole"* (Aristotle, 350 BCE). We believe that any displacement of any event will have a negative impact to the entire perception of the whole action.

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9 Appendix:

9.1 Appendix (A)

9.1.1 Ergodic:

Ryan (2001) clarifies ergodic design and sensitivity to user input regarding digital text and other virtual and electronic environments

As it is illustrated in figure (46) Ryan describes and distinguishes between three categories of Ergodic, Interactive and Electronic, she gives examples of each and the potential combination of two categories or more from the selective and productive interactivities points of views as the following.



Figur 46 illustration of the categories Ergodic, Interactive and Electronic (Ryan, 2001, p.209)

- 1. Nonergodic, nonelectronic, noninteractive texts. Standard literary text, books.
- 2. Interactive, nonelectronic, nonergodic text.
 - Selective: The case of storytelling sessions for example the dialogue exchange between the parent and the child. The story does not have a specific structure and its shaping comes as a result of conversation.
 - Productive: the case of conversation which it is an open ended, freely course-switching exchange between two people.
- 3. Electronic, noninteractive, nonergodic text. An example is the texts broad cast on TV.
- 4. *Ergodic, nonelectronic, noninteractive text.* Architectural or art works that reflect the sun light in different patterns over different day times.
- 5. Electronic, interactive, nonergotic text.
 - Selective: For example library catalogue, the user sends queries and gets a whole static predictable text.
 - Productive: Electronic conversations in internet chat rooms.
- 6. *Ergotic, electronic, noninteractive text.* Reactive electronic poetry for example the Speaking Clock by John Cayley.
- 7. *Ergodic, nonelectronic, interactive text*. Multi linear literary print texts that allows the user a choice of reading sequence, an example is Hopscotch by Julio Cortázar which it is a novel that offer two

ways of reading, the first where it leads the user from chapter 1 to 56, and the second way is to visit numerically from chapter 1 to 56.

- 8. Electronic, ergodic, interactive text.
 - Selective: Electronic poetry, literary hypertext and surfing the Net.

Productive: Interaction which takes place in designed environment, computer games. Ryan claims that VR installations and computer games can represent a combination between selective and productive interactivities because the user's participation in shooting, jumping and riddle-solving moves require more skills and they are more actively involved than only selecting options from a limited menu.

9.2 Appendix (B)

Non-verbal communication category	Sources
Haptics reflects the use of touch in communication	(Burgoon & Ruffner 1978,
situation. Physical or bodily contacts like handshakes	Argyle 1975, Fiske 1982)
and patting.	
Physical appearance defines the attributes of image and	(Burgoon & Ruffner 1978,
presentation of self. Appearance contains the visual	Fiske 1982, Argyle 1975)
aspects of one's presentation.	
Kinesics includes all bodily movement except touching,	(Burgoon & Ruffner 1978,
commonly referred to as body language. E.g., head nods,	Argyle 1975, Fiske 1982,
postures, and gestures.	Allbeck & Badler 2001)
Facial expressions may be broken down into the sub-	(Fiske 1982, Argyle 1975,
codes of eyebrow position, eye and mouth shape and	Birdwhistell 1970)
nostril size. E.g., blushing, perspiration.	
Spatial behaviour consists of proximity, orientation,	(Argyle 1975, Burgoon &
territorial behaviour and movement (locomotion) in a	Ruffner 1978, Fiske 1982)
physical setting. Proxemics include actions relating to the	
use of personal space.	
Paralanguage is the non-verbal audio part of speech and	(Burgoon & Ruffner 1978,
it includes the use of the voice in communication. E.g.,	Fiske 1982, Argyle 1975)
vocalics, non-verbal aspects of speech, non-verbal	
vocalisations.	
Occulesics are movements in facial area and eyes, e.g.,	(Fiske 1982, Argyle 1975,
gaze, eye movement and eye contact, visual orientation.	Allbeck & Badler 2001)
Environmental details define the appearance of	(Burgoon & Ruffner 1978,
surroundings providing contextual cues. E.g., artefacts,	Argyle 1975)
manipulating the physical setting.	
Chronemics involves the use and perception of time	(Burgoon & Ruffner 1978)
(how people perceive, structure, and react to time).	
Olfactics reflect to the non-verbal communicative effect	(Jacob et al. 1993, Davide
of one's scents and odours.	et al. 2001, Masterson
	1996)

Table 5 the non-verbal communication categories (Manninen, 2004, 52)



Figure 47 non-verbal communication model (Manninen, 2004, p108)

9.3 Appendix (C)

The following present Crawford's description of the basic components of Erasmatron:

<u>Actors</u>: Crawford considers an actor as the most important narrative component, Erasmatron offers a wide variety of actors, and the attributes of the actors include name, gender, active/inactive (part of / not part of the story), conscious and location (the stage the actor occupies).

Some other personality attributes that are also supported by Erasmatron such as: *Timidity, Magnanimity, Gullibility, Pride, Integrity, Dominance, Loquacity, Greed, Sensuality and Volatility*. High Timidity value in a character pushes him to give up easily facing any challenge. A high Gullibility in a character makes him trust other characters fast. A high Volatility in a character can change his mood eagerly (Wolf & Perron, 2003, p265).

<u>Verbs</u>: It refers to the actions that an actor can carry out, some of the attributes of the Verb could be: Audience (the presence and absence of other actors), the time to prepare (the time needed to set up the action) and the time to execute (the time needed to carry out the action) (Wolf & Perron, 2003, p265).

<u>Stages</u>: It refers to the location in which the different actions are executed (Wolf and Perron, 2003, p265).

<u>Events</u>: It refers to the actor's executed action. Eevents include: Subject (the actor who perform the event), Verb (the performed action), Direct object (to whom the action is performed), Location (the stage of the executed event), Time (the time of the executed event), Causal event (the reaction to a previously executed event), Consequence event (the reaction to the latest executed event), knowledge (the knowledge of the actors), Fallacious (the truth and falsification of the executed events), Secret (the knowledge about the event meant to be kept conceal) (Wolf & Perron, 2003, p266).

Based on this approach Crawford developed and implemented a game called Balance Of Power 21st Century (Crawford, 2008). The characteristics of the game can be described as a text based with drop down menus. The basic idea behind is that the player takes the role of the president of the United States, the

player should take an action after the September eleventh attack; the game engine demands the player to make some decisions to protect the country from further attacks and the people who were behind the attack. However after playing the game, we believe that the game in general has the characteristics of strategy games such as the game (*Empire: Total War*), where the player is also able to make cooperation with other empires and it involves many different game elements that direct player's interest. While Erasmatron is text based and it lacks the basic game element such as 3D and audiovisual effects; hence it is not immersive and not interesting to play, moreover one can imagine Erasmatron as railroading and constraining the user to limited possible story paths. Nevertheless it is important to take the basic components of Erasmatron into consideration, namely the relationship between actors, verbs, stages and events.

9.4 Appendix (D)

9.4.1 The analysis of Aristotle's tragedy system by Boal:

According to Boal (2000) tragedy imitates human acts and not activities. He outlines that for Aristotle men's soul is composed of two parts, rational and irrational. Irrational soul tends to produce activities such as eating, walking or performing physical movements that are not significant enough than the act itself. Tragedy imitates solely man's actions that are determined by his rational soul. The rational soul can be divided into three categories; *faculties, passion, and habits*.

Faculty refers to what the man is able to do, despite the fact that he may not do it. A man might not love, but he is able to do so, he might not hate but he is able to hate, therefore *faculty* is pure potential and immanent to the rational soul.

Passion is a concrete fact and not possibility. The realized faculties in the soul can be called *passions*. Love is considered as faculty if it is a possibility (not expressed), and a *passion* if it is expressed. When the faculty is enacted, it becomes a concrete act, a *passion*.

Habit is the constant passion in the man. If it happens that a man exerts a passion in a given moment, it cannot be considered as a tragedy worthy action. The action or the passion must be constant in the men. The action by its constant repeated exertion becomes a *habit*. Hence we can conclude that tragedy imitates man's actions that are produced by the *habits* of the rational soul; he excludes the animal activities as well as the *faculties* and *passions*.

A question might be what is the purpose of a man? Each part of man has purposes (the hand grabs, the mouth eats, the leg walks and the brain thinks), what purpose a man has as a whole being? Some answers can be presented by Aristotle: the aim of man's action is the good, it is the concrete good diversified from all different arts and sciences that deals with particular ends. Therefore a single man's action has an end limited to it, but, the actions as a whole have their purpose as a supreme good of man, and the supreme good of man is happiness. Hence "tragedy imitates man's actions, those of his rational soul, directed to the attainment of his supreme end, happiness" (Boal, 2000, p12).

In order to define happiness, Boal (2000) refers to Aristotle's work, happiness can be divided into three types, and it can be derived from: **material pleasure**, **glory** and **virtue**.

- 1. Happiness from **material pleasure:** it can be from, riches, honors, sexual and gastronomic pleasures, etc. this level of happiness differ very little from the happiness that animals enjoy, therefore according to the Greek philosophers this type does not deserve to be studied in tragedy.
- 2. Happiness from **glory**: In this case the man acts according to his own virtue, but his happiness is made of others recognition of his actions, he needs the approval of others in order to be happy.
- 3. Happiness from **virtue**: it is considered the superior level of happiness, it is when a man acts virtuously without asking for consideration, his actions is based on virtuous manner disregarding the others recognition, it is called the highest level of happiness or the virtuous exercise of the rational soul.

Virtue refers to moderation of behavior in any given situation, meaning, virtue is distant from possible extremes, for example not to eat will harm a man's health as well as the glutton, both extremes are not virtuous behaviors, a virtuous behavior could be to eat in moderation. Both, too violent exercise and not to exercise will harm the body, hence, they are not virtuous behaviors, moderate physical activities are virtuous behaviors. The same would be applied to moral virtues, for example, Creon thinks only of the good of the state, while Antigone thinks only of the good of the family and wishes to bury her traitorous brother. Both behaviors are extremes, and would be considered as non virtuous manners. Virtue is not an average of behaviors, for instance a soldier's courage is closer to temerity than cowardice. Additionally virtue does not exist in us naturally; we have to learn it, *"The thing nature lack man's ability to acquire habits. The rock cannot fall upward nor can fire burn downward. But we can cultivate habits which will allow us to behave virtuously"* (Boal, 2000, p15).

Boal (2000) adds, according to Aristotle, nature provides us with faculties, and it is the man's power to change them to passions and habits. Who practices wisdom becomes wise, and who practices justice becomes just. Aristotle adds by stating that the formation of habits must begin in childhood, therefore a youth cannot practice politics, and he requires first to learn the virtuous habits from the elders or the legislators who instruct the virtuous habits.

Vice is extreme behavior, and the characteristic of virtue is neither excess nor deficiency. To determine whether if any given behavior is a vicious or virtuous, four conditions must be fulfilled: *willfulness, freedom, knowledge, and constancy*. A behavior of a man might not be considered as virtuous even though it is virtuous, or his behavior might not be considered as vicious even though in fact it is vicious, a man's action should meet four conditions in order to be considered as virtuous or vicious.

Willfulness: It is the opposite of accidental, it refers to a voluntarily action by a will of the person. If a man wishes to act, two results will appear from his action, either vice or virtue. If his action was unwillingly (involuntarily), then it can neither be considered as vice nor virtue.

Freedom: It excludes the exterior coercion. Virtue is completely free behavior without external pressure, for example if a person commits evil because someone else forces him to do so, we cannot in this case talk about vicious behavior.

Knowledge: It contradicts ignorance. *"The person who acts has before him an option whose terms he knows"* (Boal, 2000, p18). Ignorance practices are not considered as vice nor virtue.

Constancy: Vices and virtues are considered as habits and not passions; therefore it is necessary that these behaviors be constant. Chance or accidents are excluded. The heroes of the Greek tragedy act consistently in the same manner.

Thus those whom tragedy imitates are the virtuous men who, upon acting, show willfulness, freedom, knowledge, and consistency. These are the four conditions necessary for the exercise of virtue, which is man's way to happiness.

Both art and science have their own virtues, they have their own good, their own end. For example, the virtue of a horseman is to ride the horse well; the virtue of the artist is to produce his work perfectly. The virtue of the physician is to heal people who get sick. The virtue of the legislator is to make laws that bring happiness to the citizen.

Arts and sciences are interdependent and some are superior to others, he claims that amongst all the arts and sciences, the sovereign art and science is the politics, because its field of study has "the totality of the relationships of the totality of men. Therefore the greatest good--- the attainment of which would entail the greatest virtue --- is political good" (Boal, 2000, p21). Hence the political good is justice.

What is justice? For Aristotle, the characteristics of justice refer to equality, and injustice refers to inequality. Meaning, "*In any division, the people that are equal should receive equal parts and those by (any criterion) are unequal should receive unequal parts*" (Boal, 2000, p22). How we define the criteria of inequality? People want to be equal in the inferior sense, and unequal in the superior one. Aristotle himself was against the Talion law, in which prescribe: "an eye for an eye, and a tooth for a tooth". For Aristotle, people were not equal and therefore their eyes and teeth would not be equal. For example a master's eye was not equal in value for a slave's eye. A man's tooth was not equal to a women's tooth.

In order to determine the criteria of equality and inequality, philosophers decided to examine the existing inequalities amongst people empirically; therefore they accepted the already existing inequalities as "just". Hence, for Aristotle, to be a man is more, and women is less. A free man rank higher than a slave, so the order would be, a free man, then free women comes, a slave man, at last slave women.

The Athenian democracy was based on the value of a free man. Some other societies such as the *Oligarchies* were based on the supreme value of wealth, who owned more were considered more valuable than other people. We can conclude that justice is proportionality and not equality. The criteria of proportionality will be given by the political system, and that would depend on whether the system is a democracy, oligarchy or a dictatorship. The law of a country is systematized by a constitution; hence the constitution represents the expression of the political good, with other words, the maximum expression of justice. Therefore for Aristotle "happiness consists in obeying the laws" (Boal, 2000, p24).

From this point and finally Boal (2000) concludes his analysis by pointing out what tragedy is for Aristotle and reaching the following definition: "*Tragedy imitates the actions of man's rational soul, his passions turned into habits, in his search for happiness, which consists in virtuous behavior, remote from the extremes, whose supreme good is justice and whose maximum expression is the constitution*" (Boal, 2000, p24). The repressive function is a fundamental aspect of Aristotelian system of tragedy, the main reason according to Aristotle being that it provokes catharsis.

What is the ultimate goal of tragedy? A definition of catharsis from Aristotle's point of view, can be that, nature tends toward an end, man as a part of nature has certain ends from the point of view of: health, happiness, virtue and justice. When man fails to reach these objectives, the art of tragedy intervenes to correct it; *Aristotle* calls this correction of man's actions "catharsis". Catharsis is correction, purification. It represents the center, the essence and the purpose of the tragic system. According to Boal (2000) an appealing theory proposed by Bernays outlines that catharsis would be a medical metaphor, a purgation that heals the soul just as a medicine heals the body. Bernays based his argument on Aristotle's definition of tragedy that is "*imitation of human actions that excite pity or fear*" (Boal, 2000, p28) these emotions are in the heart of all men, and the act of exciting leads to a pleasant relaxation afterwards. This is also confirmed by Aristotle who states that "*pity is occasioned by underserved misfortune, and fear by that of one like ourselves*" (Boal, 2000, p28).

The affect of pity and fear are not in the tragic characters themselves, but in the spectators. The spectators are linked to the characters through these emotions. According to *Aristotle "something undeserved happens to a character that resembles ourselves"* (Boal, 2000, p30).

According t (Boal, 2000), Milton adds little to Aristotle's definition of tragedy and states that "Tragedy...said by Aristotle to be of power, by raising pity and fear, or terror, to purge the mind of those and such-like passion; that is to temper or reduce them to just measure with a kind of delight stirred up by reading or seeing those passions well imitated" (Boal, 2000, p30).

Boal (2000) reports that, according to Hippocrates; catharsis is the "removal of painful or disturbing element in the organism, purifying in this way what remains, free finally of the eliminated extraneous matter" (Boal, 2000, p31).

From this point of view Boal (2000) concludes that "when man fails in his actions----in his virtuous behavior as he searches for happiness through the maximum virtue, which is obedience to the laws---- the art of tragedy intervenes to correct that failure. How? Through purification, catharsis, through purgation of the extraneous, undesirable element which prevent the character from achieving his ends. This extraneous element is contrary to the law; it is a social fault, a political deficiency" (Boal, 2000, p32).

Ethos: Character's action can be presented by two aspects; Ethos and Dianoia. They represent the action developed by the character, both aspects are interdependent and cannot be separated, Ethos refers to the action itself, and Dianoia refers to the justification of that action. With other words Ethos would be the act itself, and Dianoia would be the thought that determine that act. Ethos is defined as the whole of the faculties, passions, and habits. All tendencies must be good in the Ethos of the tragic hero.

Except one: All passions and all habits of the character should be good with one exception. That is according to the constitutional criteria that that systematize the laws; which is in turn according to the political criteria, because the politics is the sovereign art. Therefore a single trait in the character must be bad "only one passion, one habit, will be against the law. This bad characteristic is called *hamartia*" (Boal, 2000, p34).

Since politics is the sovereign art, the systematized laws or the constitutional criteria is the supreme, one trait of the protagonist must be against the law or be bad, this bad criteria is called *hamartia*.

Hamartia: It refers to the tragic flaw; it causes the conflict, it is a single impurity which exists in the character. This single trait must be destroyed so the other traits of the character fit in a harmony with the called "desirable society".

Empathy: When the performance starts, a relationship between the protagonist and the spectator is established. Aristotle outlines that the character resembles us, therefore we live vicariously all his experiences. Although we don't act, we consider that we are acting on the stage. We love and hate with the character when he does so. Empathy with other words makes us feel what others are experiencing, therefore it does not take place only in the tragic characters; children for example get excited while watching the "Western" on TV. According to Aristotle's empathy is an emotional relationship of pity and fear between the character and the spectator. It can also involve some other emotions such as love, desire and tenderness. The empathic relationship happens due to the character's action (Ethos), this action stimulates the reason (Dianoia) in the spectator, Ethos arouses emotion and the Dianoia arouses reason. Finally we can say that "the fundamental empathic emotions of pity and fear are evoked on the basis of an ethos which reveals good traits (hence pity for the character's destruction) and one bad trait, hamartia (hence fear, because we also posses it)" (Boal, 2000, p35).

9.4.2 The functionality of Aristotle's coercive system of tragedy by Boal:

According to Boal (2000) when the spectacle or the show starts, the protagonist comes out; a sort of empathic relationship will be established between him and the spectator. The hero surprises the spectator by exposing a hamartia or a flaw in his behavior. The hamartia is stimulated in the spectator through empathy, and the hero is on his way to happiness. Now a sudden event happens and changes everything, a radical change that changes the hero's destiny. The character climbs so high to reach what is called a perpeteia, the hero is on the way to misfortune and the fear grows in the spectator because of the stimulated hamartia.

The stage of perpeteia is important; it stretches the path for the hero from happiness to misfortune, the longer/higher it is, the bigger impact of the fall is. At the point of perpeteia which the hero suffers, the spectator in turn suffers as well because of his empathy with him. But the spectator might also detach himself from the hero, to avoid that, the hero passes through the point of anagnorisis, at this point the hero accepts his errors and hopes to gain the spectator's empathy again.

Finally, the spectator would imagine the horrible consequences of the error committed by the hero. Boal (2000) states that, according to Aristotle, the tragedy must have a terrible end; a happy end is not permitted, something which is called a catastrophe. In catastrophe, the hero should not necessarily die, it might happen to the loved ones; to experience the death of the beloved ones is worse than to die. The ultimate goal of the three interdependent parts, namely; perpeteia, anagnorisis and catastrophe is to provoke catharsis in the spectator; their purpose is to produce purgation of the hamartia, with other words to correct what is wrong. These three events can be summerized in three stages:

Stage 1: This stage involves the stimulation of the hamartia, the hero goes through an ascending path to reach happiness, and the spectator is linked to him empathically. The reversal point (perpeteia) follows this step, the character moves from happiness towards misfortune, and that's what it called the fall of the hero.

Stage 2: The hero identifies his error, his hamartia, this step is called (anagnorisis). The hero gains the spectator's empathy.

Stage 3: This stage is called catastrophe, the hero suffers and pays the price of his error with either his own death or by the death of the beloved ones.

These three stages lead to a catharsis, the spectator through his empathy with the hero is exposed and terrified from a catastrophe, this will purify his error or hamartia. The cathartic function was the most important for Aristotle, for him it was a function that purifies the citizen, his theories form a harmonic whole that demonstrates correct manner of purging the audience of all tendencies that are capable of modifying the society.

According to Boal (2000) Aristotle has stated the following: "Amicus Plato, sed magis amicus veritas" it can be translated as "I am Plato's friend, but I am more of a friend of truth!" (Boal, 2000, p38). We can agree with Aristotle and use the same argument by saying we are Aristotles friends, but we are much better friends of truth. Boal (2000) contradicts Aristotle's claim that poetry, tragedy and theatre have nothing to do with politics. Reality and Aristotle's own poetics is not so, therefore Boal (2000) concludes by saying: "We have to be better friends of reality: all of man's activities---including, of course, all the arts, especially theatre---are political. And theatre is the most perfect artistic form of coercion" (Boal, 2000, p38).

Boal (2000) argues that the stories of "Western" movies are Aristotelian. In his analysis, he regards them from the perspective of the bad guy, from the point of view of the villain and not the hero. The story begins by presenting the villain, a bandit, a horse thief or a murderer. Just because of his tragic flaw or his vice, he becomes the most feared man in the neighborhood and the city. He does his best and all possible evil he can, we empathize vicariously with him and we do the same bad things, we kill, we steal horses, etc. Until our stimulated hamartia takes place, the stage of perpeteia where the hero takes the advantage of the first fight, he restores order, social ethos, morality, after he kills the bad guys. The following stage is the anagnorisis, in which the villain is allowed to die without any mercy; the people of the town are dancing and celebrating the death of the villain. Our sympathy is more and often with the bad guy than the good guy, *"The "Westerns," like children's games, serve the Aristotelian purpose of purging all the spectator's aggressive tendencies"* (Boal, 2000, p47). The main objective of Aristotle's powerful system is to eliminate all what is not commonly accepted, *"its essence does not change: it is designed to bridle the individual, to adjust him to what pre-exists"* (Boal, 2000, p47).

A good character that comes to a happy end inspires neither pity nor fear, the drama will be missing, the spectator will observe him acting his destiny. A completely bad character who ends in a catastrophe will not inspires pity which it is very important element for the mechanism of empathy. A good character that ends in catastrophe violates the sense of justice. A totally bad character that comes to a happy end would stimulate evil and it would be contrary to the Greek tragedy. Now, three possibilities are left:

- 4. "character with a flaw, that ending in catastrophe;
- 5. character with virtue, coming to a happy end;
- 6. *character with a virtue, but insufficient, ending in catastrophe*" (Boal, 2000, p48).

9.5 Appendix (E)

	а	b	С	d	е	f
1	Neighbor A Knocks the door, scared	Neighbor A	Neighbors A and C, (one shot the other escape)	Signs of mine field The user succeeds	Guy H Shooting from a tower	Peaceful place
2	Radio news(audio)	Gunman A stopping	1 Cars (driver talk) gunman shoot	Signs of mine field The user fails	Neighbor A (help)	Guy D, Neighbor A is being tortured
3	Telephone conversation with friend (audio)	Friend A John, he calls.	2 Cars (explosion)	Guy C spy	Guy C spy and Gunman C	Guy D Torturing(shoot) the user
4	Telephone conversation (girl)	Audio a girl is screaming (Help)	Miriam ,calls	Guy D, Girl A	Girl A Screaming (Help)	Girl A, Guy D Girl is tortured
5	Telephone conversation (brother)	Guy A (telling about his brother)	Brother, he calls	Bridge explodes	Brother groaning	Guy D, Brother is tortured
6	Explosion Lights off	town (sign)	Village being bombed	Guy F, Kidnapper (Call)	Boom explosion, building collapses	Dall town explodes
7	TV News (audio /visual)	Helicopter (text/sign)	Girl C, they took her husband	Guy G (Hanged)	Guy L and Guy M	Guy L and Guy M are executed

Table 6 shows the events on the IDM

9.6 Appendix (F)

Questionnaire:

Please use the following scale in order to describe how much do you agree with the statements of the questionnaire:

The scales are: (Strongly disagree "0", disagree "1", neither agree nor disagree "2", agree "3", strongly agree "4"

1- While progressing in the experience, I could find answers to some of the questions in my mind.					
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree	
1	2	3	4	5	
< >	< >	< >	< >	< >	

2- I was interested in the overall story.					
Strongly disagree Disagree Neither agree nor disagree agree Strongly ag					
1	2	3	4	5	
< >	< >	< >	< >	< >	

3- I was interested in exploring the environment.					
Strongly disagree Disagree Neither agree nor disagree agree Strongly ag					
1	2	3	4	5	
< >	< >	< >	< >	< >	

4- The more the story was unfolding the more I forgot my surroundings.					
Strongly disagreeDisagreeNeither agree nor disagreeagreeStrongly agree					
1	2	3	4	5	
< >	< >	< >	< >	< >	

5- I had to concentrate deeply, in order to understand what was going on.				
Strongly disagree Disagree Neither agree nor disagree agree Strongly				
1	2	3	4	5
< >	< >	< >	< >	< >

6- It was not hard for me to escape from the town.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

7- I am motivated to meet more characters					
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree	
1	2	3	4	5	
< >	< >	< >	< >	< >	

8- I want to keep experiencing the world					
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree	
1	2	3	4	5	
< >	< >	< >	< >	< >	

9- I want to get away from the experience					
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree	
1	2	3	4	5	
< >	< >	< >	< >	< >	

10- I think it is boring					
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree	
1	2	3	4	5	
< >	< >	< >	< >	< >	

11- I want to try again				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

12- I felt that it was like a nightmare and I was really in the war zone.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5

< >	< >	< >	< >	< >

13- I did not have enough time to decide where to go, I felt frustrated.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

14- I had to put lots of efforts in order to reach my goal.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

15- I was curious to get information from other characters, in order to decide where to go.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

16- When I was discovering the reasons for the events, I was deciding something new.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

17- Each time after talking to the characters, I was deciding something new.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

18- I felt as I was exactly in the other character's situation.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

19- I wished that I had a gun to stop the bad guys from threatening the other characters.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

20- I wished that I could stop the air bombs.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

21- I wished that I could help the other characters when they asked for help.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

22- I was sad when the other characters were sad or in trouble.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

23- When I was worried, the other characters were also worried.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

24- My actions depended on the other characters' actions.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

25- The other characters actions were dependent on my actions.					
Strongly disagree	Disagree	Neither agree nor	agree	Strongly agree	

		disagree		
1	2	3	4	5
< >	< >	< >	< >	< >

26- The other characters paid close attention to me when I was approaching them.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

27- I paid close attention to the other characters when they talked to me.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

28- What the other characters did affected what I did.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

29- I influenced the mood of the other characters.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

30- My mood was influenced by the other characters.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

31- I wanted to revenge from the gunmen because they were torturing the other characters				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

32- At the end of the experience I felt bad because I couldn't save some of the characters.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

33- At the end of the experience I felt guilty because I couldn't help the others much.				
Strongly disagree	Disagree	Neither agree nor disagree	agree	Strongly agree
1	2	3	4	5
< >	< >	< >	< >	< >

Age:	Male:	Female:			
How often do you play computer games per week? Put (X) in the options bellow.					
Never:	1-5 times a week:	5-10 times a week: 10-20 times a v			
What is your favorite type of computer games? Mention at least one if you remember?					

(THANKS ALOT FOR YOUR PARTICIPATION;)

9.7 Appendix (G)

Descriptive Statistics	N	Mean	Std.
1-While progressing in the experience, I could find answers to some of the	30	3,50	1,042
questions in my mind.			
2-1 was interested in the overall story.	30	4,17	,791
3-1 was interested in exploring the environment.	30	4,40	,563
4- The more the story was unfolding the more I forgot my surroundings.	30	3,60	1,037
5-I had to concentrate deeply, in order to understand what was going on.	30	3,03	1,066
6-It was not hard for me to escape from the town.	30	3,43	1,006
7-1 am motivated to meet more characters	30	3,77	1,135
8-I want to keep experiencing the world	30	4,13	,629
9-1 want to get away from the experience	30	2,33	1,269
10-I think it is boring	30	2,23	1,040
11-I want to try again	30	3,80	,714
12-I felt that it was like a nightmare and I was really in the war zone.	30	3,47	1,167
13-I did not have enough time to decide where to go, I felt frustrated.	30	2,47	1,042
14-I had to put lots of efforts in order to reach my goal.	30	2,63	,964
15-I was curious to get information from other characters, in order to	30	3,97	1,217
decide where to go.			
16-When I was discovering the reasons for the events, I was deciding	30	3,10	1,062
something new.			
17-Each time after talking to the characters, I was deciding something new.	30	3,00	1,259
18-I felt as I was exactly in the other character's situation.	30	3,37	1,033
19-I wished that I had a gun to stop the bad guys from threatening the	30	3,73	1,048
other characters.			
20-1 wished that I could stop the air bombs.	30	3,57	1,006
21-1 wished that I could help the other characters when they asked for help	30	4,37	,718
22-I was sad when the other characters were sad or in trouble.		3,60	1,037
23-When I was worried, the other characters were also worried.		2,97	,809
24-My actions depended on the other characters' actions.		3,13	1,074
25-The other characters actions were dependent on my actions.	30	2,77	,971
26-The other characters paid close attention to me when I was	30	3,63	1,066
approaching them.			
27-1 paid close attention to the other characters when they talked to me.	30	3,87	1,042
28-What the other characters did affected what I did.	30	3,63	,890
29-1 influenced the mood of the other characters.	30	2,47	,973
30- My mood was influenced by the other characters.		3,43	1,104
31-I wanted to revenge from the gunmen because they were torturing the		3,63	,964
other characters			
32-At the end of the experience I felt bad because I couldn't save some of	30	3,90	1,062
the characters.			
33- At the end of the experience I feit guilty because I couldn't help the	30	3,30	1,236
otners much.			

Table (3) presents the questions, number of 30 test subjects, average values, and the standard deviations.
9.8 Appendix (H)

Purpose: To explore Engagement in an Interactive Drama

Consent Form

MOTIVATION

Were you interested in trying this?

- Why? OVERALL EXPERIENCE / SITUATION

What did you just experience?

- Why? Talk a bit about the characters?

Talk a bit about the locations?

Talk a bit about the situation(s)?

What can it be used for?

- Why? Did you get something out of it?

- Why? Have you tried something like this before?

- Where? What would you compare it with?

MAPPING

A – Did you want to learn more about any of the characters?

- Which one?
 - Why?
- C Did you want to see how it ended?
 - Why?
- E Did you want to see more of the locations?
 - What did you want to see?
 - Why?
- S What do you want to tell your friends about this?
 - Why?
 - Do you want to experience this with someone?
 - Why?
- I What did you think during the experience?
 - Why? -
 - -How did you use your mental skills?

M – Did you want to change something?

- Why?
- I How were the controls?
 - -Why?
- E Did you encounter any feelings?
 - Which ones?
 - Why? -
- P Did you have any reactions?
 - Physically?
 - Why do you think?
 - A- How realistic was it (P)?
 - o Why?
 - Did you feel you were there physically, surrounded by the locations (I) ? _ o Why?
 - Could you imagine being there (P)?
 - o Why?
 - What did you notice in your surroundings (F)? _
 - o Why?
 - How long time do you think you used (F)?
 - o Why?

-

- What where you concentrating on (F)?
 - o Why?
- How was it to "play" the character (P)?
 - o Why?

KEEP PLAYING

Was there a certain point, where you really wanted to continue?

- Where?
- Why?

COME BACK TO PLAY

Do you want to try again?

- Why? EXTRA:

Anything you want to be different?

What can you use it for?

BACKGROUND

What kinds of games do you play?

- Why? What kinds of films do you watch?

- Why?
 - Have you ever visited such places in your fantasies or imaginations?
 - Would you liked to help the other characters?