Playful Interaction

A Master Thesis by Jimmy Marcus Larsen

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Synopsis:

The goal of this thesis has been to introduce the concept of playful interaction as an alternative or extension to traditional efficiency focused interaction design.

Playful interaction requires effort from the user and rewards her with enjoyable skill improvement. Furthermore, playful interactions are strong sources of emotion.

The concept is further explained as consisting of at least three categories - playful selection, playful activation and playful guidance - each playful in their own way and for their own reason. Playful selection will enrich a user interface with game-like mechanics with either learning before time or simple enjoyment as the reason. Playful activation replaces trivial interactions with small challenges to increase user attention and interest. Playful guidance provides integrated, just-in-time learning and help and hints as satisfying rewards or achievements.

To demonstrate the concept it is added to a game prototype called Project Sprout, which is then evaluated with and without playful interaction. The evaluation shows that parts of the playful interaction concept does indeed work, but fails to provide enough data to cover all the categories of playful interaction.

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Preface

The work described in this thesis was carried out in the two semesters between September 2007 and May 2008. The first semester was spent investigating user experience as a research area (UX) as well as creating a game prototype called Project Sprout. Most of this work is documented in my last report. The second semester was spent structuring and describing the concept of *playful interaction* and with adding this concept to Project Sprout. Most of this work is described in this thesis.

The process of creating a thesis has been remarkably uncomplicated. I attribute this to good planning, and to the fact that I have been thinking loosely about the concept of playful interaction for several years now. Demanding effort from the user or player, avoiding interaction efficiency and in general just doing interaction design differently have interested me for a long time. Most of my previous university projects involved novel concepts - like cooperative adventure gaming, context sensitive speech recognition for computer games and spatial brain swapping in reinforcement learning - and I believe this thesis as well, has a sort of novel quality making it an interesting contribution to the area of interaction design.

I would like to bring out special thanks to a few people for helping me out and providing feedback during the thesis period: My advisor Jan for insightful feedback and help, Rune who is writing the story for Project Sprout, Ulrik who made some of the graphics, Cego who paid Ulrik to do so, Lena and Gitte who drew inspirational concept artwork and finally the 16 evaluators who played Project Sprout and provided me with important feedback.

Reading guide

This thesis project has five chapters. The first chapter is the introduction - you will be reading this soon. Chapter II contains the concept of playful interaction, described in an accessible way through case studies of video games applying similar ideas. The third chapter holds a description of a video game I have designed and applied playful interaction to, and also the thoughts and arguments for doing so. In chapter IV the game is evaluated, and in the fifth and final chapter I discuss my findings and conclude my research question.

Literature is referenced like this: [Author(s), Year, Page]. This includes both books and articles from various sources. Web-sources are referenced with [Subject, Domain] if they are without an explicit author and date. Everything can be looked up in the literature list in the back of the report.

Have fun!

I

Introduction

Getting from A to B in the fastest possible way has long been the main goal of human-computer interaction design. Whether you are creating a spreadsheet application, a web-site or a computer game, your primary concern has most likely been the efficiency and effectiveness of the interaction; you do not want to waste the user's time, and you want her wish to be fulfilled with as little trouble as possible. By pure instinct, the user should be performing trivial interactions to solve the task at hand.

Grounded in the emerging research field of User eXperience (UX) design, this thesis strives to diverge from the above trail of thought. To do this, the first thing which must be devised, is a working alternative. One cannot just abandon a working design principle, and have nothing to replace it. The focus must not only shift away from something, but toward something as well. This something is *playful interaction*.

In the preparation project for this thesis, I performed a thorough investigation of current UX research and found several novel ways to describe human-computer interaction and the experience gained through it. One I found particularly interesting is from [Forlizzi & Battarbee, 2004]. They describe three types of user-product interactions:

- *Fluent interactions* are automatic and well-learned interactions requiring no conscious effort.
- *Cognitive interactions* gain the user skills or knowledge, or negatively; frustration or confusion.
- *Expressive interactions* are efforts to reshape the relationship between product and user.

These three points more than hints at an interaction model which goes beyond mere efficiency - away from fluent interaction. The move is toward interactions which requires effort, but gives something in return. This could be everything from skills and knowledge to an altered product. These interactions are sources of emotion; positive or negative. They have the potential to make the user feel stimulated, challenged, curious and proud, but also frustrated, confused and even sad. This focus on overall user experience and emotion is the essence of UX, as I see it.

In game design theory similar ideas exist. Challenge and effort is central. It said that we are enjoyed by learning new things - either by seeing a whole new pattern, or by adding data to better grasp an existing pattern [Koster, 2005]. We seek to form meaning from chaos, and when we do, we feel pleasure or have fun. In good games we learn or train mental skills like logic and memory, dexterous skills like rhythm and hand coordination and social skills like communication and conflict resolution. Games sport unique, fun and pleasurable approaches to teaching or training these skills, and that as well is central to my view on

human-computer interaction. It should be fun and pleasurable experience to interact with a computer, and this pleasure comes from the way in which the computer grows the patterns in our mind.

With traditional human-computer interaction design, fun is something we want to avoid, or at least not something we seek explicitly - any interaction should build on well known and easy-to-use interaction mechanics; patterns we have grasped long ago, and consequently boring patterns. That, I think, is rather sad; learning, arguably the most pleasurable concept known to mankind, is deliberately avoided in the name of efficiency. The standard ISO definition of usability does list the term satisfaction together with effectiveness and efficiency, but I believe that in some regards effectiveness and efficiency can be a hindrance to satisfaction, which is why I see the need for an interaction design philosophy which does not focus on these terms at all.

I could have gone on from here using the interaction terms from [Forlizzi & Battarbee, 2004] and mix them up with the interaction ideas found in game design theory, but that would not be fair to either of the theories. Instead I use my own term; *playful interaction*, to describe the kind of human-computer interaction scheme that I believe should replace the traditional efficiency focused interaction paradigm.

In the next chapter I will explore the concept or philosophy of playful interaction more thoroughly, e.g. which techniques are used to teach and how the emotional outcome is increased, but this is the basic definition:

- *Playful interactions* require effort and reward it with growth of the brain patterns (cognitive structures, mental models, schemas etc.) associated with the applied dexterous, mental and social skills.
- *Playful interactions* are sources of emotion potentially making the user feel, for example, stimulated, challenged, curious, proud, frustrated, confused or sad.

If one wish to relate this definition to [Forlizzi & Battarbee, 2004], then playful interaction is a concept enclosing both cognitive and expressive interaction, but with ideas from game design added in; effort, challenge and the idea that skill training is a central activity in having fun or in feeling pleasurable emotions.

My thesis is divided in two parts. In the first I will explore related theory and existing examples of playful interaction, and in the second part I will design and evaluate a game in two forms; one with focus on fluent interaction and one with focus on playful interaction. This can be formulated as the following research question:

> *What are the advantages and disadvantages of playful interaction when consistently applied throughout a video game?*

I believe the concept of playful interaction is widely applicable, but I will concentrate on its use in video games. The research question will be answered first through case studies of existing examples, and then through analysis of empirical data gained from two evaluations of the same game in two forms; one with playful interaction and one without.

Research Method

There is no such thing as the right way to do research, but there is a set of accepted practices one must adopt part of. In choosing a research method, I find it important to look at the area that the research belongs to. My thesis can be classified as UX research, and therefore one should remember what UX is about:

> *"UX is about technology that fulfils more than just instrumental needs in a way that acknowledges its use as a subjective, situated, complex and dynamic encounter."*
>
> [Hassenzahl & Tractinsky, 2006]

In knowing this, a fitting research method should acknowledge the subjective and situated nature of user experience. From my point of view, this asks for interpretive and qualitative methods.

Taking a high view of my method and applying the terms from [Cornford & Smithson, 2006], I am building theory through an *interpretive case study* and verifying theory through *a scientific experiment*. The finer details on each part are described below.

Research in Playful Interaction

In defining the concept or theory of playful interaction, my research method has resembled that of grounded theory; here *one does not begin with a theory … one begins with an area of study and what is relevant to that area is allowed to emerge* [Strauss & Corbin, 1990, p23]. From the start I have wanted my thesis to contribute theory to the field of interaction design (and video game design), and grounded theory is an acknowledged way to do so. In essence, grounded theory is an interpretive research technique, which relies, to some extent, on the creativity of the researcher. It is believed that simple descriptions of data and existing theory will not build new theory, but creative use and interpretation will.

The theory which will act as ground for introducing the concept of playful interaction is mostly found in UX research. I have studied this during the previous semester, and will rely on my findings from that project. I will supplement with modern learning theory, and case studies of video games applying ideas similar to mine. Because of these case studies, the concept of playful interaction will be described in a practical fashion.

In short, I am interpreting select cases through relevant theory.

Evaluation of Playful Interaction

The second part of my method is in essence an exploratory study or experiment. To be able to evaluate the applicability of playful interaction to video games, I have initially developed a video game which relies more on fluent interaction than on playful interaction. The game's interaction design has then been reshaped to form another game which in most cases is similar, but with several changes that can be classified as playful interaction. These two games are evaluated against each other.

The apparent problem with this approach is that there is reason to believe that the latter would be superior to the first game, simply because it was developed last. To ensure that

this was not necessarily the case, I did not add anything extra to the game, besides changing the interaction design. The game rules, the primary goals, the visuals, the story and the setting did not change between the two games. Expressed in scientific experiment jargon, the variable I am changing between experiments is the interaction design.

The method I have chosen to evaluate by is largely qualitative, but with some support from quantitative data.

Qualitative Data

The qualitative part of the evaluation method is somewhat similar to the *Forum* approach to usability evaluation which is described in [Bruun et al., 2006]. The paper compares three techniques of remote asynchronous user-based usability testing to a traditional usability laboratory test, and finds that none provides an equivalent rate of problem detection, but there are other factors making the asynchronous remote techniques attractive. Most notably, remote techniques are cheap and easy to execute. This is indeed one of my reasons for choosing the technique, but not the most important one. In the *forum* approach a group of people is asked to evaluate a system, and report their findings to an online discussion forum. It is this discussion aspect that I have valued highest in my selection of evaluation technique; I am not searching for usability problems, but for descriptions of the experience gained from playing the game.

Traditionally, when comparing two products for usability, the most usable one is the one with the fewest usability problems. This is not necessarily the product giving the best user experience though. Therefore, as noted by [Stage, 2006], I need to identify some other metric than lack of usability problems. In my previous project I constructed a model of user experience (Figure 1) through a review of existing UX research. In this model a product has an intended product character [Hassenzahl, 2004], which is the designer decided feature set of the product including content, presentation, functionality and interaction. I suggest this is supplemented by a description of the intended emotional effects of the product[1]; the set of emotions that the product is supposed to cause in the user. I add this because the main outcome of interacting with a product is positive or negative emotion, and because I believe the designer should consider which emotions he is intending the user to experience. From these two aspects, I get the user experience metric I have evaluated by:

> *A good user experience occurs when there is a low difference between the designer's intended emotional effect and the user's experienced emotional effect.*

Discussion and collaboration spawns reflection, and my hope has been that this aspect of the *forum* technique enables the users to describe their own emotions and actual user experience in such detail that it can be compared to the product character description made by the designer of the product. Their descriptions are then compared to the intended product character, and through this the product providing the best user experience is revealed. This should in turn bring in knowledge about how playful interaction works in practice. Using the metric above, this comparison is a matter of crosschecking the list of intended emotional effects with the postings on the forum.

[1] I initially named this set of possible emotions the *emotional affordance* of the product, but this brings unwanted associations to the regular HCI use of the word affordance.

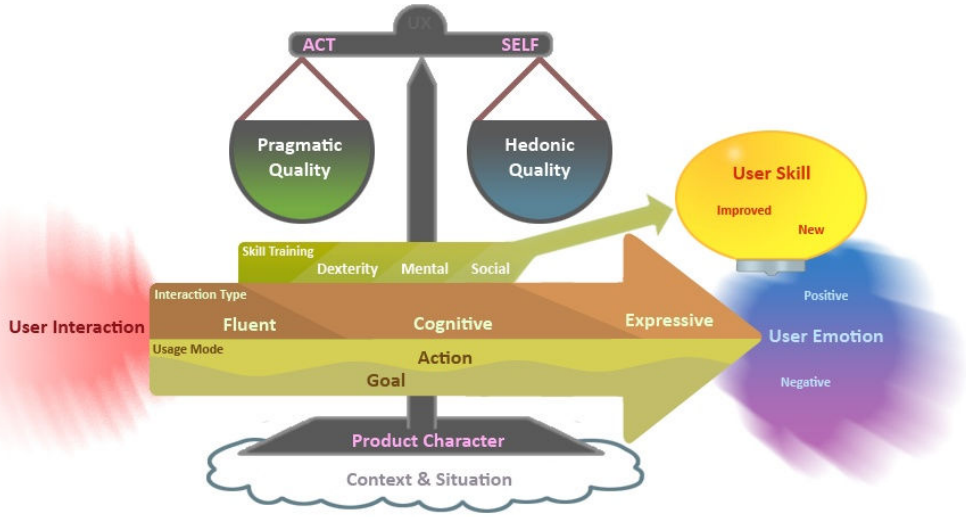

Figure 1: My model of user experience

Quantitative Data

The quantitative data is gained from automatic logging of the game as it is played - this technique is also called *instrumentation* [Wixon et al., 2008]. The collected data is used to verify the experiences described by the players. For example, some might have a hard time completing a level and this can be verified in the logs. Or some might claim that they never found out how to use a certain control mechanism, and the log file will show this as well.

There is no recognized instrumentation standard, but a framework describing techniques used for extracting usability information from user interface events is found in an often cited survey by Hilbert & Redmiles [Hilbert & Redmiles, 2000]. Even though I am not only extracting usability information, this framework can be used to describe and classify the techniques I am using. Techniques can be put in one of four categories:

- *Synchronization and searching* techniques are used to match rich data like video and observation with event data.
- *Transformation* techniques are used to select relevant event data, create higher level abstractions of the data or to recode the data into formats which can be used for manual or automated analysis.
- *Analysis* techniques are used for performing counts, creating statistics or to detect, compare or characterize interesting event data sequences.
- *Visualization* techniques make results of analysis and transformation visually pleasing.

The instrumentation method is then assembled from techniques in one or more of these categories. In most methods all categories are needed, but often some are performed manually and is as such not considered part of the instrumentation method. Hilbert & Redmiles found that only a few methods applied techniques for transformation, and argues that transformation techniques should be considered a critical part of extracting meaningful information from user interface events. I agree with this, and find it hard to think of a useful

instrumentation method which does not abstract the event data - just counting clicks and measuring time is too sparse an information source in my opinion. Abstracted data should supplement it.

This is a description and classification of some of the techniques I am using:

- *Transformation*
  - I am creating abstractions of event data showing when a player has used part of the game controls successfully or unsuccessfully. I.e. the player has made the main character jump to a higher position, or the player has made the main character jump without reaching a new position. These abstractions are mostly focused on player skill training and mastery.
- Analysis
  - I am performing counts of how often the player is doing various actions like jumping, entering dialog and leaving dialog and I am logging the time used to complete missions, the time spend exploring the game world, the average idle time and various other factors. I am also detecting interesting sequences like continuous jumping and other actions being repeated in a manner which is not helping the player reach his goal.

Synchronizing with the qualitative data from the forum evaluation and *visualizing* the results is performed manually. For each play session, the player submits her instrumentation data to me and describes her experience of the session in the forum. This ensures that instrumentation data is synchronized with forum data on a high level.

Chapter Summary

This chapter has introduced the concept of playful interaction and my research goals. The research performed in this thesis consists of an interpretive case study and an evaluation. In these two methods the techniques of grounded theory, forum evaluation and instrumentation is applied. Below is a visual illustration of my method and the process it has been used in:

Figure 2: Research method illustration

Using the *forum* technique to evaluate user experience (and supplementing it with instrumentation), is to my knowledge a new approach to UX evaluation. Therefore a more concise, step-by-step description of the evaluation is presented in a later part of this report.

II

The Concept of Playful Interaction

The definition of playful interaction presented in the introduction chapter of this thesis still stands. In this chapter I will explain how it came to be, which theories inspired it and I will analyze examples of clever use of playful interaction.

The research method used is, as mentioned earlier, grounded theory; I identified three areas of playful interaction (playful selection, playful activation and playful guidance) and to each area I attached at least two examples or cases (video games), that were analyzed to give the area a grounded and practical explanation. In doing so, I assumed the rather pragmatic point of view, that not only can texts be analyzed through grounded theory, but games as well. I hope this approach gives the reader a more clear understanding of what I see as playful interaction, and also of the efficiency focused paradigm of fluent interaction that I seek to replace or enrich through playful interaction.

This is the definition of playful interaction again:

- *Playful interactions* require effort and reward it with growth of the brain patterns (cognitive structures, mental models, schemas etc.) associated with the applied dexterous, mental and social skills.
- *Playful interactions* are sources of emotion potentially making the user feel, for example, stimulated, challenged, curious, proud, frustrated, happy, confused or sad.

From this definition, some might say that playful interaction is the essence of video games. In fact, it would seem that playful interaction is closely related to the popular term *gameplay*; the overall experience of playing a game. In games, gameplay *is* the user experience, and every element of the game affect the gameplay in some way - including the interaction design. Arguably, the most important element of a game is the *game mechanics*; the set of rules governing a game. My claim is that *good* gameplay comes from playful interaction with the game mechanics - without playful interaction there is no good gameplay and hence no enjoyment.

I will note though, that some players might get more enjoyment from an exciting story or beautiful graphics, than they will get from playful interaction with the game mechanics. This is perfectly fine - user experience is subjective. One could also argue that story and dialog can implement playful interaction as well; riddles, poetry and the lack of overt telling in general are examples of this. The same goes for graphics and audio; uniqueness in style requires more interpretive effort from the player, but repays it with stronger emotions. Story, graphics and audio are not unique to games though, which is why I will consider game mechanics more important.

Below I have redrawn and simplified my earlier model of user experience (Figure 1) such that it illustrates the above thoughts. Designing with this new model (Figure 3) in mind, involves specifying the game mechanics, the skills they demand and train and the emotions they should inspire - including when and how they should do this. Story, graphics and audio are part of the game too, so these can of course affect the experience as well.

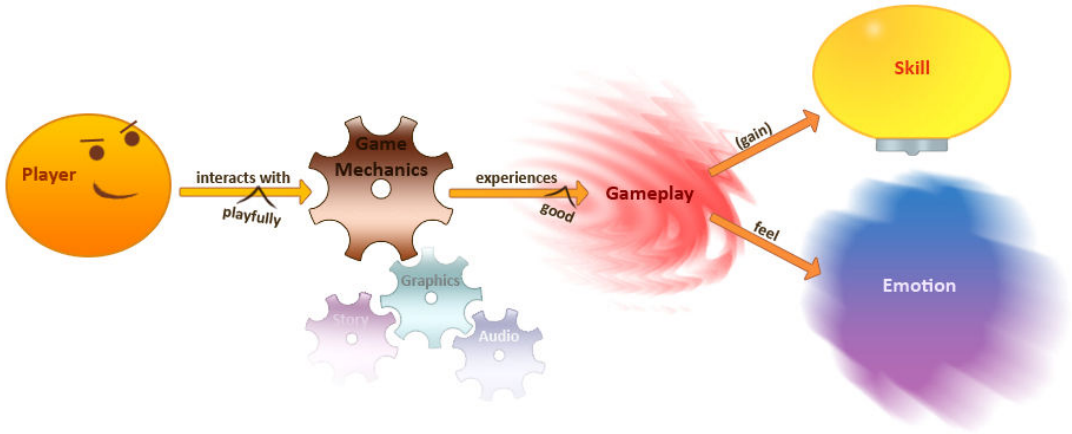

Figure 3: Model of the user experience in a game. Playful interaction with the game mechanics brings good gameplay experiences, possibly gains the player skills and makes her feel strong emotions.

The designer's challenge is to design the game mechanics such that they encourage or even forces playful interaction - such that they require effort and reward the effort with growth of the associated brain patterns or skills, and such that they inspires strong emotions. Games are generally good at this, and often do so through fair challenges that the player can learn to overcome - with excitement and triumph as the regular emotional results.

Even in games though, the interaction going on can in many cases not be considered playful. I have identified three areas, which I will focus on. First, there are game object activations which are trivial to perform - simple button activation is not playful. Second, there is player assistance, guidance or helping which is nothing more than a movie or a written manual. Third are the selection menus or screens present both before the game is started and in many games also in-game. The paradigm of efficiency shines through everywhere making selection menus something the player just wants to skip through as quickly as possible. No skills are trained and no emotion is spurred. They are not playful and not enjoyable.

There *are* examples of selection menus featuring playful interaction though, and in the first section of this chapter I will take a look at some of them, and through theory explain why they are better than menus without playful interaction. After doing this, I look at playful activation and playful guidance before completing the chapter with a look at related concepts.

Playful Selection

Selection menus could potentially have several very practical purposes besides just selecting something. They could teach the player the initial skills needed to play the game. They could introduce the story of the game. They could simply entertain the player. All this while the player pursues whatever the main goal of interacting with the menu is. Menus could even be a concentrated version of the actual game - same mechanics, but different goals.

The Jumping Plumber

Super Mario Sunshine (Nintendo, 2002), starring everybody's favorite plumber, contains an example of playful selection. The game is of the 3D platform game genre, and traditional platform game mechanics like running, jumping and landing describes the core of the game. The game does have a few unique game mechanics as well - most notably, Mario is equipped with an advanced water gun (Figure 4).

Figure 4: Mario using his water gun.

Figure 5: The file selection menu in Super Mario Sunshine.

Before each play session the player must load prior progress from one of three save files. This is done in a selection menu containing three boxes illustrating the files (Figure 5). Mario is standing beneath the boxes and can be moved left and right by the player using the control stick. Running underneath a box, jumping and hitting it will open the file it contains.

I will now give two theoretically grounded arguments, to why this kind of selection menu is good.

My first argument is rooted in learning theory, starting with Jerome Bruner's constructivist theory [Bruner, Psycology.org] - which is closely related to Piaget's theory of instruction. Bruner states that learners should be able to discover basic principles by themselves. The file selection menu of Super Mario Sunshine does exactly this; it lets the player discover part of the game's jump and run mechanics - the most central mechanics in the game - just before they are required.

The menu also fulfills Bruner's spiral organization principle, which states that learning should be structured such that the learner can build upon existing brain patterns. When the player reaches the game for the first time, he will already know how Mario moves, because he has tried it in limited form during file selection - the most critical dexterous skills related to moving Mario around are trained in a safe domain resembling the actual game, but still separated from it.

As with everything else, some amount of intuitive or tacit knowledge is needed to begin using the file selection menu. If the player has played a 2D platform game before, she will

instantly know how to operate the menu, because the camera is locked at a fixed angle, making the controls act as in a 2D platform game. To ensure that also the inexperienced player can gain the required brain patterns, with some effort, the menu has two constraints compared to the real game. First, the area is small; Mario can only run shortly before reaching the screen edge and the camera do not pan away from the boxes, unless Mario runs all the way to the right where another selection menu is found. This ensures that the player will only have to be concerned with the mechanics of moving Mario, and not those related to 3D camera control and the water gun. Again, Bruner supports this spiral structure of learning core mechanics first. Second, jumping will almost always result in hitting a box. This ensures that the player gets instant feedback, no matter how she makes Mario jump.

My second argument follows from a book I will cite frequently throughout this chapter: James Paul Gee's *What Video Games Have to Teach Us About Learning and Literacy* [Gee, 2003]. The author argues that good learning principles can be deducted from good video game design; good games are good teachers as well[2]. Through case analysis he reaches a list of 36 learning principles, which are used in video games, and argues that they could be used anywhere. What I have attempted is somewhat similar, in that I claim playful interaction result in new brain patterns - learning in other words - and that playful interaction could be applied to parts of the game which is usually not playful - like selection menus.

One of Gee's learning principles is the *Amplification of Input Principle*, which states that for a little input, learners get a lot of output [Gee, 2003, p208]. The jumping constraint mentioned before fulfills this principle; just one button press will release a sequence of events - anytime the player makes Mario jump, he will not only jump, but also hit a box and open a file. This immediately shows the inexperienced player that something good can come from jumping, and spurs the first frail emotion of success with the game mechanics.

Gee also have principles like the *Practice Principle*, the *Bottom-up Basic Skills Principle* and the *Subset Principle* which are analogue to the learning theories of Piaget and Bruner. Learning should be based on practice in a limited sub-domain where the basic skills are taught first. As described earlier, the Super Mario Sunshine selection menu is a way to apply all these principles.

To sum up, the file selection menu in Super Mario Sunshine allows the player train some of the dexterous skills needed to play the game. This is good because learning is an enjoyable emotion, and because it makes the first play session more accessible. Compared to a regular selection menu, it takes longer time to select a file, but I believe that is an acceptable loss when it spurs the emotion of success with the game mechanics, in at least the inexperienced player. In short, the menu supports good learning as it is described by both Bruner and Gee.

I have seen similar menus in a few other games as well, but they will not be analyzed here. Examples include Winnie The Pooh's Rumbly Tumbly Adventure (Ubisoft, 2005) and SolaRola (Progressive Media, 2007) - both use the game mechanics from the actual game in their file selection menus. SSX Blur (EA, 2007) does a similar thing, but a traditional menu is available through the click of a button.

[2] *What* they teach is a complicated matter though. I will assume they are teaching about themselves, but in reality sometimes they might be teaching about history, math, cooking, love, torture or other subjects as well.

Throw Your Buttons

Meteos (Q Entertainment, 2005) is a match-3 puzzle game for Nintendo DS. It features several different game modes - all selectable from a rather traditional point and click menu with text buttons (Figure 6). The buttons are quite unusual though - they are of course clickable, but also throwable. Throwing is performed by dragging and dropping - the speed of the drag decides the power of the throw when the button is dropped. Interestingly, the throwing is not that similar to the drag and drop mechanic used in the actual game, and as such it is nearly useless as skill training, assuming the player knows how to operate a touchscreen. One could argue again, that this kind of menu would allow an inexperienced player to train drag and drop motions, but the inexperienced player might not even discover that the button can be thrown. The throwing is simply an elegant extra feature which does not hinder the effectiveness and efficiency of the menu.

Figure 6: The Meteos selection menu.

Instead of training the skills needed in the game, this kind of interaction affects other brain patterns and spurs emotions like wonder, curiosity and initially also a slight surprise when the throwing is discovered. Several seconds can easily be spent throwing the buttons around and watching the result as they collide and reposition. It can be argued that this puts the player in a playful, positive mood making her first interaction with the game an encouraging one.

As the menu is not really teaching about the game or anything else, the learning principles from Gee do not explain much. Neither do Bruner and Piaget. Instead, arguments to why this kind of menu is good can be found in UX theory. In the article Let's Make Things Engaging [Overbeeke et al., 2004] from the book Funology: From Usability to Enjoyment, the authors present guidelines to enjoyable interaction design. One of their guidelines says that an interactive product should respond to affective actions; that is, actions showing the user's current emotional state. For example, one might be slamming the keyboard or shaking the phone, and the product should react to this.

In Meteos, dragging and dropping buttons which looks only clickable, can be seen as an affective action from a bored or indecisive player. Responding to this with throwing, gives the player something else to think about and hopefully changes the player's mood to a more positive one.

There is another interesting aspect of the selection menu in Meteos; it has a disordered and seemingly unintentional layout. This might just be a hint to the throwing functionality, but it also gives the menu a more artistic and less mechanic feel. In UX theory - e.g. [Stegemann & Fiore, 2006] and [Tractinsky, 2004] - art and aesthetics is considered a crucial factor in a good user experience. Tractinsky outlines the importance of aesthetics through Roman

writer, architect and engineer Vitruvius, who found that architecture must satisfy three basic requirements; *firmitas* (strength), *utilitas* (utility) and *venustas* (beauty). Tractinsky relates this to the design of computer products, stating that *firmitas* has been solved by the underlying logic and *utilitas* by usability, while *venustas* is a largely neglected area in the design of computer products. Even though it is a lesser problem than in office software, games too focus on a functional audio-visual presentation more than an artistic appearance. The selection menu in Meteos is a compromise of functional and artistic design. The artistic, unordered layout provides the *venustas*, while the *utilitas* is sacrificed by neither the layout nor the playful button throwing.

Tractinsky further states that when everything else is equal, and much is today, aesthetics becomes the differentiating factor. This is true for games as well, where many games follow strict genre conventions. Meteos is a match-3 puzzle game, with easily recognizable game mechanics, but the aesthetics sets it apart. Tractinsky also argues that the immediate affective response to a product, the aesthetic impression of a product, is highly correlated to the long term attractiveness evaluation of the same product and that aesthetics, according to Maslow, satisfy human needs for pleasure. Again, these are good arguments to why a menu like the one in Meteos is better than a more traditional menu.

In summary, Meteos spurs emotion through a non-functional extra activity - button throwing. This works because of the interesting aesthetics, and because it can be seen as a response to player emotion.

I have not seen many examples of the kind of playful selection present in the Meteos menu. Most menus seem like either uninspired last minute add-ons or over-designed and extremely usable textbook examples, which just gets the job done and nothing else. One small example though, is in North & South (Infogrames, 1989). In the selection menu on the title screen (Figure 7) the player can click the butt of a photographer to make him giggle - not at all useful, but still quite fun.

Figure 7: Click the butt.

Summary

Teaching the game mechanics, responding to affective actions and offering interesting aesthetics - e.g. a disordered layout - all spur emotion in an intense way. Games often do this in-game, but only few do so in their selection menus. I have described examples of playful selection menus, starting with the skill training in Super Mario Sunshine and ending with the affective response in Meteos, and presented theoretic arguments to why these menus are better than traditional menus.

Playful Activation

In-game there is often a lot of trivial interaction filling the game with boring moments; push this button to open the door or wander down this empty corridor to reach your goal. Many in-game interactions dealing with the activation of a game object are trivial and not playful, but that could easily be fixed. Opening a door might involve turning the key in a certain way or playing a puzzle game placed on the electronic lock, and given the means to do so the player can even drive the story progression herself. Luckily, there are examples of games which substitute the small trivial interactions with more interesting ones in form of mini-games or more advanced control maneuvers. In this section I will explore a few of the examples, and again present theoretic arguments to why trivial in-game interactions should be replaced with playful interaction in the form of mini-games or control challenges.

Mini-games - Bauer style

24: The Game (SCEE, 2006) is an action game based on the TV series 24, featuring the same cast and fitting into the same storyline. In 24: The Game sequences which would ordinarily take place in a cut-scene, without any player intervention, has changed into mini-games, and trivial actions like opening a lock has been turned into mini-games as well. In the TV series unlocking an electronic lock would feature some hacking device which automatically cracked the lock. In the game the unlocking is not automated. The player has to play little word matching games or maze games to unlock something (Figure 9).

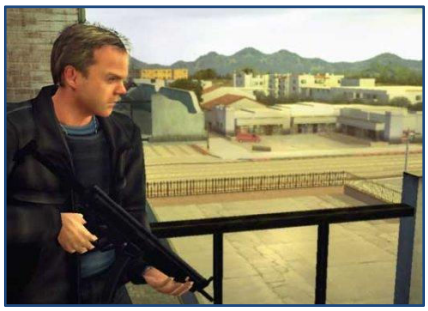

Figure 8: Jack Bauer seeking cover.

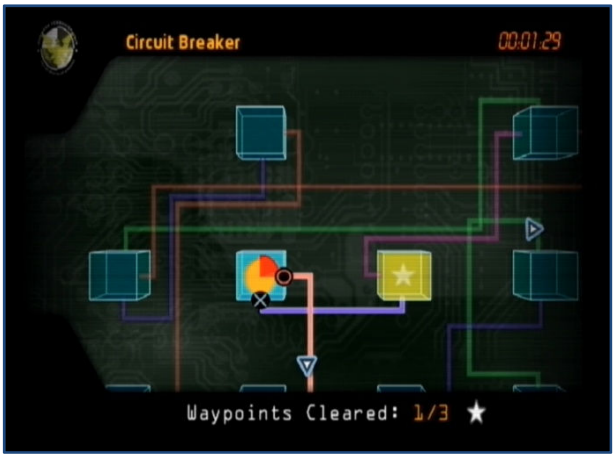

Figure 9: The Circuit Breaker mini-game is used for lock picking and bomb defusal.

The learning theory arguments from earlier do not work in the same way here as they did for Super Mario Sunshine. The lock picking mini-game do not train the skills used in the main part of the game, which is about shooting bad guys and seeking cover (Figure 8). But as the lock picking is in essence a game in itself, it features the same learning principles - they are just teaching a different skill set. Therefore, the game can be said to consist of several smaller sub-domains, almost like there are different subjects in a school course curricula. This makes the game interesting even to people who does not like shooting, as they have the mini-games to look forward to and excel in.

In game design literature very little has been written about mini-games, which indicates that this is an overlooked area. In most games unlocking a door often only requires the player to find the key or hacking device and pressing a single button to use it. This is a fluent or trivial interaction, which is seemingly effective and easy to perform. Finding the key might provide an interesting exploration quest, but actually using it is an anticlimactic experience. I see

two ways to fix this. Either the key activation button is automated, which effectively removes the trivial interaction. The challenge in this approach is to provide feedback to the player, telling her that something has been activated automatically. The other approach is a mini-game. Here the challenge resembles that of creating any other game, but is supplemented with demands for a theme which makes sense to the rest of the game.

24: The Game also features an interrogation mini-game in which the player asks questions while matching them with the suspect's mental state. This is a good example of how the player can drive the story through a well-integrated mini-game, as each question advances the story (if the suspect answers it at least). In other games an interrogation scene is likely to be a simple cut-scene. Similarly there are frequency scanning games and network traversal games serving the same purpose; letting the player drive the story by removing cut-scenes and replacing trivial interactions with small mini-games.

In summary, removing the in-game trivial interactions, often present when a game object is to be activated, can be done through well integrated mini-games. Mini-games can also be used to remove cut-scenes, as it is seen with the interrogation game in 24: The Game, allowing the player to drive story progression.

Playful activation in lock picking is also seen in Oblivion (Bethesda, 2006) and Splinter Cell (Ubisoft, 2003). I have not seen other examples of cut-scenes replaced with mini-games.

Control challenges

In console role-playing games (RPGs) featuring turn-based battles, the norm is to keep the challenge at a strategic level; deciding which attack to use when, is most often the primary challenge in a battle. Unfortunately the player will go through hundreds of battles, some against similar opponents, and hence begin mastering the strategic elements and in turn find that the battles become trivial. Some games remedy this by ensuring that the monsters always have a strength matching the strength of the player, but other games have found a more playful solution. One of these is Shadow Hearts (Sacnoth, 2001) and its sequels.

Shadow Hearts is in many cases a traditional console RPG, with its linear storyline and turn-based battles. When the player fights a monster, attacks are selected from a traditional selection menu (Figure 10), but at the moment they are selected a so-called Judgment Ring appears. This is a colored circle with a rotating needle that the player must stop at a specific position (Figure 11). The precision the player does this with decides the strength of the attack, resulting in battles which have a lasting dexterous challenge besides the strategic challenge of selecting the correct attacks. There is a lot of additional finesse to the system which I will not delve into here.

Figure 10: While selecting an attack in an ordinary battle selection menu, the player is informed how the following Judgment Ring will work.

Figure 11: A battle from Shadow Hearts: From the New World. The needle is spinning on the Judgment Ring. This ring has only one small red area which must be hit.

The argument I can give for applying this challenge is that it demands attention - and learning obviously works better while one is paying attention. Of course, this assumes that the attention is kept also when the Judgment Ring is not shown, as otherwise the only thing which would be enhanced is the skills in using the Judgment Ring - the added dexterous challenge. I think it is fair to assume that attention is kept for a little while at least, and as such the argument holds. Also, if the player is paying attention, there should be a notably smaller risk of her missing the information or impressions that keeps her interested in the game.

In summary, these small dexterous challenges can be used to keep the player from losing interest in the game, because they demand attention - the player will perform badly if she does not pay attention. If strategic battles did not become trivial with time, this would not be necessary of course - but most often they do, and then this kind of system can add a new layer of depth to the game mechanics.

Dexterous challenges in RPG battles are found in Super Mario RPG: Legend of the Seven Stars (Square, 1996) and its sequels. The genre defining Final Fantasy-games do not have this concept applied rigorously, but there are glimpses of it in some of the games. An example is Final Fantasy VI (Square, 1994) in which one of the player characters has an attack requires the player to pull of fighting game-like button combinations to make the attack succeed. This could be something like performing a full circular motion with the directional buttons.

Summary

Through this section I have studied different approaches to removing fluent or trivial interactions in in-game activation of game objects. 24: The Game was my first case study, and it showed both how picking a lock can be turned into a fun mini-game and how the story can be told through a mini-game instead of a cut-scene. The next case was Shadow Hearts showing how the activation of battle commands can be replaced with playful interactions in the form of small dexterous challenges.

Playful Guidance

Games are in many cases complex systems taking place in imaginary worlds, and as such the player cannot be expected to have any sort of intuitive or tacit knowledge about how to interact with them. This is where the designer needs to step in and provide the needed assistance. Most often this is done through some kind of overt telling; listen to this voice telling you explicitly what to do or read this manual. This works and games are generally really good at guiding and teaching the player. Usability researchers have huge knowledge in this area as well, with attributes like learnability and memorability [Nielsen, 1993, p26] being of crucial importance to player guidance and helping.

I believe there are other ways to guide a player though. Guidance can for examples be fully integrated with the rest of the game, essentially making it transparent to the player and help can be a reward for carrying out a smaller challenge. In this section I explore a few examples where guidance is done in a playful kind of way.

Monkey see, monkey do

Super Metroid (Nintendo, 1992) is an exploration game with platform game mechanics starring female alien hunter Samus Aran who is fighting for galactic peace. During her travels she picks up several objects which grant her new abilities, forcing the player to learn new skills as the game progress.

Figure 13: Samus Aran and her spaceship.

The designers have chosen not to tell the player explicitly how to use the abilities that Samus acquire, as it is most often seen, but instead the use of them is hinted at with other means. The best example of this is when Samus needs to use the ability to jump from a wall (called wall-jump). Stuck in a deep shaft, the only way to get up is to jump from wall to wall inside the shaft. The problem is, that the player does not know how to wall-jump. Conveniently, a small monkey-like creature (called an etecoon in Metroid-terminology) is entertaining itself by wall-jumping up the shaft several times. If the player watches the creature and sees the connection to her own problem, then it will not take long to figure out how to wall-jump. It is unlikely the problem will be solved through experimentation, as the wall-jumping technique requires very precise timing of button presses. The most likely way to progress is to observe the monkey and do what it does, until the wall-jump skill is learned.

Figure 12: Notice the creature on the right wall.

This is an elegant way to teach the skills needed to progress in the game, and it matches with several of Gee's learning principles. One of them is the *Just-in-Time Principle*, which states that the learner is provided the needed information exactly where it can be best understood and used in practice [Gee, 2003, p138]. Had the player been told how to wall-jump at a situation where it was not needed, she would be likely to forget about it before reaching the shaft. In usability research, principles like providing the user with information exactly when and where it is needed has existed for a long time, and it is of course the same basic idea here.

Another matching learning principle is the *Discovery Principle*, which states that overt telling is kept to a minimum allowing the player to make discoveries [Gee, 2003, p138]. In Super Metroid no one tells the player to observe the creature, but eventually she will make the discovery herself, and gain enjoyment from both the discovery and later from actually learning and mastering the wall-jump skill.

To sum up, Super Metroid facilitates the learning of difficult skills by providing a rich environment able to teach the player, if the player observes it. There is no overt telling, and therefore the player has to figure out what to do without being told explicitly. Discovery is an enjoyable emotion, and Super Metroid provides plenty of room for it. Further, Super Metroid presents the information just-in-time, giving the player good reason to learn it.

I have not seen this exact approach to teaching in any other games. Plenty of games provide just-in-time information and teaches by encouraging the player to train skills at specific times, but presenting the skills by showing how to use them is quite novel.

The Hint Cat

So far all the cases I have studied have been games. This one is not, though it is still found in the world of video games. The screen interface for the Nintendo Wii game console is build around the concept of channels; one of them is the Photo Channel, which is an application used for viewing pictures from a memory card. Inside the Photo Channel a little cat is running around in the top part of the screen (Figure 14). It is hard to catch with the cursor, but if you do the reward is a random hint about how to use the application (Figure 15).

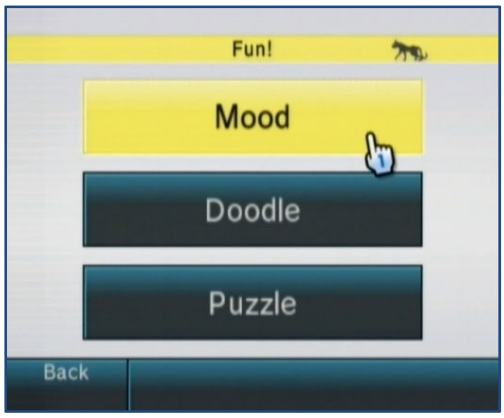

Figure 14: Photo Channel menu and hint cat.

This is a rather unusual way to present hints. Often an application offers random hints at startup, but as we all know these are mostly just annoyances - random hints rarely feel important, so they are turned off quickly. In the Photo Channel getting hints becomes a game of tag, and as such the random hint becomes a reward instead of an annoyance. The process of collecting hints is enjoyable, and the user also gains skills in using the pointing device faster and more accurately.

To explain why making help a challenge to get is a good thing, I will reference UX research. Forlizzi & Battarbee describes the concept of cognitive interaction as interactions which grant the user skills or knowledge [Forlizzi & Battarbee, 2004]. This is part of my definition of playful interaction as well, because gaining skills through (mental, dexterous or social)

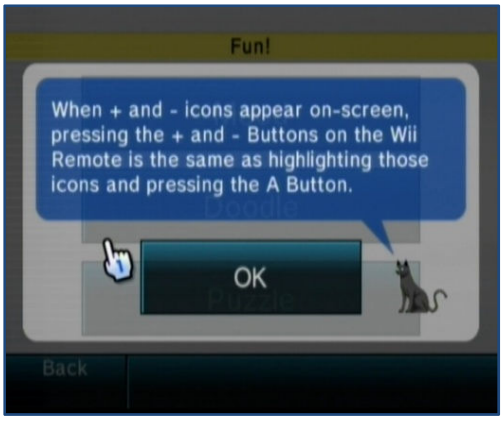

Figure 15: The hint cat has been caught.

challenges is intrinsically rewarding. Challenge is also mentioned as a way to enjoyment in many of Marc Hassenzahl's UX writings - e.g. [Hassenzahl & Tractinsky, 2006], [Hassenzahl et al., 2000] and [Hassenzahl et al., 2001].

One of the most interesting theories about challenge and why it is enjoyable is the popular *flow* theory by Mihály Csíkszentmihályi. The concept was originally introduced as a way to explain happiness, but has since then been used to explain many related emotions and experiences, like fun and creativity. Flow describes the state of mind a person experience when entering absolute control of a task, while the challenges linked to the task exactly matches her skills. Csíkszentmihályi lists eight preconditions to flow [Csíkszentmihályi, 1990], where at least some of them has to be satisfied before flow can occur. One of them asks for balance between skill level and challenge, and another asks for a sense of personal control over the situation or activity. This is important to game design as well, and therefore the theory is often cited in game design literature. What I find interesting to the subject of this section, playful guidance, is that challenge can lead to flow - which of course is a positive emotion. This has the obvious benefit that being in a positive mood makes it easier to receive guidance and learn new skills.

It is important to note though, that the challenge provided by the hint cat is quite easy to overcome - few people will catch the cat on their first try, but soon thereafter they will do so with ease. It is more of a fun easy challenge, than a true lasting challenge (as the Judgment Ring in Shadow Hearts is). Further, the kind of help the user is rewarded with is essentially unimportant to understanding the basic features of the application. These are explained through regular user interface design techniques, like mouse-over animation and a logic layout. The rewards for catching the cat merely include for example hotkey information.

Another source of enjoyment coming from the hint cat is of course the initial discovery of its playful nature, and after that, when the cat is caught, the realization about what it is good for. This is similar to the discovery-of-new-knowledge-enjoyment mentioned earlier.

A regular desktop application containing playful interaction is very interesting, and perhaps games are where they should seek inspiration next. Imagine being a level 42 Spreadsheet Wizard or a level 27 Word Warrior - in games there are lots of ways to encourage the user to explore and use the application. Perhaps the dreaded paperclip in older versions of Microsoft Word could be revived with an ability to fight - to get help you would have to beat the paperclip…

I have not seen this kind of hint system in any games, but something similar exists in SSX Blur (EA, 2007). Here a central hub area provides access to all the levels, and exploration of the hub area is rewarded with hints about how to better play the game. Exploration is even a challenge, because the hub is like a tree structure that you can only traverse in one direction. Hence you have to remember your way through the hub if you want to find new

hints. There are control challenges to new players as well, because, as mentioned earlier, the hub area requires skill in using some of the same game mechanics as the actual game.

Summary

Through this section I have explored different and novel ways to guide the player. I have looked at the integrated guidance system in Super Metroid, where friendly creatures show the player how to use her skills by playing the game with her. There is no overt telling - the player has to discover the skills herself without being explicitly told how. I then looked at the hint system in the Wii Photo Channel, which requires the player to catch a cat before a hint is provided. The argument for this kind of system is that challenge is enjoyable.

Related Concepts

In this section I will shortly discuss additional approaches to interaction design, which could be classified as playful if used correctly.

Tangible interfaces

Input devices connecting the physical and the digital have lots of playful potential. The most often used name for these, are tangible interfaces. There are many approaches the connection can be made, but computer vision and motion sensing is already used in video games today.

Motion sensing input devices like the Wii Remote is a way to add less trivial interaction, but motion sensing in itself is not playful - one has to be careful not to require trivial or unrelated motions as well (like random shaking). Many Wii games have unfortunately fallen into this trap, allowing the player to perform actions by shaking the Wii Remote without there being any obvious relationship between the action and a shaking motion. To make motion sensing a playful interaction, it must be first satisfy regular interaction design principles like meaningful mapping between action and input. Then it must be used to enrich the interaction, by for example providing dexterous skills to master.

Computer vision can be used to connect both dead objects and real people to a virtual world. The Playstation 3-game Eye of Judgment (SCEJ, 2007) uses a camera to read barcode-like symbols from special playing cards. Each card correspond to a creature that the player can control, and by placing cards on a table below the camera the creatures are used to capture squares on a virtual game board. Again, this is not necessarily playful but it might indirectly strengthen the emotional outcome of for instance social games, because the connection between physical and virtual is made very obvious.

Audio-visual art

I mentioned this in the start of the chapter as well. Art requires a stronger interpretive effort to get, but the emotional outcome is stronger as well. Also, experiencing art gains you skills at interpreting art - just like playing games train your skills at the game mechanics of that game (and similar games). Gaining skills is enjoyable and a strong emotional outcome is better than a weak one - hence art is better than everyday pop (from lack of a better word).

There are several examples of video games featuring art as their main visual aesthetic. One is ICO (SCEJ, 2001) which has a very unique washed-out way of capturing light, making it look almost like a live impressionist painting - or at least something with the same attention

to lighting. Another obviously artistic game is Rez (Sega, 2001) which attempts to link both graphics and audio closely to player actions, resulting in a game which shapes itself around the actions of the player.

Poetry and riddles

Finally text or voice can be playful as well, which I also mentioned in the chapter introduction. Overt telling requires no effort from the player, while poetry, riddles and other creative use of language requires interpretive skills.

A good example of this is insult swordfighting in the Secret of Monkey Island-series, where the duelists' trade insults instead of sword slashes. In the first game a pirate might say *"There are no clever moves that can help you now"* - to beat this, the player must respond "*Yes there are. You just never learned them*" from a short list of different options where only one is good. In the third game, insult swordfighting is expanded with rhyming insults. A pirate might say *"You're the ugliest creature I've ever seen in my life"* - to beat this, the player should respond *"I'm shocked that you never gazed at your wife"*. This is a clear example of playful interaction, as it requires effort from the player, rewards it with insult swordfighting skills and gives a strong emotional outcome in the humor it holds.

Chapter Summary

Through this chapter I have explored different ways to apply playful interaction where it is not usually applied. I began with exploring the "effort and emotion"-definition of playful interaction, by relating it to user experience research and video game design. The result was a model of user experience in games (Figure 16), illustrating how the player interacts with and experiences a game:

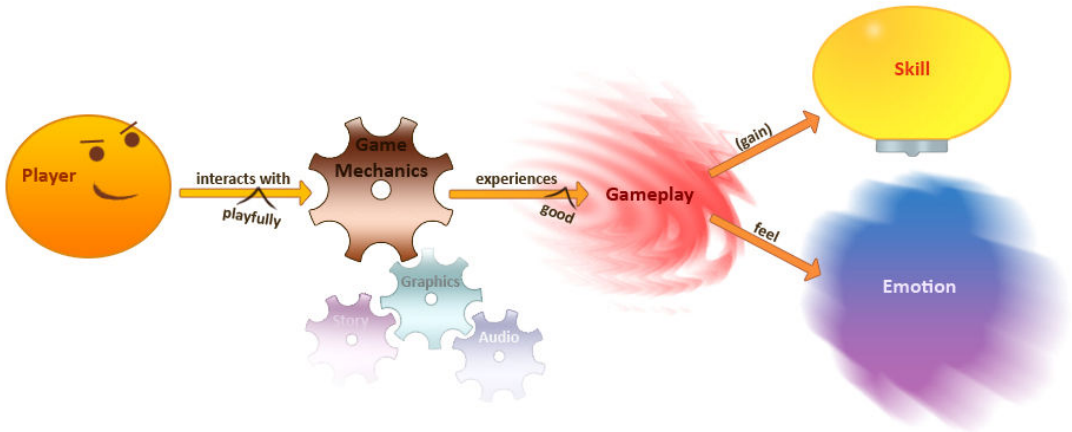

Figure 16: Model of the user experience in a game. Playful interaction with the game mechanics brings good gameplay experiences, possibly gains the player skills and makes her feel strong emotions.

Designing for a good user experience, or for good gameplay, involves designing the game mechanics and the interaction with them. To do this, it is necessary to consider which skills are required, trained and gained and which emotions should be felt by the player. With playful interaction, the outcome is higher - skills are learned more efficiently and emotions are stronger.

I then identified three distinct categories of playful interaction, and described them through relevant theory and matching examples. For each category, this gave me two concepts and

knowledge of the advantages associated with them. The grounded theory matrix is shown below:

Categories	Concepts	Advantages	Examples
Playful selection	1. Adding the game's game mechanics to its selection menus. 2. Putting non-functional extra activities into selection menus.	1. Trains player's skill in using the game's game mechanics. 2. Inspires curiosity and prevents boredom.	1. Super Mario Sunshine file selection menu. 2. Meteos game mode selection menu.
Playful activation	1. Replacing game object activations with mini-games build on either the game's existing game mechanics or new ones. 2. Adding small dexterous input challenges to game object activation.	1. Removes trivial interactions at a low level and enriches the game with new game mechanics or new uses of existing mechanics. 2. Keeps the player attention high.	1. Lock-picking and interrogation in 24: The Game. 2. Battle input in Shadow Hearts.
Playful guidance	1. Integrated guidance using show but don't tell principles. 2. Guidance as a reward for overcoming a challenge.	1. Provides help when and where it is needed and lets the player herself figure it out. 2. Instruction received when in a positive mood.	1. The wall-jump creatures seen in Super Metroid. 2. The Wii Photo Channel Hint Cat.

This table summarizes the meat of the chapter. I hope it has given the reader some idea about what playful interaction is, how it can be designed for and what the advantages are. It is of course, this concept I have attempted to design for and implement in the game I will describe in the following chapter.

III

Project Sprout: Playful Interaction in Practice

The examples from the previous chapter provides evidence that the concept of playful interaction can be applied successfully to parts of a game where it is not usually done. To verify this, I have developed a game in two different variations; one with traditional fluent, effective interaction and one with playful interaction. In this chapter I will describe the game, the experience and emotions I want it to deliver, how playful interaction was added and which design challenges I faced when trying to do so.

Several people are involved in the creation of Project Sprout. I am the lead developer, responsible for concept, game design and programming, while a scenario writer does the bigger part of the story and mission design and a graphics artist is doing graphics. To complete the game fully I hope to get more people involved, but for the prototype(s) I will describe below, this have not been necessary. A full list of credits is written in the preface of this report.

Overview

As I have two versions of the game, I will be describing both. They are very similar though, so until I state otherwise my description applies to both of them.

The game was given the working title *Project Sprout*, referring to the fundamental idea of the game; getting seeds to sprout. The goal is to solve problems by growing plants in the right places. Planting a seed is done through a puzzle game, where minerals must be removed to give the soil a fertile mineral composition, such that the seed will grow.

The game can be described as constantly looping through these game mechanics:

1. Find a problem to solve.
2. Figure out which plant will solve the problem.
3. Find the seed if it is not found yet.
4. Figure out where to grow the plant.
5. Solve puzzle game to make the seed grow.

To make the game mechanics more interesting, a story provides context and motivation. The story is told through an adventure game, where the player moves the player character around the game world to meet people and see places. This adventure game is where the player finds the problems to solve, the seeds to grow and the places to grow them. A short summary of the story has been written by the scenario writer:

> *Time seems to be standing still at an isolated island far away, from which all the young people leave when they get the chance. But when the young teacher, Ms. Lili, arrives on the island, the entire*

society is stirred up by her different approach and thinking. Above anyone Lili gets through to the lone kid Vita, who has an extraordinary connection to the nature. Vita can apparently communicate with both animals and plants. By doing so, and under the instruction and guidance from Lili, Vita begins to explore the life and nature of the island. They soon realize that things aren't what they appear to be, and together they try to uncover the deep, dark secret of the island, that can explain all the strange things that seems to be going on.

Vita is the player character. To enable both male and female players to identify with Vita, he appears androgynous - from the player's point of view Vita could be both male and female. In the following I will refer to Vita as a boy, because that is how I see him when I play.

The theme of the story is life and aging. The game attempts to show a metaphor for this in the sprouting seeds and withered plants. Initially Vita will mostly meet old people, but as seeds are planted and the island gains color from the plants, more and more kids will come outside and play. It is like the island is being revived through the plants being grown.

I will not describe the detailed design, or the process it was conceived through, in this thesis, but instead focus on what is interesting to the interaction design. The first thing to look at is the screens or states that must be designed. After that I will describe the interaction design in each of them in detail, before looking at how the game inspires emotion and which emotions it should be and finally I will look at the scenario which has been designed for the prototype evaluation described in the next chapter.

Game States

This is a limited list of the screens, menus or states that the game can be in. I have cut away a few minor states.

- *Main menu*
  - This is the title screen where the player selects a file to load.
- *Adventuring*
  - In this state of the game, the player will explore the game world by controlling the player character (Vita). The player can listen to the inhabitants of the game world, open menus for selecting seed and digger, open a mission list screen and of course initiate the digging game.
- *Digger selection menu*
  - This is where the player selects which digger animal to control in the digging game.
- *Seed selection menu*
  - In this menu the player will select which seed to grow. Before a seed can be grown it must be fused from a seed core and a seed shell.
- *Digging*
  - In this state of the game, the player will attempt to solve a digging puzzle by controlling a digger-animal in a mess of different

minerals. The digger can of course be ordered to dig, and also to use special moves that will remove or replace minerals in certain ways. The digger can be moved left or right and it can jump.

- *Mission list screen*
  - On this screen the player can review the received missions, see which of them has been solved and which are still available.

Designing the game was mostly a matter of designing these states. The adventure and digging parts are clearly the most complex ones. They are what I regard as the main part of the game, and as such they hold all the important game mechanics. The adventuring state assembles the other states into a meaningful whole, while the digging state constitutes the main challenge in the game. The digging is where the player will most frequently feel regular game-like emotions such as triumph and excitement.

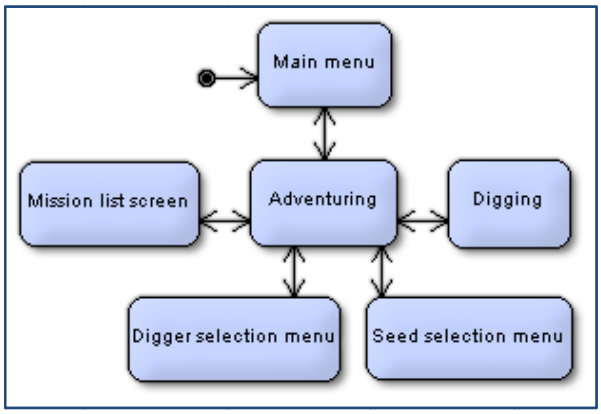

Figure 17: A state diagram shows that the adventuring state is central.

Interaction Design

As I have developed two versions of the game, there are two versions of all the game states, but most have many similarities - the only thing which is different is their interaction design philosophy. Below I will describe each state in two columns; fluent interaction on the left and playful interaction on the right. Before doing so, a small introduction to the vocabulary and context is needed.

The game is being designed for the Nintendo DS (Figure 18). It is a handheld gaming device, featuring two screens - one of them is a touch screen, a microphone and 12 buttons. Of those inputs, Project Sprout uses only the touch screen with a stylus for input. Touch screen input can be approached in different ways; I have decided to rely on two usages, namely pointing and tapping. The difference is the amount of time that screen is being touched. If the screen is being pointed at, the player is touching it for longer than a few milliseconds. If the screen is being tapped the player has touched the screen very shortly. For the pc prototype the touch screen is simulated with a mouse. Tapping is done by pressing and releasing the left mouse button and pointing is done by keeping it pressed.

Figure 18: Nintendo DS

The decision to use the touch screen only, is based on the ergonomics of the hardware. When using the touch screen it is awkward to use the buttons as well. Also, I believe that using the touch screen allows a wider group of players to enjoy that game - anyone can point and tap, while using 12 buttons correctly is a bit harder. Other options would have been to rely on gesture input on the touch screen or speech input using the microphone, but both are harder to implement and also harder to imagine a good design for in Project Sprout.

With pointing, tapping and the Nintendo DS added to the vocabulary I will begin describing the interaction design of the different game states, beginning with the central adventuring and digging states, as they will influence the design of the menus, when designing those with playful interaction in mind.

Adventuring

To move Vita around the island, the player points at a place in the environment using the touch screen. Tapping a person (a non-player character or NPC) makes Vita move to the person where he begins listening. The dialog is displayed in a textbox, and it is advanced by tapping the textbox. This is a conventional way to display dialog in an adventure game. If the player points outside the textbox, Vita will walk away from the NPC and end the dialog. This is not conventional, but it was added to allow the player to skip dialog without having to press a button. In addition to showing the dialog text, the dialog box also displays the speaker's name and mood.

From the adventuring state the player can enter other game states. This is done by tapping Vita to activate a selection menu. The menu options appear as icons in a circle around Vita, and tapping one of the icons activates the corresponding game state. I have named this the bubble menu.

Fluent Interaction

The icons of the bubble menu appear quickly and it is easy get a quick overview of the options, provided that the player can understand the symbols (Figure 19).

Playful Interaction

In this version of the game, the icons slowly rotate around Vita. This makes them slightly harder to tap. The idea is to provide a small negligible challenge and to give an illusion of more options, because rotating the icons make it seem like there are more of them.

The dialog is slightly different as well. There is less over telling, and when the player leaves a dialog before it has ended the NPC will detect it and respond with a humorous or curious comment (Figure 20).

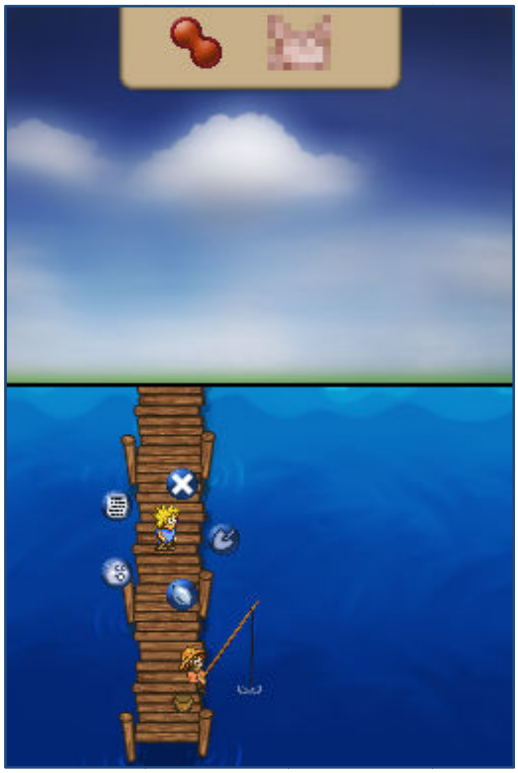

Figure 19: Vita standing on the pier with the bubble menu open. It does not rotate in the fluent version. The top screen shows the selected seed and digger. The digger portrait is censured here because I borrowed the graphics elsewhere.

Figure 20: In the playful version, as Vita leaves a dialog, the speaker responds with a curious and seemingly unrelated comment.

Digging

Tapping and pointing is again the base mechanics used. The player moves the digger by pointing to the left or right side of it, and makes it jump by doing a drag-and-drop-like motion from the digger in the wanted jump direction. To remove a mineral block, the player must tap it. Special moves are activated through the bubble menu, which works the same way it does in the adventuring state. As mentioned earlier, the goal is to create a fertile mineral composition by removing mineral blocks. What composition is fertile is decided by the seed - some seeds might require very little calcium while others requires a more balanced mix of the five available minerals. Additionally, a certain depth must be reached before the seed can grow. On the top screen the player is informed of the mineral status through a pentagon shaped diagram (Figure 21), where each corner represents a mineral. There are also meters showing how much mineral has been removed, how deep the digger has dug and at which depth the seed should be buried.

Fluent Interaction	*Playful Interaction*
Quick to use bubble menu.	The icons on the bubble menu are rotating.

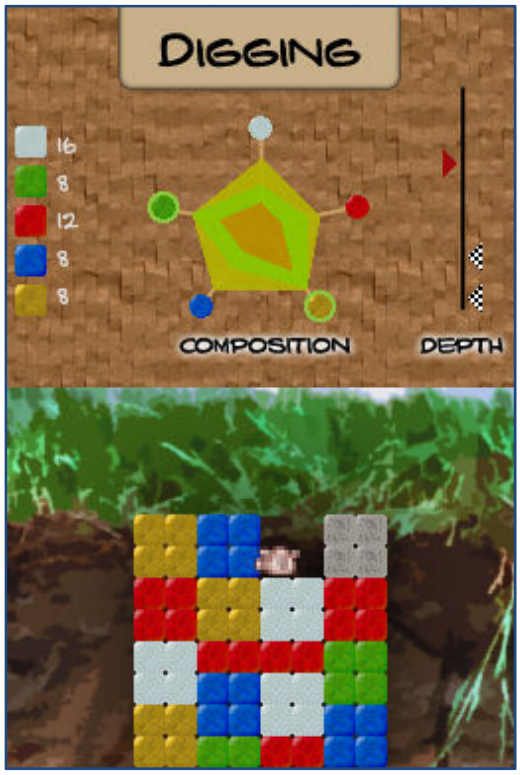

Figure 21: The digging puzzles. The pentagon on the top screen shows the current (yellow) and needed (green) mineral composition. The digger is censured here because I borrowed the graphics elsewhere.

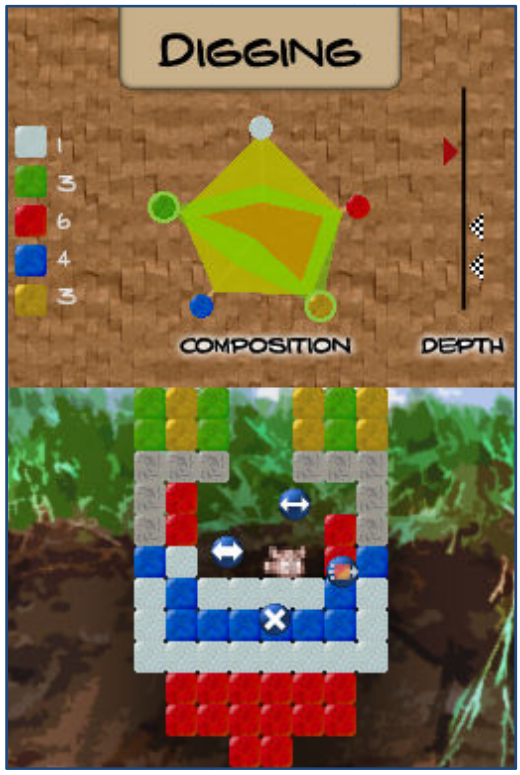

Figure 22: The player has opened the bubble menu. In the playful version this menu rotates around the digger.

Main menu

This is where the differences between the playful and the fluent interaction version begin to be important. The main menu is the first thing the player will see when starting the game. It contains the game logo on the top screen, and on the bottom screen the player can select which of three saved files to load.

Fluent Interaction

In the fluent interaction version, the text "select file" is shown above three icons representing the files which can be loaded (Figure 23). The menu is both easy to use and understand, and selecting a file requires only a tap on the corresponding icon.

Playful Interaction

The playful version has been designed with the concepts described in the previous chapter in mind. Instead of a text and three icons, Vita is wandering randomly around the screen (Figure 24). As there is nothing else on the screen, the player should quickly decide to tap Vita. This opens up the bubble menu, which contain the three files. This is an instance of *playful selection* - I have replaced a regular selection menu with a more playful one which uses the in-game mechanics. It teaches the player about the bubble menu, it inspires initial curiosity when the player sees Vita wandering and it provides a small challenge through its rotating icons.

Figure 23: The fluent version of the main menu. Just tap a file to select and load it.

Figure 24: In the playful main menu Vita is wandering the screen. Tap him to open a rotating bubble menu containing the files.

Digger selection menu

Here the player selects which animal will do the digging. The selection is performed on the bottom screen, while the top screen is used for information about the selected digger.

Fluent Interaction

In this version, the selection is made by tapping a big portrait of the wanted digger. This puts a selection box around the digger, and a button reading “pick” appears (Figure 25). Tapping the button closes the menu and makes the selection.

Playful Interaction

To make this very simple menu more playful, I decided to add a little challenge. Instead of big portraits of the diggers, I let them run back and forth across the screen (Figure 26). To select a digger it must be tapped, but now this is a bit challenging because of the running. Besides just rewarding the player with the selection, the digger will make a happy or humorous statement and matching animation when it is selected. This is done to remove the need of a “pick” button. Through the dialog and animation the player will know that the digger has been selected.

Figure 25: A digger has been selected in the fluent version. Digger portraits are censured here because I borrowed the graphics elsewhere.

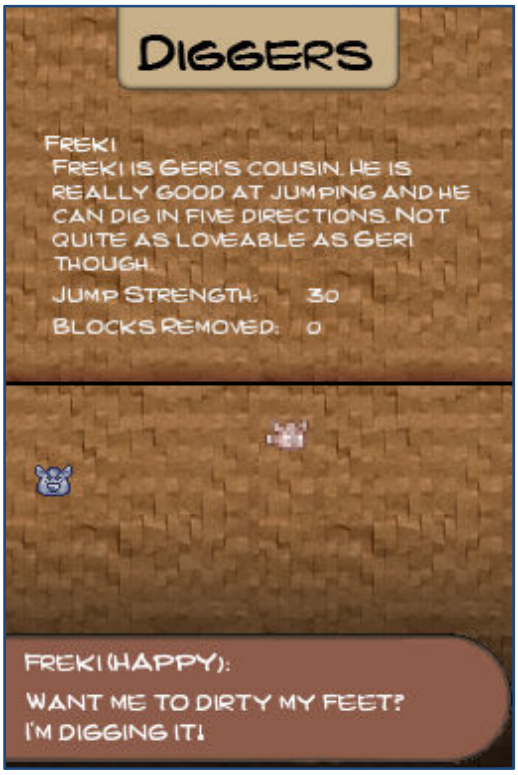

Figure 26: A digger has been selected in the playful version. The digger who is not selected runs back and forth across the screen making him hard to tap.

Seed selection menu

This is where the player selects and creates the seeds to grow. A seed is created by fusing a seed core and a seed shell. On the bottom screen is a list of cores, shells and seeds. Tapping any of them will put a selection box around it. When both a seed and a shell are selected, and those are from the same seed, a text-button reading “fuse” will appear.

Fluent Interaction

Fusing a seed core and shell is as easy as selecting them (Figure 27), and then tapping the fuse button. The shell and core will then disappear, and a seed will show up.

Playful Interaction

The initial part of fusing a core and a shell is the same, but when the fuse button is tapped a mini-game will start (Figure 28). This game is a variation of the digging game, but instead of creating a specific mineral composition a specific mineral pattern must be created. This is an instance of *playful activation*, as it has replaced the trivial fuse action with a challenging mini-game, designed to train the logic skills required in the digging state. Seeing patterns in the mineral blocks is a useful skill to have, even when the goal is a mineral composition and not a mineral pattern.

Figure 27: A seed core is selected. When a shell is selected as well, a fuse button will appear. Tapping the button will fuse the seed.

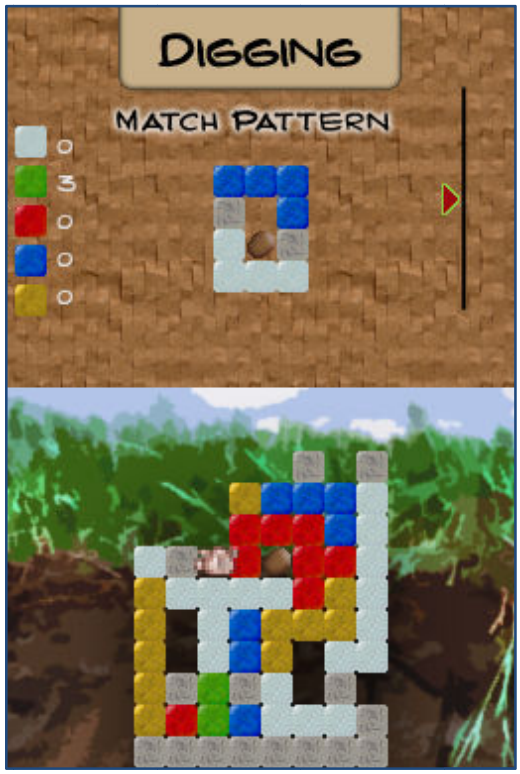

Figure 28: In the playful version, a seed will not fuse when the fuse button is tapped. Instead this variation on the digging game must be played first.

Mission list screen

This is where the player can look at the available missions. The only available option is to close the screen again, which is done by tapping a cross in the bottom left corner (Figure 29).

Fluent Interaction

No additional features.

Playful Interaction

Realizing that some players might be in an indecisive mood when using this screen, because they cannot decide which mission to do, or because they are not sure what the mission descriptions mean, I decided to give them something extra to do. When tapping the screen, a flower will bloom where it was tapped (Figure 30). This must be discovered, and should hence provide a little surprise. I also allows for a little creative exploration, as flowers can be placed anywhere and little formations can be drawn.

Additionally, the mission descriptions are less overt and more like simple riddles instead of clear goal descriptions.

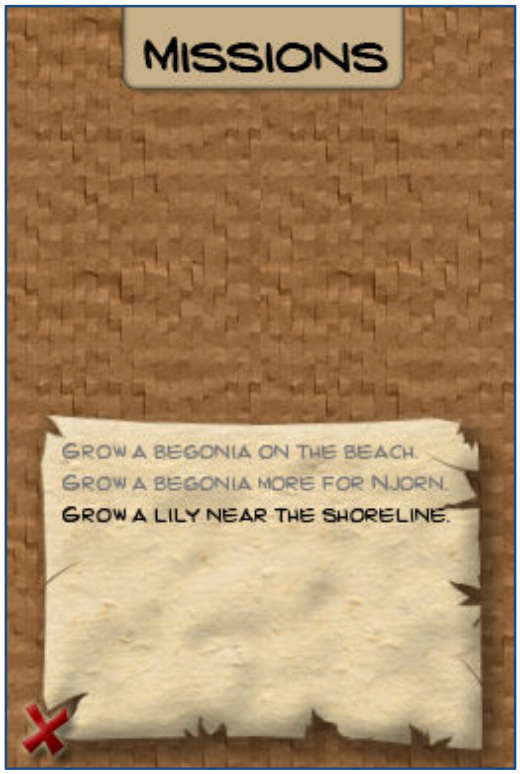

Figure 29: The mission list. Review available and completed missions or close the screen again.

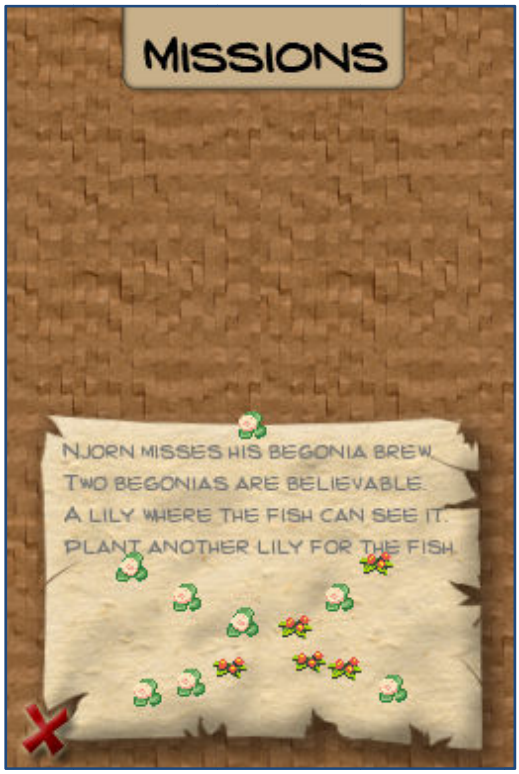

Figure 30: In the playful version flowers will bloom where the player taps the screen. Mission descriptions are less overt as well.

Summary

Through this section I have described how fluent interactions in Project Sprout have been turned into playful interactions. *Playful selection* was introduced in the main menu, which trains the use of the bubble menu, and on the mission list screen which now has a non-functional extra activity - planting flowers. *Playful activation* was added to the seed selection screen, where seeds need to be fused through a mini-game using game mechanics resembling those of the digging game, and to the bubble menu which rotates to provide a small dexterous challenge. In addition, there are examples of playful dialog in the mission descriptions.

The overall goal of adding these small changes have been to provide a better user experience, or improved gameplay, by either abandoning the fluent interaction paradigm or by supplementing it with playful interactions. Some seem rather silly and most requires extra programming and more work on content like graphics and dialog. The evaluation in the next chapter was meant to show if this has paid off or not.

Emotional Effects

According to my model of user experience in games, the outcome of interacting with a game is always emotion. To ensure one designs for emotions, I suggested defining a list of intended emotional effects. Below is the list of emotions I intend the game to inspire, including where it does so, how it is done and how often. I will note that, naming the emotions was not an easy task - perhaps because English is not my native language, or perhaps because there are many different words for similar emotions. I hope my descriptions explain what is meant by each word.

- Contentment
  - This is the most prevalent emotion in the game. The player should feel at ease, satisfied and relaxed most of the time.
  - With the story and scenario, this is achieved through the quiet island setting and the lightly poetic or philosophic themes and dialog.
  - The game mechanics and interaction design inspires the emotion as well. Primarily, the game never punishes the player explicitly. If a digging puzzle is not solved, the digger will still have gained some experience and possibly more special moves that can be utilized in the next digging attempt. The game also never stresses the player. There is no time limit to the puzzles, so the player can spend all the time needed to think about the logical solution. The special moves which are earned from digging are never actually needed to solve a puzzle, and as such it is not something the player will feel unsatisfied with not having. The special moves do give the player more options and freedom in doing the digging in new ways, and as such they should make the player more satisfied or contented.
- Curiosity
  - With a satisfied and relaxed player, there is a real possibility of boredom too. To remain this from happening, the game attempts to keep the player curious and puzzled.
  - Initially, before the island is fully explored, the curiosity should come from a wish to see it all. When the island is fully explored, the mystery of the island has become bigger and hopefully interesting enough to keep the player curious.
  - The game mechanics and interaction design has different ways to inspire curiosity as well. New seeds are gained, and the player should be curious to see how they look once sprouted. New diggers are gained as well, and the player should be curious to see how their distinct traits bring new options to the digging - e.g. some can push blocks and others jump higher. The playful version of the mission list should make the player curious as well.
- Surprise
  - Surprising the player is another way to remove boredom.
  - The game surprises the player with a few plot twists throughout the story.

    - In the interaction design, surprise found many places in the playful version where things moves and rotates. The game mechanics will also surprise the player with new digger moves, new kinds of seeds, new digging levels and in the playful version new patterns to match in the fusing mini-game.
- Triumph
    - This is a strong emotion which is achievable through challenge, but to not stray from the contentment the challenge cannot be stressful. As mentioned, the game reaches this goal, by granting the player all the time she needs.
    - From the story, the player will occasionally feel slight triumph because a sprouted seed has brought the story forward.
    - The strongest triumph is gained from the actual moment of successfully planting a seed - when the mineral composition and depth is just right. In the playful version this triumph is found in the fusing mini-game, where the minerals must be placed in a certain pattern around the seed.
- Amusement
    - Laughing should not be occurring frequently, but occasional humor is used to keep the game from getting too gloomy and melancholic.
    - The diggers make humorous comments when selected in the playful version. Occasionally, when the player leaves a dialog it might also result in a fun comment.
- Enjoyment
    - The player should of course be enjoyed. Like contentment, this should be a prevalent emotion, but it is not something which is inspired by a few distinct design decisions - everything should be enjoyable to some extent.

The game will attempt to inspire other emotions as well, though these more rarely and not as much through the interaction design as through story, graphics and audio. Examples include sadness from seeing a person die, respect for seeing someone risking their life to save a loved one, happiness and being touched from helping with reuniting a family and awe and wonderment from hearing an impressive tale or seeing an architectural wonder. The present scenario though, does not include the story and setting needed to inspire these emotions. The scenario is the topic for the next section.

Scenario Design

For the prototype evaluation a small scenario has been set up. This scenario bears some resemblance to the scenarios of the full game as it is planned be, but it combines several parts into one concentrated sequence and lacks graphical finesse and sound effects. Both versions of the game use this scenario.

> *Ms. Lili has just arrived on the island and has followed the islanders to town. The town gate is closed and Vita is standing on the beach alone. Near the pier a fisherman is talking to himself. There is*

nothing else to do, than listen to the fisherman. He will complain about how he supports the whole island with food, while no one cares to support his drinking habit. He has decided that until someone brings him a flower he can use to give his brew a better taste, he will not do any more fishing. He hints at where the seeds are and where they should be planted, and then Vita has a mission. After solving this mission, by planting two of the needed plants, the fisherman is in a better mood and has started fishing. The fish won't bite though, and he talks about how a certain plant could be used to lure the fish near the beach. Vita will then have to plant two of those near the shoreline to get the fisherman landing fish. At that time the gate will open and a kid will come to the beach and wonder where all those flowers came from. At this point, the game is completed. The player can still walk around the beach though, and the kid will tell what can be expected from the full game once it is complete.

This scenario can be broken down into the game mechanics mentioned in the beginning of the chapter:

1. Find a problem to solve.
2. Figure out which plant will solve the problem.
3. Find the seed if it is not found yet.
4. Figure out where to grow the plant.
5. Solve puzzle game to make the seed grow.

There are four problems or missions: plant two flowers for the fisherman's brew and plant two plants to lure the fish in. The player will get all the seeds after listening to the fisherman, and with only two seeds in the game it is trivial to figure out which to use. The player will have to fuse the seeds though. Where to grow the seeds are learned from listening to the fisherman, and making them grow is done by playing one of four digging levels.

These levels are designed to have an increasing difficulty. The first one is very simple while the last is much more challenging.

Chapter Summary

I have described Project Sprout - an adventure game about growing plants, featuring digging puzzles and a touching mystery drama. I have described how the concept of playful interaction has been applied to the game, which emotional effects this should have and finally I have described a game scenario which will be used in the evaluation in the next chapter.

IV

An Evaluation of Project Sprout

Both versions of the game described in the previous chapter have been evaluated using a novel UX evaluation technique. I have named it the *Emotional Forum* technique: In essence, it is similar to using a forum for usability evaluation [Bruun et al., 2006], but with the important difference that I am studying the overall user experience and the emotional effect – not only usability, even though that is part of the user experience as well.

I have supplemented the above technique with instrumentation - automatic logging of the game as it is played. The acquired logging data are used to verify and explain the experiences described by the players, and to improve different aspects of the game.

Throughout this chapter the two techniques are explained, I will describe the evaluation setup and who the evaluators were, analyze the results and of course reveal the answers the evaluation gave to my research question:

> *What are the advantages and disadvantages of playful interaction when consistently applied throughout a video game?*

I have attempted answering this through a two part evaluation of two versions of Project Sprout; the emotional forum evaluation and the instrumentation evaluation is performed on both versions. I begin with describing the emotional forum evaluation and the results, and finishes with the instrumentation evaluation. But first, I will describe the evaluators.

Evaluators

The Emotional Forum technique relies on the assumption that the evaluators can explain their experience of playing the game in great detail. As I saw it, this situation demanded a special kind of expert evaluators; people who are used to writing about and discussing game experiences. People like this can be found in any online gaming forum, but often the discussions going on in these places lack the depth I am looking for. Instead I have turned my attention to game reviewers. These people write deeply about games all the time, and often have the insight and experience to explain problems and causes in a detailed way. It is not though, a common sight to see game reviewers explaining their actual emotional experiences, but I assumed they could do so when instructed to.

I invited 22 current or former game reviewers, all male and all Danish, to participate in the evaluation. 16 accepted and I assigned eight evaluators each version of the game. I tried to make sure evaluators who were connected - privately or professionally - to each other, were assigned to the same game. This was done to ensure knowledge of the different versions did not leak between the groups. Besides that, the evaluators were assigned randomly to a group. In picking the evaluators I favored people who had reviewed at least one game for

Nintendo DS, as I found it important that they could relate the pc-based prototype to the intended hardware platform. I also picked a few none-reviewers, based on their insightful forum posts, and a few because they were amateur game designers.

This table summarizes the demographic information I collected about the evaluators in both groups:

	Fluent Version	Playful Version
Evaluators (all male)	8	8
Age (average)	≈ 25	≈ 27
Reviews written (average)	≈ 54	≈ 66
Non-reviewers	1	3

There seems to be a slight experience skew toward the playful group - they are a bit older, and have written more reviews on average. The playful group has the highest amount of non-reviewers too though - the more reviews written on average is due to three very experienced reviewers. The fluent group has just two reviewers with a similar amount of experience.

An interesting note about this choice of evaluators is that they are not necessarily part of the game's target audience. Project Sprout is primarily targeted female gamers and secondarily ex-hardcore gamers of any gender looking for something different to play. Some of the evaluators fit the secondary target group, but none fits the first. As reviewers or designers though, they should always have some sort of empathy for the target group.

These 16 evaluators all participated in the emotional forum evaluation, which I will describe in further detail now, and they submitted a log-file for the instrumentation part of the evaluation - I will describe this later.

Emotional Forum

Because I had two versions of the game and two groups of evaluators, I had two separate forums. None of the evaluators knew about the other forum and the other version of the game.

In the appendix you will find a translated version of the Danish introduction, that the evaluators saw when they were given access to the forum. This is a short summary of the introduction contents:

- Welcome to an early evaluation of Project Sprout.
- Notes about difference between pc and Nintendo DS.
- Introduction to the story of the game.
- Evaluation instructions about log-file and experience description.
- Notes on game limitations and game controls.

This resulted in 2x8 threads - each with one evaluator's view on the game, and some with comments from the other evaluators. I will now describe and analyze the results of the emotional forum evaluation.

Results

As written in chapter I, this is the user experience metric I have evaluated by:

> *A good user experience occurs when there is a low difference between the designer's intended emotional effect and the user's experienced emotional effect.*

I have put the list of intended emotional effects in a matrix, and for each time an evaluator seemed to reference an emotion I have noted it in the matrix. I had two matrices - one for the fluent and one for the playful version. The full and un-translated matrices can be found in the appendix - below is a short summary, showing how often an intended emotion was referenced and also how often unintended emotions were referenced. The unintended emotions are not necessarily bad for the game, but in most cases they were examples of the game spurring negative emotion. The right column is a translated version of one of the actual quotes.

Emotion matrix for the fluent version

Emotions	Occurrences	Translated quotes (examples)
Contentment	6	*"Gets in a classic RPG-this-is-nice-and-easy-mood"*
Curiosity	2	*"Wanders around a bit and explores the area before going down to the fisherman"*
Surprise	2	*"Figures out by chance that you can jump as well!"*
Triumph		
Amusement		
Enjoyment	2	*"Puzzle 3 is much more fun - nice detail with the flags"*
Unintended	10	*"Is not having fun anymore and gives up"*

Emotion matrix for the playful version

Emotions	Occurrences	Translated quotes (examples)
Contentment	3	*"Despite missing explanations I'm finding it relatively easy and rewarding to discover the individual elements myself"*
Curiosity	1	*"I keep on experimenting and exploring the game"*
Surprise		
Triumph	1	*"Because those puzzles were so hard it was of course a strong experience of success when I succeeded"*
Amusement		
Enjoyment	1	*"When I first started the game the music and the little wandering character gave a nice impression"*
Unintended	5	*"The idea is actually pretty good, but the difficulty was unfortunately too high for my patience – resulting in that I was unable to complete the game"*

I had hoped for more emotional description, but the above is what I got without too much reading between the lines and over-interpreting. It is not much, but there are still interesting points in the descriptions. The most interesting result here is that contentment is the most often mentioned of the intended emotions - which is good, because that was an important design goal. Nine evaluators made some reference to how relaxed and satisfied wandering the adventure-part made them feel. Some did feel curious about the content of the location, which was intended, but sadly the game was too much of a prototype to keep

that emotion for long - there were evaluators who were disappointed about the lack of content. As for surprise, it mostly came from discovering the game mechanics. This was expected as well, because the prototype scenario did not offer much story and plot. It seemed as if the evaluators were much surprised by the puzzle game mechanics, and enjoyed experimenting with the digger and its abilities. That as well though, did not last because the game was too difficult - it took too much experimentation to solve even the first puzzles. The high difficulty did spur triumph and the evaluators congratulated each other for progressing further than they could themselves.

Even with the small amount of emotional description, the evaluation did give a little insight into the emotional effect of the game. The emotions the game should spur were spurred, and even in the intended way. This makes the overall design of the game a success, even though there is of course lots of room for improvement as well – i.e. removing the unintended negative emotions.

Unfortunately, if one looks at the descriptions separately, there is not enough to state that one version is better than the other. The evaluators did not explain their emotions and experience in enough detail - the low number of occurrences in the matrices above shows this. Especially the playful group was bad at doing this, and the threads explaining their experience with the game was in general much shorter than the threads in the fluent group. On average the experience descriptions in the playful group contained 265 words, with the shortest being 100 words long and the longest 570 words. In the fluent group, the average amount of words was 720 with the shortest description containing 420 words and the longest 1304 words.

One reason for this lack of detail in the playful group might be that the first evaluator to write down his experience wrote it down shortly and without detail, while in the fluent group the first to write his experience did it in much more detail and with some emotional description. The first evaluator's writing style might have affected the other evaluators' writing styles, leading to descriptions that were very detailed in the fluent group and lacking in detail in the playful group. I did try to anticipate this problem by commenting in each of the forums after the first evaluator added his experience description. In the fluent version I commented that I was satisfied with the writing and encouraged others to do something similar, while in the playful group, where the short experience descriptions was written, I encouraged the next evaluator to read the instructions again and provide me with a more detailed description. This did not work though - the experience descriptions did not improve. Perhaps my comment was seen as discouraging, or perhaps it was simply ignored, not being read or forgotten as the evaluator was writing his own experience description. In either case, it shows that directing people into a specific writing style is difficult. In a forum there is a certain tone and style, and trying to change this through directions might be a hindrance to people's participation.

A big part of the problem with the evaluation was the large amount of negative emotion caused by bad accessibility. In general the controls were experienced positively, but only after climbing a steep learning curve - and some evaluators did not manage this climb. Most of the problems were caused by my attempt at simulating touch screen input using a mouse - clearly a bad idea when the game does not explain clearly how it works. I did explain it in the forum introduction, but either this was not enough or people just did not read the introduction properly - there were indications of that as well, with for instance people asking about things that were written in the evaluation instructions.

Further cause of frustration was found in the difficulty level. I had intentionally fitted the demo with difficult puzzles, because I wanted to show the potential of the digging game. This was not a good idea at all, because even though the evaluators were expert players most of them could not solve the puzzles. Only two evaluators - one in each group - were able to complete the game. Having to deal with these difficult puzzles, the evaluators naturally focused their descriptions on that. It also ruined much of the intended emotional effect, because feeling challenged is a more dominating emotion - that eventually led to frustration for some of the evaluators.

In short, the *Emotional Forum*-evaluation did not work as I had intended. At least with the evaluators I picked, there was too little emotional description and too much difference in participation between the groups. As a result, I did not get the results I needed to be able to say whether playful interaction works in practice or not. The problem could be my execution of the technique, or that the game simply was not ready to be evaluated - maybe the evaluation technique had worked, if the accessibility had been better and the difficulty level lower. Then frustration might not have been such a prevalent emotion.

In some respects though, the evaluation was a huge success. Plenty of usability or accessibility issues were revealed and several design changes was suggested. This has proved very useful in the further development of the game, which has definitely improved since the evaluation and because of it. I immediately incorporated many of the changes suggested by the evaluators, and also showed them the game again after doing so leading to more positive comments about the game. I especially liked this one:

> *"Yes, yes, yes! That's how you do it. You have truly understood the idea of QA, because you have used the critique constructively and thought of ways to refine both gameplay and usability … Good tutorials and hints which also gives the main character a more sympathetic appearance."*

And this one:

> *"Earlier the seeding-part was an "oh no"-experience, but now it is the best part of the game because the different gameplay-elements come into their own now. I'm dodging falling blocks, jumping around, planning safe areas when the blocks group and I can plan a strategy from the start. Super!"*

Improving accessibility has improved the user experience tremendously. This indicates that neither fluent nor playful interaction works when the accessibility is low, and shows that I should have worked on that part before doing the emotional assessment. This actually follows in line of an interesting discussion I had at a CHI 2008 workshop on user experience evaluation in games - "in which part of the production of a game, is this and this evaluation method suitable"? I think now, that to be able to evaluate the emotional experience of playing a game, the accessibility should be evaluated first. There is no way the intended emotional effect can be experienced in a game you cannot play properly.

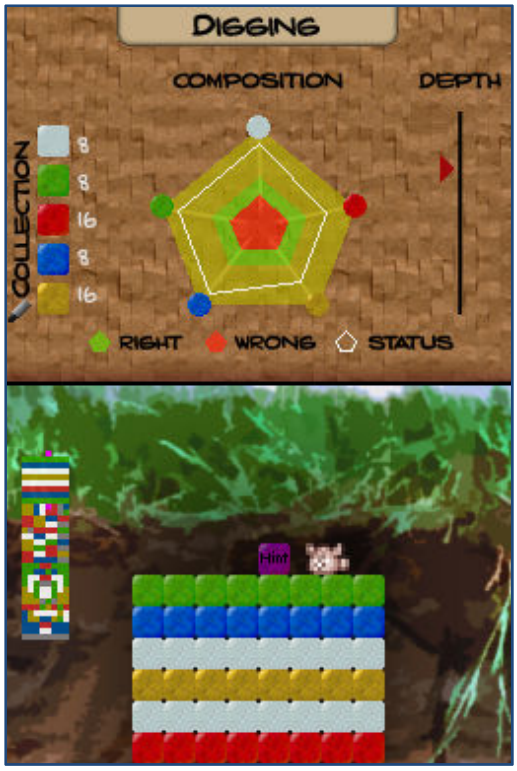

Figure 31: Improved interface for the digging part.

Figure 31 on the left shows some of the improvements I made during and after the evaluation. Compared to the interface in the initial version (Figure 21), the status pentagon has been changed such that the yellow area do not resize when minerals are removed. Instead a thin white line represents the current mineral status. This line must reach the green area - in the initial version the edge of the yellow area had to reach the green area. A symbol legend is added as well as a heading telling what the numbers on the left side is. Difficulty is lowered by removing the depth requirement, by adding a hint block that gives instructions and by adding a mini-map on the left side of the screen.

The evaluation was not meant to be focused on usability, difficulty or accessibility issues though, which was partly why I picked expert evaluators. I expected them to be able to look above those issues - I knew about some of them before starting the evaluation - and I expected them to be able to focus on the subjective qualities of the game. This was not the case at all, and in hindsight it is painfully obvious that expert evaluators of course are going to focus on what they know about game design, usability and related subjects instead of the plain and simple emotion gained from playing the game. Perhaps it would have been better to use ordinary players who were simply good at writing in general and not necessarily about games - journalists and some bloggers come to mind. They would still have had problems with the difficulty and accessibility though.

Summary

In conclusion, the emotional forum evaluation did not contain the expected amount of emotional descriptions and hence it could not tell whether the fluent or playful version of the game was the best. It did however show that the intended emotional effects was achieved when looking at both versions together, indicating that the overall design works as intended. The evaluation also proved very useful in identifying usability issues, but this was not an explicit goal for the evaluation. Both versions of the game provided an equal user experience, when measuring using the metric above. Unfortunately, all the little playful details were overshadowed by the mouse controls and the high difficulty level making it impossible to say if they added to the experience or not - at least by looking at the experience descriptions in the forum. Fortunately, the next part of the evaluation - instrumentation - was somewhat more successful in saying something useful about playful interaction versus fluent interaction.

Instrumentation

Setting up the instrumentation was not a trivial task. I did not want simple input logging, but abstracted event data showing what the player did and how she played the game. I needed it to reveal if she understood how to play the game, and also to give some objective results on whether playful interaction is better than fluent interaction.

The following is a description of how I instrumented each game state. In common of all the states, is that for each log entry I note the time played in seconds and I also log each time a new state is entered. That way I can see how much time is spend in each state.

- *Main menu*
  - In the playful version this screen should teach the player about the bubble menu. I log when Vita is tapped and the bubble menu opened, and when a tap misses a bubble. In the fluent version I log if the player is tapping where she should not be tapping.
- *Adventuring*
  - Again, I am logging the usage of the bubble menu. I also log how the player goes through a dialog, and if she decides to leave the dialog and I log how long the player spends at each location. I log when plant is grown and when a mission is completed.
- *Digger selection menu*
  - Here I log when a digger is selected and when the player taps without selecting anything.
- *Seed selection menu*
  - In this menu I log when a seed part or a full seed is selected and when the fuse button is tapped. I also log when the player taps without selecting anything. The mini-game in the playful version logs data similar to the digging state below.
- *Digging*
  - This state has the most advanced logging because it has the most advanced game mechanics. In logging how the player jumps with the digger extra code had to be added, such that the jump could be analyzed. I log if the player jumps to a new height, or if she just jumps in place. Besides that, I log where the player digs, when a goal condition is reached and which special moves are performed. I also log when the player taps at nothing and again the bubble menu usage.
- *Mission list screen*
  - Here I log when the player taps anything else than the exit button.

The instrumentation code produces a simple html table containing data as described above. The data abstraction is made from the interaction design or game mechanics, and as such it is not simple input logging. I do not even log pure input data as I have no clear use for e.g. the exact coordinates of a tap or the mouse movement speed. Abstracted or pre-analyzed data is much more useful.

Results

The instrumentation data gives better indications about what worked and what did not in regard to playful versus fluent interaction. Most of the data gained from instrumentation though, are not really relevant to this because it was supposed to cast light on accessibility issues. This it did, but I will not get into much detail about that here and instead focus on what the instrumentation tells about whether or not playful interaction works.

Main menu

I will begin with looking at the bubble menu, which is present on the main menu in the playful version and hence figuring out that it is activated by tapping Vita should be easier in this version. In the instrumentation data I can see if this is true, by comparing the time it took for the evaluators to open the bubble menu for the first time.

Average time before the bubble menu is opened for the first time (in seconds):

- **Fluent**: (543 + 75 + 385 + 91 + 304 + 384 + 353 + 678) / 8 ≈ 352 seconds
  - SD: 204.25, SEM: 72.21, 95% CI: 180.87 to 522.38
- **Playful**: (42 + 129 + 120 + 248 + 62 + 37 + 226 + 614) / 8 ≈ 185 seconds
  - SD: 190.69, SEM: 67.42, 95% CI: 25.33 to 344.17

The data shows a difference in the time it took for players to discover the bubble menu - they were 167 seconds faster in the playful version. The SEM (standard error of the mean) shows how far away from the calculated average the actual average is likely to be - even in the worst case, the average will still be very different. This difference is likely caused by the playful main menu, where the player should learn that the bubble menu is opened by tapping Vita. One evaluator though, did not learn this and took even longer to find the menu than the evaluators playing the fluent version. This indicates that this kind of teaching is not perfect, but still better than simply assuming the players will figure it out themselves - and more fun than just telling them how.

It is also interesting to see, that the first evaluators are not in general taking longer to figure it out than the last evaluators. This indicates that they do not learn from each other's experience descriptions. Perhaps they do not read them, or perhaps they cannot learn from something they have no relation to yet.

Adventuring

In the playful version, the dialog had been revised slightly to cause more puzzling curiosity in the player. One way to see this in the instrumentation data is to look at the time spent playing the game - a more curious player should play the game longer, because she wants to see what is around the next corner and how it ends.

Average play time (in seconds):

- **Fluent**: (3131 + 6143 + 2487 + 2010 + 3703 + 7542 + 2321 + 2102) / 8 ≈ 3680 seconds or 61 minutes
  - SD: 2064.41, SEM: 729.88, 95% CI: 1953.99 to 5405.76
- **Playful**: (1002 + 6171 + 1671 + 796 + 855 + 846 + 776 + 13344) / 8 ≈ 3183 seconds or 53 minutes
  - SD: 4497.45, SEM: 1590.09, 95% CI: -577.34 to 6942.59

Just looking at the average play time reveals no major difference, but if one ignores the last evaluator in the playful group then the difference is huge. The statistical analysis shows this as well - the standard deviation (SD) is very different between the two sets, and the average is found with much less accuracy in the last set. In general, the evaluators in the fluent group played for a much longer time. This could be one reason for the lack of detail in their experience descriptions, and it could indicate that the playful dialog and mission descriptions do not work as intended. They might be too difficult to understand and hence frustrating to the player.

Digger selection menu

Unfortunately, no players found extra diggers and hence they had no real use for this menu. This is obviously quite bad test planning, as I should have set up the game scenario in a way that would have led the evaluators to use this screen.

Seed selection menu

There is no instrumentation data able to measure the success of the playful features added to the seed selection menu. It was noted in the forum a few times, that the seed fusing puzzles were actually more fun and easier to understand than the digging puzzles.

Digging

The digging puzzles had few differences between the two versions, and as such there is nothing in the instrumentation data that will tell which version is better.

Mission list screen

In the playful version, the player can make flowers bloom on the mission list screen by tapping it. The idea was to entertain the player by adding a non-functional extra activity. In the instrumentation data of the playful version, it is recorded whether this functionally is discovered. In the fluent version on the other hand, nothing happens if the player taps the screen randomly - if the player taps it anyway, it might be a sign of boredom or confusion.

Average amount of taps on the mission list screen:

- **Fluent**: (7 + 4 + 1 + 3 + 1 + 4 + 4 + 2) / 8 ≈ 3 taps
  - SD: 1.98, SEM: 0.70, 95% CI: 1.59 to 4.91
- **Playful**: (48 + 13 + 0 + 1 + 4 + 22 + 1 + 48) / 8 ≈ 17 taps
  - SD: 20.47, SEM: 7.24, 95% CI: 0.01 to 34.24

As expected, the evaluators who discovered that plants could grow on the mission list did spend a few taps doing so. Whether they found it enjoyable or not cannot be understood from the instrumentation data, but I would say that the high amount of taps is a good indication that they did. If a player finds it worthwhile to do 48 taps on the screen in a short period of time, then it has been worthwhile to add the functionality.

Other results

The emotional forum evaluation was supposed to be my main source of empirical data about playful interaction, but as it failed in that regard it was nice to see that the instrumentation could shed some light on some of the concepts, even though it was not the main goal of the instrumentation evaluation.

The main goal was verify the experience descriptions in the forum and to gain usability information - these goals were satisfied. For instance, I wanted to know whether the player would be able to figure out how to leave a dialog sequence that she did not want to read to the end of. The instrumentation data showed that 13 of the 16 evaluators were able to figure this out. I cannot see though, if the remaining three evaluators did not want to leave a dialog sequence or if they could not figure out how to do it. For further development of the game, I find the controls for leaving a dialog sufficiently good.

Another thing I wanted the instrumentation data to shed light on was the jump controls in the digging game. These were not explained in the game, and not totally trivial to use. There are two ways to assess the success of the jump controls; one could assume that the player knows how to jump when the first jump is performed or one could assume that the player knows how to jump when the jump is used to reach a new area in the level. I chose the latter, and found that on average the evaluators jumped approximately 5 times before doing a meaningful jump. One evaluator never jumped and another never did something useful with the jump. In developing the game further, I will have to tell the player something about jumping, because it is a crucial skill to master if one wants to complete the puzzles. Luckily, I saw very few failed jumps meaning players quickly mastered the basic input mechanic required to activate a jump.

Similarly, the instrumentation data showed if or if not the controls in other parts of the game was usable or not. I won't detail all the findings here, as usability testing was not really the goal of the evaluation.

Summary

The instrumentation data showed me one thing about playful interaction; that *playful selection* works - menus using in-game mechanics eases the learning curve and helps the player discover important information early, and non-functional extra activities makes players spent more time and effort in an otherwise boring menu.

Besides that, instrumentation proved useful in gaining usability information about specific parts of the game. Instrumentation cannot find all usability problems though - the game has to be instrumented in the area where the designer suspects there might be problems or things to improve - as I did with the jump controls. Interestingly, the players did not mention problems with jumping in their experience descriptions on the forum - this shows that instrumentation finds problems that the forum evaluation do not. On the other hand, there were usability problems found by the evaluators and described on the forum that I would not have seen in the instrumentation data unless I knew what to look for. For instance, the game has a notification icon that shows when something new was added to the bubble menu. The evaluators thought this icon should be tapped, and it took a while for them to figure out that they should open the bubble menu and find the icon in there instead. I could see this in the logging data, but not in such detail that I would have taken note of it had they not told me.

Chapter Summary

In this chapter I have described the two part evaluation I have performed on Project Sprout. This was my research goal:

> *What are the advantages and disadvantages of playful interaction when consistently applied throughout a video game?*

Beginning with the emotional forum evaluation, it was unable to provide me with any clear answers. This is because the evaluators were not able to describe their emotional experience in enough detail - I simply did not get enough data to support any claim about playful interaction. The emotional forum was not a total failure though, because I did get lots of feedback on accessibility and control issues - the emotional part also worked somewhat, because I could see that the intended emotional effects were achieved. Just not in the frequency I had hoped for. Whether this is due to bad test execution or a bad choice of evaluators is hard to say. I tend to believe though, that perhaps expert evaluators are unable to focus on the pure experience of playing, because of their expert knowledge about games and game design.

The instrumentation evaluation was more successful in providing evidence to support playful interaction. It showed that a main menu containing the concept of *playful selection* were able to drastically reduce the time it took for a player to discover important game mechanics, when those mechanics were used in the main menu as well. Non-functional extra activities were also shown to be able to keep players interested in an otherwise boring menu screen. Further, the instrumentation data provided usability information on the parts of the game which were instrumented to reveal this information. This information was different from the usability information gained on the forum, indicating that the two techniques could support each other.

In the end, I gained a lot of useful feedback and insights from both the forum and the instrumentation data, but not data that could completely verify my theoretical findings about playful interaction. This is reflected in my conclusion.

V

Conclusion

In the introduction I stated it was time to abandon the paradigm of fluent interaction and replace it with playful interaction. Instead of interactions requiring no conscious effort, I wanted interactions that required effort and affected the user emotionally. This was of course a rather bold statement, but I went with it and formulated the following research question:

> *What are the advantages and disadvantages of playful interaction when consistently applied throughout a video game?*

I found my first answers through a case study of existing examples of playful interaction, which I analyzed using learning theory and UX research. I first presented the overall definition of playful interaction:

- *Playful interactions* require effort and reward it with growth of the brain patterns (cognitive structures, mental models, schemas etc.) associated with the applied dexterous, mental and social skills.
- *Playful interactions* are sources of emotion potentially making the user feel, for example, stimulated, challenged, curious, proud, frustrated, confused or sad.

I then split the concept into three main categories, and three more which I did not investigate that much. The main categories are playful selection, playful activation and playful guidance. My theoretical investigations informed the concept of its advantages:

- *Playful selection* (adding game mechanics or extra activities to menus)
  - Trains player's skill in using the game's game mechanics.
  - Inspires curiosity and prevents boredom.
- *Playful activation* (mini-games and control challenges)
  - Removes trivial interactions at a low level and enriches the game with new game mechanics or new uses of existing mechanics.
  - Keeps the player attention high.
- *Playful guidance* (providing help through discovery and challenge)
  - Provides help when and where it is needed and lets the player figure it out herself.
  - Instruction received when in a positive mood.

As for the disadvantages, I did not state them explicitly. The most obvious disadvantage though, is the development cost - in my experience it takes more time and effort to design and implement playful interaction - at least when it is added as a replacement to existing

interaction design as I did in Project Sprout. Another disadvantage is the fact that not everyone likes to be challenged - some likes tradition and does not like being led into new ways of thinking. That is a problem with any novel design concepts though.

Now, one might question the relevance of playful interaction and ask; is really needed? Is it really better than fluent interaction? When one focuses on the overall user experience, my findings tell me it is. Playful interaction is about making any interaction game-like and about exploiting game design concepts in interaction design - from my point of view this is a definite improvement to regular efficiency focused interaction design, as games are intrinsically enjoyable to a degree few other experiences can match. Games have a unique ability to shape and create brain patterns (cognitive structures, mental models, schemas etc.), and this is where the enjoyment comes from. Often this presents the user with a challenge, but games do have other ways to enjoy as well - i.e. immediate and frequent rewards, pleasing aesthetics and they can drive a long list of strong emotions. Spreading these thoughts to any part of the interaction design - in any application - not just games - is my reason to suggest playful interaction as the interaction design paradigm we should seek next.

In my theoretical investigations, I found the best arguments for playful interaction in learning theory. Learning is enjoyable - building new brain patterns is enjoyable - and this is why playful interaction is enjoyable as well. Playful interactions require effort and are hence something the user or player must learn or master. Doing this through a set of challenging - at just the right level - game mechanics leads to a strong emotional outcome and a better user experience.

Another answer could have been given through an evaluation of a practical example of playful interaction - with Project Sprout I made an attempt. To that game I added a few examples of playful interaction, and I did an evaluation of the game with and without playful interaction. The evaluation showed that *playful selection* did indeed improve the player's ability to enjoy the game, as they were much faster at learning crucial game mechanics in the game with playful interaction. The evaluation did not say anything useful about *playful activation*, and I did not add the concept of *playful guidance* anywhere in the game, so I was not able to verify anything in that category through the evaluation.

This concludes the main findings in my thesis. Playful interaction is mostly grounded in theoretical arguments, as the evaluation could neither verify nor falsify a big part of the concept. I am confident though, that the theoretical arguments hold because there were small hints in the evaluation showing that I am right about this - i.e. evaluators noting that they liked the mini-game more than the full puzzles.

I made notable secondary findings in my thesis as well. These has two do with my evaluation methods, which were novel and partly successful. I proposed and used the emotional forum technique as a way to gain insight into the emotional outcome of playing a game. I wanted expert evaluators to write down their feelings of playing the game, but unfortunately they did not do so in enough detail. Perhaps I was asking too much, or perhaps I picked the wrong evaluators. Good things did come out of the evaluation though, because I was able to see that the intended emotional effects were achieved as I had designed them and the expert evaluators I picked was able to point at precise design problems, and even present clever and realistic solutions to them. So even though it might have failed its initial goal, the evaluation provided valuable design verification and critique that I would not have gotten

through for instance some kind of player observation evaluation, where I would have had to formulate the critique myself.

The other part of the evaluation relied on the logging data gained from instrumentation of the game. The game simply logged which skills the player seemed to use, and through this I was able to point at several accessibility problems - even some that the evaluators did not take note of. The initial goal of the instrumentation was simply to verify the experiences described by the evaluators, and this worked as intended - even though the experience descriptions lacked the emotional detail I needed.

While there have been complications with the evaluation methods, they definitely showed promise in several areas. I can recommend expert evaluators if one wants design critique and suggestions, I can recommend using a forum if one wants to get the written feedback at a low cost and I can recommend instrumentation as an additional data source able to both verify the evaluators' feedback and to find unique usability or accessibility problems as well. Just don't expect expert evaluators to forget that they are experts - they will use their knowledge of interaction design even when you ask them not to.

Limitations

A limitation in the theoretical part of the thesis, chapter II, is my selective use of literature. My choice of literature is mostly based on the literature study in the preparation project I did last semester. While this study covered a lot of ground in UX research, it might be incomplete in other regards. As an example, I have not performed a thorough study of available learning literature and hence only picked works that I knew beforehand. Another limitation in this part is in my choice of cases or games used to explain the concept of playful interaction. The concept sprung from these cases, and might have looked somewhat different if I had picked other games.

As for my evaluation, there are plenty of limitations. For one, I only had 16 evaluators which is not a lot from a statistical point of view. For instance is a t-test not likely to say that two averages are significantly different, even though simple descriptive statistics shows that there is a relatively big difference. A second limitation is in my choice of evaluators. I already discussed whether or not expert evaluators were appropriate, but one could also question their distribution in the two groups - there was a huge difference in participation, which indicates that they were poorly distributed. Again, with more evaluators this problem might be less likely to occur.

Future Work

In the future, I would like to see the concept of playful interaction applied to more games and to games of any genre. This would help prove the concept, and enable it to slowly replace or enrich the fluent interaction paradigm we know today. In my work as a game design, I will make this happen, but more designers need to join me on this such that we can inspire each other and build on these ideas.

It would also be very interesting to see the concept applied rigorously to a more serious application such as a word processor or an internet browser. The latter being most challenging, because an internet browser is expected to be an almost invisible interface to a web page. Making the internet browser more playful is bound to make it a disturbance to

the web page it renders. I can readily imagine though, that meta-games using URL click counts or playful guidance using the challenge as a reward idea could provide a different but still enjoyable web surfing experience.

Future work is also needed in ways to measure the emotional effect of the game. I think that my approach, the emotional forum, was somewhat successful in assessing emotion, but the evaluators did not participate enough for it to be an effective method - at least not with 16 evaluators. One could imagine a more structure approach, in which the evaluators had to fill out standardized forms hinting at the intended emotional effect. There would be other limitations to that approach as well though.

This concludes my thesis. It has been very enjoyable to write - I learned a lot from both my theoretical explorations, my design work and from the evaluation. I hope my thesis can inspire someone to explore the concept of playful interaction further, and that it has at least been interesting to read about.

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Appendix

Introduction to forum evaluation

This is the evaluation introduction that the evaluators could read when they were given access to the evaluation forum.

> *Welcome to an early evaluation of Project Sprout - a game intended for the Nintendo DS, but available as a pc-based prototype for this evaluation. The game is being developed by me, with story and scenario assistance from Rune. There are also people working on new graphics, but these are mostly not in the game right now. Because of this, the game looks simple and also lacks original music and any kind of sound effects. As the game runs on pc, the touch screen is simulated using the mouse. This gives some problems, but most can be avoided by lowering the sensitivity on your mouse. It can be played with a regular high-sensitivity mouse too though, so don't worry too much about that.*
>
> *Project Sprout is a story-driven adventure-game with an integrated puzzle-part about growing plants. You control Vita - a young kid living in a small village on an isolated island. In this prototype, everyone has just welcomed a new teacher to the island. They have followed her to the village, but Vita stayed behind and is now stuck on the beach outside the town gate. Your goal is to get the gate to open, at which point the game will end.*
>
> *When you have completed the game (or before if you are not able to), I would like you to email me the file "log.html" found in the game directory, and then go to this forum and write down your experience of playing the game in as much detail as you can. I want to know how you felt during play, how you felt at specific parts and which feeling you are left with after playing. Please create a new thread for each of you, but feel free to comment and expand other people's threads as well – in fact you are encouraged to do so, as the discussing or agreement among you might provide important insights.*
>
> *This evaluation is performed as part of my master thesis at Aalborg University where I, among other things, study how games are designed and evaluated. There are two groups evaluating the game independently, and you are one of those.*
>
> *Instructions in bullet form:*
>
> 1. *Complete the game (if you are able to)*
> 2. *Mail me the file "log.html"*
> 3. *Create a new thread here on the forum*
> 4. *Describe your experience with the game*
> 5. *Comment and discuss other's experiences*

It is important for the evaluation that the description of your own experience is detailed. You are welcome to be creative and write it as, for instance, a traveling experience. And feel free to ask questions here if in doubt about anything.

Link for game: LINK
E-mail for log file: E-MAIL

Short instructions for the game:

1. *Even though you select a save file, the game do not save. It must be completed in one go.*
2. *You must imagine the mouse as a stylus - hold the button to touch the screen and click quickly to quickly tap the screen.*
3. *When planting a seed the main character can jump by dragging the stylus/mouse from him in the direction of the jump.*
4. *Seeds only grow when the mineral composition and depth is absolutely right. The top screen shows what the mineral composition and depth should be.*

Emotion matrices from forum evaluation

These are the sparse mentions of emotion made by the evaluators. The quotes have not been translated.

Emotion matrix for the fluent version

Emotions	Occurrences	Quotes
Contentment (afslappet og tilfreds)	6	"Et lys begynder at dæmre, og det bliver egentlig meget sjovt at forsøge at sammensætte den rigtige jord." – "Indtil videre ser det ud til at være et hyggeligt spil." – "Kommer i klassisk RPG-her-er-roligt-og-rart-stemning." – " … får også snakket med Njorn. En dejlig karakter synes jeg. Smiler også over dialogen." – "Efter jeg forstod konceptet, nød jeg faktisk rigtig meget at plante frø." – "Grafikken er indtil nu retro-præget og hyggelig."
Curiosity (nysgerrig og udforskende)	2	"Undrer mig stadig lidt over sammenhængen mellem en fisker og blomster .. i sandet." – "Går lidt rundt og undersøger området, og går så ned til fiskeren."
Surprise (overrasket)	2	"At det var muligt at bevæge kæledyret udover afsatser havde jeg dog ikke regnet ud til at starte med. Eller at man overhovedet kunne bevæge ham mens blokke faldt." – "Opdager ved et tilfælde at man også kan hoppe!"
Triumph (sejr og triumf)		
Amusement (morskab)		
Enjoyment (fornøjelse)	2	"Puzzle 3 er meget sjovere, og fin detalje med flagene." – "Min digger er sødere og har mere personlighed end Vita."
Unintended		
Frustration (frustration)	4	"Til mig og mit temperament bliver det dog for svært" – "Bliver småirriteret over, at jeg nu skal til at gøre et eller andet dumt, for at få spillet på gled." – "Har det slet ikke sjovt længere og giver op." – "hvad skal jeg gøre, så frustration... så begynder jeg at føle mig dum."
Confusion (forvirring)	5	"Får ikke helt fat i, hvem jeg er, og hvorfor jeg er her." – " havde indtryk af, at jeg lige var ankommet på selv samme mole, og finder det lidt sært at skulle gå derud igen som første skridt." – "De næste 5 minutter går jeg rundt og ved ikke hvad jeg skal gøre, indtil jeg ved et tilfælde frembringer menu'en." – "Glædede mig til at komme ind og se hvad der foregik derinde, men øv, er det allerede slut?!" – "Prøver at samle Begoniaen op men der sker ikke noget, på trods af, at der (vist) dukker et ikon op. Det er lidt forvirrende."
Disappointment (skuffelse)	1	"Skuffes noget over, at opgaven er identisk med den første, men går friskt til værks."

Emotion matrix for the playful version

Emotions	Occurrences	Quotes
Contentment (afslappet og tilfreds)	3	”Njorn fanger tonsvis var fisk, fordi mine liljer er for seje.” - ”Personligt fandt jeg spillet ganske innotuitivt hvad styring angår.” – ”På trods af manglende forklaringer, var det relativt nemt og berigende at opdage spillets enkelte elementer selv.”
Curiosity (nysgerrig og udforskende)	1	”Efter den korte introduktion af demoens præmis, fortsætte jeg med at eksperimentere og gå på opdagelse i spillet.”
Surprise (overrasket)		
Triumph (sejr og triumf)	1	”Når nu de der puzzles var svære, så var der selvfølgelig en stor fornemmelse af success da det lykkedes”
Amusement (morskab)		
Enjoyment (fornøjelse)	1	”Da jeg første gang startede spillet, gav musikken og den lille travende figur et ganske hyggeligt indtryk.”
Unintended		
Frustration (frustration)	1	”Ideen virker faktisk ret godt men sværhedsgraden var desværre lidt for høj til hvad min tålmodighed kunne klare - hvilket også gjorde at jeg ikke fik gennemført spillet.”
Confusion (forvirring)	4	”Jeg forstod f.eks. ikke, at dybden også skulle passe, lige til at starte med.” – ”Andre gange havde jeg prøvet at grave et andet sted, for at få et andet puzzle som måske var nemmere, men uden held. Det forstår jeg ikk'” – ”En anelse forvirret fik jeg plantet det første korn, og fik løst den første puzzle.” – ”Endelig fandt jeg ud af, at jeg skulle trykke på den lille figur for at starte spillet, men igen skulle jeg være ret præcis for at ramme det lille et-tal.” –
Disappointment (skuffelse)		