PRESENTING LEARNING POSSIBILITIES THROUGH BRANCHING STORYLINES

A case study of epic proportions

Master Degree Project in Informatics
One year Level 15 ECTS
Spring term 2011

Andreas Wilhelmsson

Supervisor: Mikael Johannesson
Examiner: Per Backlund
Abstract

This paper concerns the creation and evaluation of a branching story written by the author. Branching storylines are unique in that each branch delivers a different experience, wherefore this paper poses and attempts to answer the question, is it possible to offer similar learning experiences regardless of which story path is taken in a branching story structure? As a case study, the story is written for a pervasive game, an application for Android phones. Due to the game’s design and wishing to motivate the players to move around on their own, it was written to be segmented and yet have linear, branching storylines.

The case study consisted of creating a game set at a historical site, specifically Karlsborg fort, where the story would give the players an idea of how a day in the life of a sergeant could have looked in 1865. After testing and knowledge-based questionnaires, the data body proved minute, wherefore no significant conclusions are reached; however, it is suggested story nodes are useful for giving each player equal possibility of gleaning specific knowledge from the game, gathering all storylines in event scenes where the specific knowledge is presented.

**Key words:** Serious Games, pervasive game, altered reality game, Karlsborg fort, historical sites, nonlinear storytelling, branching storylines, story nodes, learning possibilities
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1 Introduction

According to the views of narratology, games are a medium through which storytellers can spread their works in new ways (Rollings & Adams, 2003). Several games have experimented with different methods of telling stories, methods that are only possible through the unique setup of games, where the audience has the ability to move as they choose through both virtual space and the paths of the story. Popular games, such as those made by BioWare, have advanced theories of game-based storytelling behind them.

In a similar way, centers of education have developed an interest in the attractiveness of gaming. Most people, however children most often, enjoy games for the various layers of entertainment they offer; whether for the sake of escaping reality or social links, it is generally accepted that games are a popular pastime. For this reason, much research has been done on the possible uses of games as tools for education.

As the two theories, games as a medium for storytelling and games as tools for education, make their way through their respective paths, it is inevitable that they someday meet. After all, both attempt to tap into the unique potential of games. This paper details one such meeting, and attempts to discuss possible interactions between them: is it possible to offer a group of players similar learning experiences while simultaneously giving them unique and personal entertainment experiences through the game’s branching storylines?

This is then connected to pervasive games, a game genre which creates immersion for players by using the real world as its base. Classic storytelling and pervasive games seem at odds with each other, however, seeing as how they attempt to achieve immersion through different means. But are they impossible to bring together? Is it impossible to create a written-story-based pervasive game that does not challenge the players’ suspension of disbelief? Using a Serious Games approach, it would seem possible to gauge this by attempting to present learning experiences: if immersion is broken, it would not be likely the players derived any of the information presented through the story as they would not be paying attention or trusting it.

As a case study of these problems, the writing of such a story for a pervasive game is detailed in this paper.


2 Background

One of the first programs to be popularized as a game was Tennis for Two (1958). Similar to one of the most well-known and iconic games of all time, Pong (1972), it was a tennis simulator played on an oscilloscope. Interestingly enough, it was developed not only as a game for the public, but also as a physics simulator to show the capabilities of computers of the time (Kent, 2001).

Bergeron (2006) defines serious games after the following criteria:

“A serious game is an interactive computer application, with or without a significant hardware component, that: - has a challenging goal; - is fun to play and/or engaging; - incorporates some concept of scoring; - imparts to the user a skill, knowledge, or attitude that can be applied in the real world.”

Serious games is the collective term of games that, besides entertainment, also provide learning experiences, sometimes as the main focus; these could consist of applying mathematics or grammar, simulations or rehabilitation of hand-eye coordination. (Michael & Chen, 2005) The term “learning experience” is in this paper used to denote the part of, most commonly, a serious game which presents the player with an opportunity to derive more than entertainment from it, as explained above.

Not only designed for entertainment, but also to present to its players a learning experience, Tennis for Two can be defined as a serious game. Therefore, it is not impossible to claim that serious games have existed since the dawn of computer gaming.

Serious Games as a research field, however, is fairly young. Alongside technological advances, games have become a more tangible presence in the everyday lives of children and youths. It is this increased prevalence of games in society that has led many researchers within the social/organizational field of informatics to study games in order to find a way to educate while entertaining. The idea behind this is that “fun” and “engaging” equals “more learning” and Serious Games is the current major field where this view holds true.

Still other people attempt to use games’ inherently interactive attributes to achieve increasingly immersive storytelling methods. While this activity is still mostly limited to games made purely for entertainment purposes, games as a storytelling medium overall have become more popular, and therefore also as a field of research. Interactive storytelling is the unique experience games can give over books, and this is what storytellers want to tap into: “Interactive Storytelling (IS) is the research area that intends to allow the use of interactive computer systems as a new medium for storytellers.” (Barros & Musse, 2005, p. 1). This field of research tries to unify “optimal solution”-focused AI systems with the more accepting dramatic constraints of storytelling. Interactive storytelling allows the player to feel more immersed in the game world, thus being more open to what the game is to offer, and this is where IS tangents Serious Games.

Stories, according to western traditions of theatre, are segmented in acts, with a beginning, middle, and end; and they require six elements as defined by Aristotle: Plot, Character, Idea,
Language, Music, and Spectacle (Hatcher, 2000). Respectively, the acts are responsible for presenting the audience with exposition and character introduction, presentation of goal and obstacles, and finally the protagonist striving against the obstacle to reach the goal and achieving the climax.

A storyteller usually has a reason for telling a story. Fairy tales through the ages, for example, most often had morals and lessons for children to learn. In the age of Aristotle, catharsis was the state in the listener to strive for as a storyteller, where they reach a form of insight and hopefully become better persons. In movies and games, the general goal has been entertainment, however rarely also education.

In their paper, Romero, Santiago, and Correia (2004, p. 2) write:

“More recently, storytelling [Brooks 1996; Kretschmer et al. 2001; Mateas and Stern 2003] has been the focus of much attention in different types of applications, namely interactive tourism guides, education, and entertainment. Storytelling is a powerful and compelling way to present information and enable interaction, especially if the knowledge and skills learned during a thousand years can be properly transported to the digital world.”

The above paper also defines “spatial narrative”, in which the story and its telling is dependent on the player’s physical location and in which direction he or she is moving. For storytelling in pervasive games, this seems a central concept; however for this paper another term has been adopted.

Parise (2002) identifies different types of storytelling in games and explains these using the terms “node” and “path”. A story node is a segment within a game’s story where information is given or an action is expected to be performed by the player before the game proceeds, while a story path is defined by the player’s movement through and between the story nodes, from beginning to end.

An interesting thing to note in this is that, when placed in a pervasive games context where the players’ actions constitute the story, the term “story path” becomes equal to the term “spatial narrative”. The focus in this paper is slightly more weighted in the favour of storytelling, wherefore the term “story path” with its wider application is chosen.

In a linear story structure (see figure 1, below), each story node is only connected to its predecessor (unless it’s the beginning node) and its successor (unless it’s the end node), creating one story path.

![Figure 1](attachment:linear-story-structure.png)
In the case of a branching story structure (see figures 2 and 3), a story node can either be a point in the story where it branches off, creating additional possible story paths to follow, and/or a point where such branches gather:

![Figure 2 and 3 Branching story structures.](image)

The events that occur in these nodes that collect branches are therefore present in each of the possible story paths. They sometimes serve to group storylines together if they are to follow the same story path for a while, such as for games that feature several paths but one generic ending.

In the case of a book, a branching story structure could mean that certain main characters split up and the story then tells their individual experiences, respectively. A game can handle this kind of structure in more and different ways, however: the player’s actions or choices can steer him or her down an alternative story path and thus change the events with which he or she is presented throughout the remainder of the game. The entire game experience is altered this way, even if the ending of the story is the same regardless.

Increasing the complexity of the branching story structure further is the nonlinear story structure, presented in figure 4 on the next page.
Nonlinear story structure.

This story structure can allow the storyteller or player to circumvent conventional storytelling methods and is not bound by the three act structure as tightly as other methods. To give a mental image of this structure, its most common appearance is in the form of narrative “jumps” back and forth in chronology, either metaphysically or topically.

Chen (2009) discusses nonlinear storytelling and identifies that stories in general do not actually start where they begin: the audience is ushered into a world with set rules and persons at a point where certain events have already happened and are in the past. The point of the story is to tell what happens next, up until another specific point. During this telling, however, it is common that information about characters and past events is presented, such as through dialogue where characters speak of them.

The game Facade (Procedural Arts, 2008) is a good example of this. Referred to in its subtitle and presentation as a “one-act interactive drama” with a nonlinear narrative, it has the player visit the home of characters Grace and Trip, and during the game, through the player’s actions and responses, more of these characters’ relationship and background is presented. The game’s actual story takes place during a small time span in a single location. The characters’
actions are however presented to be based on a long and expansive history, of which the player only becomes aware of pieces and in a non-chronological order.

If we take as example the tragedy of *Oedipus* by Sophocles and attempt to discern how a game would tell it, we must first identify the specific important events that are identifiable as its story, such as the protagonist’s unwitting slaying of his father and marriage to his mother, and the end where the truth is revealed and the events that follow. If the theoretical game would then have a branching story structure, then those events would need to be present in each possible path for the player to know what the story concerns. The remaining story is less critical and could be substituted with other, different parts to create the story branches. Those events are then transformed into story nodes, which will occur regardless of the player’s chosen path through the story branches, and regardless of which story path is followed, the player will be lead to the same ending. Thus the player can be said to have played a game which tells the story of *Oedipus*.

An important part of the story is to achieve what is known as “suspension of disbelief”, where the audience is willing to accept things that would normally be considered unnatural or illogical, inconceivable or impossible (Coleridge, 1817). This term is within game design closely connected to immersion (Rollings & Adams, 2003), which is a term that defines how mentally involved in a game its player is. Increased immersion heightens the player’s suspension of disbelief and subsequently allows players to accept what the game presents as truth. A genre of game that can accomplish this with little difficulty is pervasive games.

Pervasive games are a relatively new breed of games that attempt to blend in the real world as they unfold. “By blurring the boundary between game fiction and reality, Pervasive Games impact the shared space of the city areas that they use as gaming platform.” (Davies, 2007, p. 1). They are capable of allowing players to escape the confines of stationary consoles and take the story further into the physical realm, and this brings with it possibilities other games would find hard to achieve. An example could be a meta-museum, where you move around the building physically, but use a mobile phone application to see through the eyes of someone who went there in the past.

There are two types of pervasive games: altered reality and augmented reality. In the former, the game attempts to make the player experience reality as different and containing elements not usually present, such as for example secret organizations for which the player runs errands to compete against other secret organizations; the latter takes reality and adds a new layer, usually with the help of technological tools. They sometimes have players viewing reality through these tools in order to see objects or read information pertaining to the game but not normally accessible through viewing the world as usual.

For this paper, the term pervasive game is commonly used inclusively for both; however exceptions are made if the situation requires it.

Story in pervasive games tends to be limited to settings and objectives, while the players’ actions become the actual story. Since pervasive games mostly have players move around physically, it could be considered bad form to break this activity by forcing them to read long
passages of text. This means that a more immersive writ story, ironically, runs the risk of ruining the player’s suspension of disbelief.

2.1 Pervasive Games
In Re-experiencing History in Archaeological Parks by Playing a Mobile Augmented Reality Game (Ardito, Buono, Costabile, Lanzilotti, & Pederson, 2007), a project is explained and discussed that concerns using pervasive games to teach students about archaeological sites. It offers a standard for gameplay for similar games:

"“Gaius’ Day” is structured like a treasure hunt to be played by a class of students: it combines the excitement of both chase and solving a case with the joy of freely exploring a place and discovering its hidden secrets. This type of game is perfectly suited to the archaeological park context, with wide spaces where students can freely move and use their intelligence and imagination to conjure up how life used to be there, by observing the park and memorizing places, names and functions.” (Ardito, et al., 2007, p. 2)

As the genre of pervasive games suggests, players moving about is to be preferred, as it and allows the game to guide the players to key locations within the confines of the site. It is also useful for suspension of disbelief: “the joy of freely exploring a place” directly addresses the immersion value of facilitating free physical movement, hinting at the connection players make between the game’s environment and their current context.

Another interesting mention in the above report is how playing the roles of historical people is motivational. The students seemed to be immersed in the game world and enjoyed playing their given roles as normal people in the time when the site was in use. Whether this is derived from the inherently immersive experience of role playing or the players’ individual interests in the social dynamic in other times, it still speaks for the use of pervasive games as more entertaining guides to historical sites.

Avery, Piekarski, Warren, and Thomas (2006) developed a pervasive game and evaluated how enjoyable and intuitive it was compared to a PC version of the same game. This evaluation was made via a method known as Rapid Iterative Testing and Evaluation (RITE), which characterizes itself by advocating user interface changes immediately upon identifying a problem and its solution, even after a single tester’s session. Inspired by Space Invaders (1978), the game was named Sky Invaders 3D. It is a first-person shooter game where the player is tasked with shooting down UFOs that are invading the planet; in the PC version, this is done by mouse and keyboard, while in the pervasive game version, players are equipped with virtual reality gear and manipulate a toy weapon to aim and attack. According to the test data, the pervasive game version was more enjoyable and intuitive; however some gaming conventions, such as locating the in-game bunker, and some issues with sun flares were met with confusion and could have been avoided through better presentation and equipment accessories, respectively. Pervasive games offer new possibilities for gameplay, but also require shedding or alteration of some conventions and standards.
In a project that is to my knowledge not yet finalized, Romero, et al., (2004) describe activities for both storytelling and gaming in what they refer to as mixed environments, i.e. the combination of real and virtual world interactions. They were developing an adventure game where players attempt to solve a robbery at an art gallery that is situated in the real world, however the paintings contain virtual worlds, and most interaction is done via applications. The gameplay consists of searching for clues, either by looking for them physically or talking to characters in the game world, and analyzing their findings to determine which step is the next logical one to take.

One thing that remains constant in these pervasive games is the notion of physical actions guided by the virtual. Where the locations of old were situated, where the aliens are descending, where the paintings and characters are placed are all questions answered by the applications, and the actions to be taken are dictated by the game’s genre, be it enact the lives of those who lived in those locations, defeat the aliens, or investigate the paintings and question the characters. The story, however, is told in different ways in each: in the first, it is created by the players as they role play; in the second, it is given to the players as the premise, where the player’s abilities decide if it ends in victory or defeat; and in the third, it is woven into the entire game and the players tug at the ends to unravel its mystery.
3 Problem

The physical result of this project is a pervasive game with branching story paths, meant to educate, entertain, and guide; it should work for a smaller group of people as opposed to a school class, as in the example of Re-experiencing History in Archaeological Parks by Playing a Mobile Augmented Reality Game (Ardito, et al., 2007).

3.1 Problem area

How does the branching story structure affect learning and learning goals? Is a branching storylines approach a viable way to present the intended information? The story needs to both educate and entertain players, and in a pervasive game, it must also function as a guide in the physical realm. This puts much responsibility on the authors of this form of story. They must not only create a well-written and immersive story that can branch off, but also research the details of the physical and historical context, working close to the learning goals and properly refer to the physical realm in the story.

While the immersion concept is not central, wherefore it is not included in the research questions, it is nevertheless important to consider, as it facilitates the learning experience. A story that does not appeal to the audience has little chance of properly delivering the message.

This work attempts to bring together the three fields of Serious Games, story-writing, and pervasive games in a case study. Considering the research questions mostly revolve around the creation and perceiving of the user experience, it could similarly be classified as being within the social/organizational field of informatics. This means that my work might be used as reference not only as a method of writing stories that fit in the junction of these fields, such as the case study in effect, but also for those who would venture into it for other reasons as an aid and guide to the minute details of their interactions.

3.2 Research Question

How can I write a story with a branching story structure that offers the same learning experience regardless of which story path is taken?

It should be noted that the relationship between fictive and factual is assumed based on how the question states that I would write the story, meaning it would be fictive and not a historical recollection, and that it should offer learning experiences, meaning there should be some form of factual knowledge to be gained from experiencing it.

A more case-specific question would be: can I through a branching fictional story give the players of a pervasive game an understanding of what a day in a sergeant’s life could have looked like in 1865?

The case-specific question allows me to discern if the chosen method is viable, and therefore serves to answer the general question as well: a “yes” would infer that this is indeed how I can make one, whereas a “no” would infer the opposite.
Through measuring the number of accurate answers on a test and comparing the score to each individual tester’s attributes, it is possible to deduce whether or not the subject has derived any understanding from the game. If subjects, regardless of story path taken, achieve a fairly similar score, and these scores are fairly high, one can deduce, as apparently the different story paths have not affected the learning, that having story nodes is a valid method to present relevant information in a serious game with branching storylines.

Derived from the two questions and the terms they utilize, the following points can be discerned as guidelines in creation of the story:

1. **The story is fictive but based on historical facts**
2. **The story is divided into more than one story path**
3. **The story paths have a common beginning**
4. **Each story path is divided in segments on linear paths**
5. **The player can affect which story path they follow**
6. **Each story path presents situations and information that could be present in the defined environment**

Point 1 and 6 are derived straight from the questions, and corresponds to the learning experience the story is to offer, whereas points 2 through 5 are included in the mention of the branching story structure. Points 2 through 4 specifically are apparent should one examine figures 2 and 3 in the background section. There exist exceptions to point 3, but these are irrelevant for this project.

Point 5 is the pivotal point for the gameplay, as it would cease to be a game if the players were stripped of the ability to control it.
4 Case study

For the case study for the project detailed in this paper, it was decided to use the ongoing Karlsborg fort project.

The Swedish city of Karlsborg is at the time of this document’s creation working hard to make its fort become a more popular tourist attraction. The construction of the fort started 1819 and went on for about 90 years (Kartaschew, 1999). Situated further away from the Russian border than the capital, it was meant to house the king and the national reserve in case of an enemy attack; however, at the fort’s completion, wartime technology had advanced so quickly that the fort was already outdated. While it has always been a site in military use, the tourism agency in Karlsborg wishes to see it used for more purposes. To this end, they have taken up contact with the University of Skövde, and the university has responded by having game students produce several games with a Karlsborg fort theme.

4.1 The game

From early on, it was decided the main character would be one that acts as antagonist in another Karlsborg fort project. This was in order to tie in with other Karlsborg experiences, bringing more people between the two projects and creating a bigger impact on those who visit. Seeing a game that explores the motivation of an antagonist from another story would perhaps seem attractive to people. It also lends the game an established context.

Originally, the game was meant to take place inside the fort, where the players would follow messages through rooms and, through clues, determine which path to take next. The application was to use GPS; however, there were issues with GPS-reading inside the fort, wherefore the game area was changed to the outside. Players move between specific zones to play and eventually complete the game, with the story acting as guide and motivation.

It's difficult to plan ahead where the players will be and what they'll do, (Davies, 2007) but the game’s designer attempts to steer them towards the goal. For this game, several different ways of doing this were considered, some of which involved showing icons on the screen as the player was close to something important, and arrows that showed which direction the player should go. Ultimately it was decided that the main character would always be present on the screen, with a text bubble of him thinking about where to go, as this keeps the technical complexity down somewhat as well as further envelops the player in the game world. By having a story element, i.e. the main character, ever-present and acting as guide, the players will learn to trust and believe in this character. This in turn increases their submersion into the game world.

4.1.1 Game overview

The game genre is “Location-based augmented reality game”. It is a game where the players move around in the real world, visiting key locations while following a fictive story told on their Android mobile phones. For an example of what the game looks like in action, see figure 6.
Setting the context, players are told the Android mobile phone acts as a window to the past, where the main character of the game, Sergeant Adolf Stålhammar, is the focal point. At certain hotspots, where the connection is strong, the players are able to effect his actions. They are then given the objective of finding the first hotspot, where the game’s story will begin following a day in the main character’s life.

To further guide the players and connect them to the physical site, as well as to lend those without consoles a role, they are also presented a map with certain key locations specified (see figure 5, below).

![Map of the Karlsborg fort area](image)

Figure 5 The map of the Karlsborg fort area, used for the game.

The numbers are merely for sake of reference, and do not in any way dictate a path for players to follow. In fact, most of the marked locations are not included in the game and only act to give players more of a context.

The gameplay consists of two modes: story mode and search mode. In story mode, which is entered by reaching hotspots and/or clicking on game characters on-screen, players read dialogues between game characters on the screen, and receive objectives, hints, and information pieces. Mostly, players are expected only to read and advance the dialogue by clicking a button on the screen, however sometimes they are also presented with options for different replies from the main character. These options effect further dialogue and are also the means by which the story path is chosen.
Figure 6 People enjoying the game’s immersive story.

In search mode, which is initiated automatically whenever a story segment is finished, players are expected to search for the next hotspot, where the next dialogue sequence will occur. During search mode, the screen shows the main character and his thoughts, which serve to guide the player towards the next hotspot with varying degrees of clarity. As the story dialogues concern locations marked on the map, and the thoughts mention physical objects in the players’ vicinity, players may use both the map and their surroundings to find the next hotspot and thus also the next story segment.

The search mode is also why physical map was chosen above an addition to the application: a map that is removed from the device allows the screen with its hints and connection to the story to be more readily accessible to players. This ensures they are not shifted outside the story and immersion is maintained. It does however optimize two-or-more-players sessions while hampering the experience in case of a single player having to utilize two different objects. Fortunately the map is small enough to carry in one hand, so the only major loss is that the player is forced to pay attention to the environment in shorter, more focused, bursts.
5 Method
As I moved into this work, I had only a base idea of how to develop a pervasive game. Fortunately, my work could for the most part be detached and rendered independent on the game genre, making the challenge two-fold: to write a story that could be divided into segments without disrupting game flow; and in the story refer to existing objects within the player environment that could serve as clues and guides. As a pervasive game, the place where the game takes place is closely connected to its story. This allows the physical area to serve as aid as long as the game does not break this connection, such as by suddenly presenting a scene that takes place elsewhere.

5.1 Learning goals
As a serious game which attempts to impart to players understanding, it is important to keep the learning goals in mind while writing the story. Incorporated in the game’s story are simple knowledge pieces, mainly social opinions that held true in the military environment of 1865 and were integral to a person’s worldly awareness in that day. These things include Russians being a constant threat, alcohol being the pastime of choice, and a clear-cut social class system, as it takes place within a military environment. The story strives to make this clear without making the dialogue between characters unnatural.

Examples of solutions follow:

5.1.1 Educate

“Kantänka gårdagen bestod av mycket bultintag? Jag märkte att du sov alldeles utanför uthuset.”

Roughly translated into, “mayhap yesterday consisted of much ‘bult’-imbibing? I noticed you were sleeping right outside the outhouse”, this passage serves as reference to the effects of the local beverage of the time, “bult”. Bult is a mead-like alcoholic drink with recorded laxative effects. The importance of this beverage becomes more apparent as the name of the current local ice cream cafe, “Bulta-Majas Glassbar”, named after the hostess of the time period’s favored bar, who in turn was named after the beverage.

The indirect reference to this laxative effect is important to note. As it does not clearly state that the player is supposed to learn something, it allows the dialogue to flow naturally, without removing the player’s suspension of disbelief.

5.1.2 Guide

“Han slank iväg uppåt vägen. Mot kommendanthuset gick han.”

“He went up the road. Towards the commander’s lodging he went.” While this works better in context due to where the players are situated when they receive this message, outside of context it still clearly states that the next location is the commander’s house.
5.1.3 Entertainment

"Den bästa motivation som finns är min piska."

“The best motivation there is, is my whip.” The character Adolf Stålhammar is said to have been very eager to use his whip on the workers. While this would probably be considered cruel by today’s standards, it was accepted in the time period, and as such serves both to educate and, in the surprise players experience in such an unexpected comment, entertain.

5.2 Story design guidelines

As stated in the problem section, these evaluation points are to strive for, ergo acting as guidelines, during the design of the story:

1. The story is fictive but based on historical facts
2. The story is divided into more than one story path
3. The story paths have a common beginning
4. Each story path is divided in segments on linear paths
5. The player can affect which story path they follow
6. Each story path presents situations and information that could be present in the defined environment

The goal of the story is less to impart factual knowledge and more give an understanding. Facts can be presented in other ways, such as museums, where the audience can go about it at their own pace and learn in depth about that in which they are most interested. Still, for there to be any form of learning experience regarding historical sites, it would be improper to base a story on pure conjecture. For this reason, point 1 is of utmost importance.

Points 2 through 4 are all based on game design principles for story-writing, however substituting the term “scene” for “segment”, and the theory of branching storylines. They can act as guidelines for planning story structure. Drawing a map of the entirety of the story using nodes and paths helps to identify whether these criteria are reached or not.

Point 5 is a gameplay issue, and requires some forethought to be placed into the game design rather than just the story. It is nonetheless an important point, as the potential of a story that features multiple paths would be squandered if the game did not allow its players to explore more than one of them. Not fulfilling this point renders the game less of a game and more of a storytelling session. In the case of a pervasive game with an intended learning experience, it also limits said learning experience and the game’s ability to act as guide to a historical site.

Point 6 connects point 1 to what the opening paragraph of this section spoke of the physical area of the player. This is the medium through which the player is given understanding, by allowing them to place the story with its intended learning experience into the context of the historical site upon which they are standing.
A theoretical point 7, “the story paths have a common end”, could be presented. However, as this is not actually part of the research question and only part of the specific goals of the project, as a solution to case-specific problems, it is not listed among these.

To evaluate these points, a questionnaire was conceived (presented in section 5.6). Evaluating understanding is difficult, however, as its nature is subjective and tools to quantify it are similarly difficult to read. Therefore, the questionnaire was designed to draw from the subjects answers that could be used to derive hints towards whether or not understanding had been imparted.

Having “fuzzy” directives also gives the player more room for interpretation and decision-making. According to Sorens (2008), giving the player a more definite role gives them more of a feeling of creating, or “writing”, the story. A goal that is connected to the story is more motivational; “go here and find an item” is less fun than “go here, where person X once did Y, and find an item to present to the king to marry the princess” (Sorens, 2008).

However, according to Adams (2004, p. 1):

“The difference between a challenge and a choice is that a choice does not require that the player work to achieve anything (although the choice can be difficult to make up your mind about). As a result, there’s no built-in presumption that a good choice should produce a reward, or even that there is such a thing as a good choice. Of course you can build in right and wrong choices leading to good and bad endings, but be careful – taken too far, this leads to a moralistic, preachy game. A more interesting approach is to offer the player morally ambiguous choices and explore some of the possible consequences of them.” (Adams, 2004)

Clear goals are important for motivation, as they provide players directions or suggest what possibilities exist. “Fuzzy” directives are therefore risky if the player doesn’t understand them; the story should present and explain the situation well enough that players are able to discern the meaning of their decisions, while any “fuzziness” should be left in the player’s conscience as they consider their options.

5.3 Implementing learning experiences
This project had two main challenges for the learning experiences: maintaining immersion and offering similar learning experiences in each path of the branching story structure.

Immersion can work to ease learning experiences onto players, seeing as how an increased susceptibility of the story’s turns also increases susceptibility of meaningful messages in it. Learning experiences, however, can break immersion if they are too apparent: players will notice the story’s flow changing to incorporate learning goals, and this makes them incredulous to the message. Learning goals must therefore be integrated in the dramaturgical writing in a natural way, that it does not break immersion.

The story must also accommodate for its branching story structure: there should be no discrepancies in the flow of the storyline regardless of which path is taken. More importantly, as players should emerge from this game with similar understanding gleaned regardless of
story path taken, each path should provide relatable learning experiences. This means comparable knowledge pieces need placement across each path.

This section aims to delve deeper into each of these problems.

5.3.1 Maintaining immersion: the impact of the search mode

Immersion can be created both through dialogue flow and physical movement; however these are at odds with each other. As such, there is a contrast in working on a heavily text-based story for a pervasive game. The design of the storytelling must take the physical gameplay in mind, and not work against it. In an attempt to have the two opposing forces work together, the game takes on a flow that has players alternate between search mode and story mode.

To explain in further detail, while the players are in search mode, they are physically moving around, paying attention to the surroundings and the map to find the next location. They only look to the game screen for hints. Contrary to this, in story mode, they are focusing on the game screen and the text to follow the story. The physical location becomes less important at this point.

For this reason, the story attempts to bridge the gap in a natural way through its implementation: similar to smaller, self-contained stories, each scene at each story node has an introduction, a discussion, and an end.

The introduction works for the story to introduce new elements, such as characters. It sets the story context for the following discussion, while connecting it to past scenes. For the physical element, it also attempts to usher the players into reading mode after having been focused on the surroundings. This is done by means of: surprise, such as introducing the commander Bergenstråle character in a scene before the next target location is reached; comedy, such as the privates’ fumbling speech about gold when the main character investigates their odd behavior; or rewarding the players with success, as in the case where the main character grabs the Råttan character before he manages to sneak off again.

The discussion is the largest part of most scenes. With its heavy focus on argumentation and exposition, it works to motivate the actions of the characters and add more substance to the overall story. It is in the center of the story scenes, placing it as far away from the search mode part of the game as possible, and thus where the players are hopefully the most focused on the text. This makes it the most fitting container for learning experiences and story-based player decisions.

The end of each scene serves to explain to the players their next objective and act as motivation to strive to reach it. It gives the player their next destination, and a general sense of direction to guide them there.

In the interim between scenes, i.e. during search mode, there are hints and thoughts from the main character. While these exist mainly to guide the player to the next physical location, they also serve the story in that they present players with opportunities to peer into the personal opinions of the main character. Referring both to past and future scenes, they keep the players
connected to the story during the time absent from it, and allow them to understand the main character better.

5.3.2 Similar learning experiences: the impact of the branching story structure

As is continuously mentioned throughout this paper, the game would feature two differing paths: one path would have the player trust the advice of commander Bergenstråle and hunt down Råttan; the other would be to disregard the advice and accidentally happen upon Biffen, Råttan’s father. The players are left to their own preferences and logic in deciding which option to make, however the main character presents his opinions about weighing the commander’s rank against the uncertainty of the advice to motivate discussion before the decision is made.

The paths differentiate themselves in dialogue and events before the ending. More importantly, they differ in that the first path has the player wring out information from Råttan about the Russians’ involvement in the story, while the second has the player using alcohol to bribe Råttan’s father for information on his son’s whereabouts. Both the Russians and alcohol were important concepts in this time (Kartaschew, 1999), wherefore they are present in this game.

However, as both storylines attempt to offer the same learning experience, it is unacceptable that these pieces of information are only present in one each. This problem is remedied by reiterating the perceived threat of the Russians in the end scene, where Stålhammar explains his plans to Råttan and two soldiers, and by each character the players meet before the branching node making some mention of alcohol, such as staff sergeant Lagom offering Stålhammar a “pick-me-up” in the second scene. Both of these scenes are nodes the storylines share, which allows players to see each of the two information pieces regardless of path taken.

5.4 The story at work

The area where the game would take place was originally planned to be an indoors area. The story was to make the player feel less limited as they move through the rooms and corridors of the fort, to create a more lasting experience. To this end, it would feature branching story paths, adaptable depending on the players’ actions and choices. Each story path would also sport its own ending as an additional way to motivate several play-throughs.

In the end, due to GPS issues, the game was set outside, and in order to prevent confusion amongst players due to the size of the site and also due to time restraints, it would be less mystery-based and more linear. The branching story path concept was retained; however they would share the same ending. This was to gather the players in one spot after playing, as abandoning players at a spot that might be far from the starting point would no doubt incite annoyance. Compare this to a regular guided tour: while it is true that tours do not always end in the same place they began, the guide is still present and may continue to act as guide until the entire tour group has disbanded. This was solved in that the main character as foreshadowing in an early scene orders two minor characters to clean up after him at the site of the beginning node, then in a later scene requests other key characters to meet up with those minor characters as well as himself in that place.
Despite being fictional, the story would also feature a learning experience in that it should give the players an understanding of everyday life during the fort’s original military use. As the main character was chosen to be another Karlsborg project’s antagonist, a sergeant named Adolf Stålhammar, this provided us with enough of a defined setting to specify what manner of day the players would experience. The story introduces the game world and its main character slowly, and through the impact of the players’ choices gently makes them more empathetic towards him and eases them into his shoes. Most of this is told through dialogues and monologues, and so to give players a peek into the life of a sergeant at the Karlsborg fort in 1865, the story uses language and suggests conduct that was common in those times.

The flow of the game consists of players finding their way to specific locations, where they are rewarded with story segments within which lie hints towards where to head next. This results in the story being divided into scenes, which constitute the nodes in a branching story structure. Nodes are useful in that the off-shoots of a branching story path can be collected in a single story node before continuing, allowing the game to feature multiple story paths and still gather the players in the place where the game began, if the beginning node and the end node are in the same location.

Due to the impreciseness of the technology, the story needed to be fuzzy about exact locations to allow for more of an error margin. Players would be confused if the story explained an event on a location that looks nothing like where they are situated at that point. Alternatively, it might impart a mistaken understanding as they might believe the current location once looked like what is being explained. This was in theory solved by using general directions such as “towards the corner of the building” and then allowing the players to move to any corner of said building and still be rewarded for going to the correct zone.

To guide players to the specific locations, much work was put into field investigation to make sure all story references to the physical site were accurate and suggested whether the players were going the right way or not. Placement of zones was also important. One example of this is the above-stated, where a zone was placed at the corner of a building, and the next destination was another corner of the same building; the plan was to allow players to continue on to any other corner. In early testing it was found to be confusing for players to not have a corner specified. By placing the first node a few meters further up beside the wall of the building as opposed to the first corner, and changing the stated direction to “towards the other corner of the building”, it became more natural for players to continue on to the next corner, and the flow of the game was improved in that part.

Adding to this, directives must be fuzzy enough to allow space for the players to make decisions without leaving them confused. The aforementioned example after the changes is intuitive but does not pose much of a choice, as there is one single, clear path towards the corner. Most other zone-to-zone travel allowed players more freedom in deciding which way to go to reach the next location. Guiding them without writing the most optimal solution on their nose was done the map handed to them, which showed the various locations mentioned in the story, along with a few others that had no direct bearing on the story. The player holding the game device would read the story out loud, mentioning the next stated location,
and the player responsible for the map would consult it and orient themselves to find which direction to go. They also received guidance during the travel through the several layers of hints among the main character’s thoughts that appeared on-screen between story nodes: there exist both timed messages that appear after specific time periods have passed and messages that depend on the player’s location. Among the first, the early messages are vaguer regarding directions, and serve more as space to present the main character’s thoughts and emotions. In the case of players taking a long time due to being lost, later messages are more specific about directions. Among the location-based messages, some act as encouragement, such as saying the next location is not far away, if the players move from a zone that is further away to one that is closer to the target zone. In the opposite case, the messages act as error notifications, often humorously to not make the players feel guilty, such as the main character contemplating the possibility of his mind still being under the effects of alcohol.

In such a way the interaction between players grants them access to two specific guiding devices, one of which furthers the storytelling and maintains immersion, while still being allowed freedom of choice and physical movement.

This interaction also works to have the players share the learning experience. The story presented on the screen is the vehicle for the information pieces, wherefore a dialogue between players is necessary to pass them on to the map-holder. The solution for this lies in the aforementioned design as it is much easier for the players to relay information to each other than leaving each to their own whims. The game’s design itself motivates teamwork and discussion, as does the story: the players are at certain points presented with dialogue options where they are to decide what the main character is to do. Discussion arises from these naturally as the players attempt to weigh the options against each other.
5.5 Testing and evaluation of the game

As the intended audience of the game is people aged 20-30, i.e. the identified common owner of Android phones, subjects were found on and around the University of Skövde area. The test group consisted of six testers. They were taken to the Karlsborg fort, where they were asked to play through the game once.

The only information subjects were given was that they would play a pervasive game, where they follow a character through the mobile phone, which acts as a window to the past when the character lived. In specific hotspots they could control the character slightly, while everywhere else the connection was weaker and they could only hear the character’s thoughts.

After this, subjects were instructed to play in pairs, one being responsible for the mobile phone and the other of a map of the compound with certain places, which might or might not be important, marked. Originally, the plan was to guide subjects to play specific story paths, however in the end they were allowed to play it freely.

Subjects were observed while they played, having been asked to pretend any observers were not present.

To test understanding, after playing through the game, each subject was given a simple knowledge test with open questions to gauge if they picked up any of the important pieces of information the story offered them.

The subjects received individual points for each accurate information piece they mentioned on questions where they were expected to give them, provided this information piece was present in the story: if information submitted was gained from other sources, this would not completely negate the use of the answer sheet, however it would require further analysis as to which parts had been compromised. Point values were compared to specific responses to the remaining questions to look for trends.

The subjects’ answer sheets were then divided up in groups depending on which story path they took and each group’s average point value was compared. As players are assumed to gain similar knowledge regardless of story path, it would seem logical to infer the groups would get overall similar results on this test.

5.6 Questionnaire

To attempt to gauge understanding, a simple freeform knowledge test was given to each individual subject, asking about a few terms that are brought up in the story. Some questions can either be answered correctly or incorrectly, some have several possible accurate replies, and still others seek to attribute the subjects various traits for grouping purposes.

The questions of the test, and their respective motivations, were as follows:

1. In what time period (i.e., about what year) do you imagine the game story took place?
This question aims to see if the subject has picked up in what time period the game takes place.

2. Do you after playing this game find yourself with any form of information or understanding pertaining to the time period? If so, could you specify?

General question to pick up what the subject has learned, without contaminating the response with hints.

3. Did you find the characters to be believable, when considering the time period?

Easing the subject into thinking about the characters; also touches upon whether they actually believe what information pieces they picked up.

4. What kind of social environment do you imagine for these characters in the time period?

General question to see if the subject has an image of the general environment of a sergeant at this time.

5. What would you say were the main worries of the people of the time period?

This aims to glean what the subject has picked up about general worries of the time, such as the Russians, protocol, and alcohol.

6. What kind of character would you say Stålhammar is?

Tries to have the subject define what they thought of the main character. It also ties in with his perceived credibility, and therefore, representative of his role as an instrument of learning.

7. Did you experience any kind of social class system in effect throughout the game?

This attempts to see if the social status differences were apparent to the subject.

8. Place the following characters on a rank order scale of their social importance: Stålhammar, Rättan, Lagom, Bergenstråle.

A follow-up question, this investigates whether each character’s social status was apparent.

9. Did anything in the characters’ behavior get your attention? If so, could you specify?

General question that attempts to close in on the subject’s perception of specific behavior in the story.

10. Did you find those actions to go against socially acceptable norms, when considering the time period?
Forces the subject to consider if any actions they noted were representative of the time period.

11. Did the objects in the game story get your attention? If so, could you specify?

General question that attempts to close in on the subject’s perception of the specific items in the story.

12. Do you imagine those items to be misplaced, when considering the time period?

Forces the subject to consider if the items were representative of the time period.

13. Did any of your answers to the past questions come of prior knowledge of the historical Karlsborg setting and/or the character Stålhammar? If so, could you specify?

This investigates if the player had any prior knowledge of Karlsborg or the main character, and if they actually used it while responding to the questions.

14. Which story path did you take – happening upon Biffen, or chasing down Råttan yourself? You may feel free to not give this question an elaborate answer.

This question simply defines which story path they took.

Questions 1, 2, 4 through 8, 10, and 12 correspond directly to the problem because they gauge, whether directly or indirectly, if the players have gleaned the type of understanding the story is meant to give.

Questions 3, 9, and 11 are tied to the players’ experienced immersion, which ties them to the problem indirectly. As previously stated, immersion is a means by which learning is facilitated, and while it is not a main focus of this project, it would be careless to omit it.

Questions 13 and 14 merely serve to divide the answer sheets in the corresponding groups based on story path taken and if the player had significant previous knowledge.
6 Conclusion

The data mass is much too small for any significant conclusions to be reached. However, it could still prove valuable to investigate and discuss what the results might suggest.

6.1 Results

In table 1, shown further down, the questions are numbered in the same order as they were presented in the testing section.

Subjects were given a random lettering ranging from A to F. Answers to points questions are presented as the point value the subject received on that specific question; if more than one accurate response is possible, the score value is stipulated to the right of the question number in (Number of accurate mentions=Point value received) format. Answers to other questions are presented as what specific relevant notes the subjects gave. The minus (-) and plus (+) marks on question 6 denote whether the replies were mostly negative or positive, while the Bs and Rs on question 14 represent the Biffen- and the Råttan-path, respectively.

<table>
<thead>
<tr>
<th>Question</th>
<th>Correct answers/subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B C D E F</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0 0 1 0 0 0</td>
</tr>
<tr>
<td>2 (0=0; 1=1; 2+=2)</td>
<td>1 2 1 1 1 0</td>
</tr>
<tr>
<td>3</td>
<td>Yes Yes Yes Yes Yes Yes</td>
</tr>
<tr>
<td>4</td>
<td>1 0 1 1 0 1</td>
</tr>
<tr>
<td>5 (0=0; 1-3=1; 4+=2)</td>
<td>1 1 1 2 1 1</td>
</tr>
<tr>
<td>6 (Negative (-) or positive (+))</td>
<td>- - - + -</td>
</tr>
<tr>
<td>7</td>
<td>1 0 1 1 1 0</td>
</tr>
<tr>
<td>8</td>
<td>1 1 1 1 0 1</td>
</tr>
<tr>
<td>9</td>
<td>Whip None Greed, aggressiveness Aggressiveness Whip, aggressiveness None</td>
</tr>
<tr>
<td>10</td>
<td>1 0 1 0 0 0</td>
</tr>
<tr>
<td>11</td>
<td>Whip None Gold Gold, alcohol, whip Alcohol Gold, alcohol</td>
</tr>
<tr>
<td>12</td>
<td>0 1 1 1 1 1</td>
</tr>
<tr>
<td>13</td>
<td>None None None None Stålhammar None</td>
</tr>
<tr>
<td>14 (B=Biffen, R=Råttan)</td>
<td>R B R B R R</td>
</tr>
</tbody>
</table>

Table 1 Each subject’s point values and replies to each specific question.

Dividing subjects into groups based on which story path they played and presenting their individual scores gives us table 2:
<table>
<thead>
<tr>
<th>Råttan story path</th>
<th>Biffen story path</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 6</td>
<td>B 5</td>
</tr>
<tr>
<td>C 8</td>
<td>D 7</td>
</tr>
<tr>
<td>E 4</td>
<td>F 4</td>
</tr>
</tbody>
</table>

Table 2 Subjects are divided into groups depending on story path taken, and their individual score is presented.

The highest scoring subjects were C and D, with 8 and 7 points respectively. The other traits these two shared were that they responded the characters’ aggressiveness and gold was of note, on questions 9 and 11, respectively. Of note is that these subjects played through different story paths.

As shown in table 1, subject E admitted to having previous knowledge of the protagonist, and should therefore have scored higher than the others – however, as is shown in table 2, this person actually managed to score the lowest together with subject F. This could suggest that the subject’s previous knowledge acted as a hindrance to the learning experience. For the sake of understanding the message the game’s story intended to give, it would seem wise to play this game before experiencing other projects featured.

All subjects replied with finding the characters believable. Most of them obtained an overall negative image of Stålhammar, mentioning his whip, greed, and aggressiveness. Interestingly enough, however, the subject with stated previous knowledge responded with a more positive view. This either suggests that Stålhammar’s role as main character lends him a more tolerable demeanor compared to other sources where he is featured, or that the story presents him in a way that allows people who know of him to better understand him. Regardless, for the sake of appreciating the main character, it would seem better to partake in other projects in which he is featured before playing this game. On the other hand, this goes against the previous suggestion that this game should go before other projects to derive more use from its informational content. It then becomes a matter of deciding whether to use it for entertainment or as a learning tool.

The test results show no major difference in average scores between the groups. Of note is that both of the absolute lowest scores were given to subjects in the Råttan group. These two subjects have nothing else of interest in common, wherefore these results suggest that the Råttan story path is generally less effective as a learning experience. The Råttan group achieved one point lower at worst and one point higher at best than the Biffen group, however, making the average score equal. There were also more subjects in the aforementioned group, which means randomness could be attributed to the lowest and highest scores respectively, which would refute the idea of the Råttan path being inferior as a learning experience.

While the data amassed is miniscule, one could still attempt to reach a precursory conclusion. As no major difference in average scores between groups is evident, the results seem to suggest that each story path gave subjects similar learning possibilities. If true, this would mean that a branching storyline approach, with story nodes collecting players to present important information, is viable to offer learning experiences through storytelling.
6.2 Discussion and future work

As this paper began, it could be said serious games have existed since the beginning of computer games, and yet interest in using games for learning is a few decades young. The research field of Serious Games is even younger; however, due to its premise of using fun to facilitate teaching, its use in current society is certainly promising.

On the other hand, using storytelling for learning is as old as the first fairy tale to use morals to impart an understanding of social conduct in children. Stories have been entertaining and teaching people since as far back as scholars have unearthed them. However, as the breadth of subjects to teach has increased with the rise of our current civilization, fairy tales with single morals are not necessarily the best medium to spread specialized knowledge while providing entertainment.

It is only natural to want to reach a space where both educators and storytellers are capable of working together with serious games-producers, creating games that offer both great learning possibilities and interesting, entertaining stories. As the results of this research suggest, merging them together is at least not detrimental to the learning experience or the entertainment the game offers. Perhaps a pervasive game is necessary as medium for this to hold true, but a platform shared between the three disciplines is nonetheless an attractive goal that could prove to be key in advancing each field’s individual research.

Many people study games to attempt to find a way to educate while entertaining. Gaius’ Day (Ardito, et al., 2007) is an excellent example of this, as it tries to not only teach children about historical environments, but also keep their interests up through presenting it as a game.

One of the greatest challenges with teaching is that the would-be students do not always agree with the lessons. Naturally, the way the information is passed along needs to be tailored to suit those who would be the receivers and this is where entertainment can come into play: most people can appreciate having fun while learning something useful.

Pervasive games are capable of allowing players to escape the confines of stationary consoles and take the story further into the real world, and this brings with it possibilities of immersion other games would find hard to achieve, especially the simulators within Serious Games which offer no story to motivate players whatsoever. It might therefore be of particular use to continue considering pervasive games in Serious Games research.

Still other people attempt to use games’ inherently interactive attributes to achieve increasingly immersive storytelling methods. Facade (2008) limits the layer to a single place, both physically in front of the computer screen and virtually in Grace and Trip’s apartment, but in the player’s interactions with the game characters, decades’ worth of information and story is offered. Despite being bound in both the virtual and the real, players have access to a vast temporal array of information through the story’s imagined space alone.

If one were to blend the possibilities of this imagined space, created through storytelling only, with the possibilities of the physical freedom of pervasive games, what possibilities would appear? Romero, et al., (2004) explore this mixed environment for the sake of presenting a
detective novel and encourage logical thinking in its players. While their work is to my knowledge as of yet unfinished, it seems natural to assume one would be able to fit entire tours of historical sites and museums into single, entertaining game experiences.

This creates a great opportunity for anyone who wishes to increase the awareness of a specific subject among the public. Historical site or no, wrapping the information of a place or item in a story with drama and mystery makes it much more interesting for someone who knows nothing of it to learn about it. Interest in that place or item increases as it becomes more relevant and important to the person. Generally, if a person partakes in an experience where they are put into the role of someone with a direct connection to a place or item, an affective bond is created, which in turn could be utilized to increase the amount or quality of learning (Laitila Ekelund, 2010).

In his master thesis work, Laitila Ekelund (2010) examined whether emotional learning, i.e. where players’ learning is supplemented by affective stimuli, has any effect on learning, and if factual informative games are better suited to facilitate it. While the study doesn't prove a significant difference, it suggests affective learning is at the least not less useful than informative learning. This, along with the aforementioned possibilities, creates enough motivation to test my method’s viability.

My work may be small in that it does not provide significant results to prove my theories are applicable to create a space where all of the aforementioned areas of research can gather and work together flawlessly; however, it is my firm belief that the proposed method is a promising way of using interactive storytelling to implement learning possibilities in a game while also functioning to augment the exciting pre-existing game features. The results suggest interesting possibilities which garner further research. Therefore, for future work, I suggest performing similar experiments at a greater scale, with a game that features more possible story branches. The list I presented in this work could well be customized to include case-specific goals for such a project, and improved by adding points I have overlooked or altering points that are too strict or too imprecise.
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Tennis for Two (1958) oscilloscope game. William Higinbotham.