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Master's Thesis
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Towards Adaptive Game Design: Personalization Based on Player Behavior

Keio University
Graduate School of Media Design

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A Master's Thesis
submitted to Keio University Graduate School of Media Design
in partial fulfillment of the requirements for the degree of
MASTER of Media Design

Athanasia Tsatsara

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Abstract of Master's Thesis of Academic Year 2018

Towards Adaptive Game Design: Personalization Based on Player Behavior

Category: Design

Summary

As an interactive entertainment medium, video games are capable of tailoring their content to the individual player on run-time as opposed to the one-size-fits-all approach. This player-centric game design approach is called adaptive game design and is a promising field that can help designers raise their players' engagement in new ways. Specifically, feature-based adaptivity can aid designers understand what type of game content the individual player prefers from their game and adapt what type of tasks or quests the game presents to each player to suit their liking.

This research explores the design of a methodology for game task personalization by modeling the individual player's behavior into types defined in the Brainhex player typology model. By tracking the player's choices inside the game, we categorize them in Action oriented or Aesthetic oriented and present them quests designed to suit their player type.

To measure the effectiveness of the method, we developed a test game and correlated the detected player type inside the game against the self reported data from the Brainhex questionnaire. Our method showed positive results for the use of in-game behavior as a metric for player type detection. Additionally, we developed a quest for each player type and compared the user's experience with each of them. The results favored the personalized version and gave us valuable insight into possible improvements of the method.

Keywords:

design, game design, adaptive games, player modeling, quests

Keio University Graduate School of Media Design

Athanasia Tsatsara

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Chapter 1

Introduction

Games have gained their place in the spotlight the last decades in both academia and industry. Surveys show that over 60% of Americans play videogames and videogame sales brought $23.5 billion in 2015 [1]. In academia, games are being explored as an opportunity to create interesting learning processes and even invoke behavioral change. However with so much game content being produced and readily available thanks to platforms like Unity[2] and markets like Steam[3], the greatest challenge a game developer faces is to ensure that players will enjoy their games and be engaged enough with it that they will keep playing it instead of becoming another not-installed title in their game library.

One way to appeal to multiple audiences and maintains user's interest has been to design multiple different ways for the player to approach problem solving and tasks in the game. A quest in the game might have a violent confrontation or a peaceful solution if the player makes the correct sequence of choices. While that approach can offer the player agency in the game and a variety of outcomes, it can be complicated for the player to navigate all the possible outcomes and can ultimately burden the user with too much content they are not interested in.

An alternative way that maintains the wide variety of content in games but takes the burden away from the user and onto the designer is to tailor the game dynamically to appeal to each individual user and create a unique personalized

[1] https://www.statista.com/statistics/748835/us-gamers-penetration-rate/

[2] https://unity3d.com/

[3] https://store.steampowered.com/

experience. This approach to design is being referred to as *adaptive* gameplay.

Adaptive game design is a player-centric approach to game design that focuses on the dynamic customization of game content, whether that's mechanics, dynamics or aesthetics, based on predictions of the individual user preferences, play style or skill. Adaptivity can find different forms in games but for this research we will focus on player modeling approaches as proposed by Charles et al. [12] in 2004. Player modeling aims to create a profile of some aspects of each player which can be used as a tool for determining appropriate content adaption.

The concept might seem foreign but it is quite similar to personalization in popular websites such as Facebook or Amazon that automatically recommend news or items based on user modeling. User modeling is without a doubt a very precious tool for those websites and can have the same impact for game designers and players.

Although the concept of game adaptivity is appealing, examples of it in commercial games are scarce and we can assume some of the reasons why. Firstly, predicting what a player wants can be a daunting task that requires a lot of resources and secondly an adaptive system runs the risk of taking authorial control away from the game designers. Most importantly, even if the previous problems are solved we do not know whether the potential gain is enough to justify the effort behind it.

Fortunately, those challenges are not daunting enough to stop researchers and designers from pursuing them and create different frameworks and implementations of adaptive games. One examples of adaptive gameplay in a commercial game is Silent-Hill: Shattered Memories [4] a psychological-horror game that used a psychological test conducted by an non-playable psychologist character inside the game to create a "psyche profile" for the player and adapt elements of the game like enemies and characters to invoke horror on a more "personal" level.

On another note, researchers have attempted to enhance the sense of flow [14] by dynamically adjusting the difficulty of a game based by modeling player performance (cite) or in cases physiological data (cite) to create an experience that is perpetually not to easy to be boring but not too hard to be frustrating.

A target for adaptive game design that has not received enough empirical

[4] http://www.konami.jp/products/silenthill_sm_wii

focus is feature-based adaptivity based on player preferences. For example some gameplay mechanics (such as solving puzzles or looking for hidden items) might be enjoyed by one group of players but might not appeal to other type of players. The game should be able to recognize that and change its content accordingly. Moreover, we wish to do this in a non-intrusive and natural way with the only tool game designers have at their disposal, their game.

In this research paper we will design an adaptation manager that aims to make the game more engaging for different type of players. To achieve that we will create 3 different play personas that are inspired by player typology research such as Bartle's player taxonomy [1] and the Brainhex player typology [28], to understand what different groups of players a Role Playing or Adventur game can attract. Furthermore, we will define metrics of in-game behavior to recognize which player type the current user is most related to and use the adaptation manager to present the user the game content in the form of Quests that we predict they will prefer. Finally, using the Game Engagement Questionnaire (GEQ) [7] we will measure whether the adaptivity had the desired effect and also conduct interviews with our users to understand the motivation behind their actions and how they rated their experience.

Ultimately we hope to answer the question: **Can feature-based adaptive game design by modeling playing behavior have a positive effect in the player's experience with the game?**

1.1. Motivation

Personally, as an avid gamer and aspiring game designer, I devote plenty of my time into playing games or studying games. However as I grow older the time I can devote to videogames shrinks more and more and is replaced by daily responsibilities. Instead of buying a game and spending as much time needed to achieve 100% completion and hunting down secrets and easter eggs, I limited myself to navigating through the main story and searching online for the "best" content, while avoiding spending time in side-challenges like I used to.

In the past years I had the opportunity to meet other fellow gamers who shared the same experience and in one of our discussion we made an observation that

no matter how good a game's design was, sometimes the smallest things such as having to do a task we found tedious or missing a quest that would have been interesting led us to drop the game because of our limited free time.

At that time, I felt the need to push game design's limits and experiment with adaptive game design. In a perfect world, every game would be different for every player and we wouldn't have to worry about missing content we would enjoy and we wouldn't have to spend the time to complete quests we didn't enjoy. By looking into existing research I found that even though we are still far away from that perfect scenario, researchers are attempting to reach that goal one step at a time, motivating me to contribute to this research field.

1.1.1 Focus Group

I conducted a focus group discussion with 10 fellow gamers that I met through the Twitch[5] platform inquiring about the way they play games to figure out whether adaptivity would be something that interests them. 5 of the participants mentioned that they do not play videogames as much as they used to because of time constraints and that sometimes they lower the difficulty in some games navigate through them quickly. Most of them were not familiar with the concept of adaptive games but it is something they would be interested in, as long as it doesn't dilute gameplay.

1.1.2 Developer Interview

Since this research is focused on game designers as well as gamers, I did a short Interview with a game developer on Twitter[6], who would prefer to stay anonymous. I inquired whether they would implement adaptive game techniques in their games and for what. They expressed that even though it sounds like an intriguing idea, they are concerned that the effort they would have to go through to implement such features might not be worth the resources. This comment made me realize that in order for adaptive game elements to enter the game industry we need to aim for small changes at a time, that will not risk jeopardizing the

[5]http://twitch.tv/

[6]http://twitter.com/

game design process for a potentially small reward.

1.2. Research Questions

In order to reach our goal and gain insight in the adaptive game design field, our research asks the following questions:

- How do we select meaningful characteristics for personalization?
- Can we detect those characteristics in a non-intrusive way?
- How can we adapt the game in an effective and efficient way?
-

1.3. Contribution and Scope

This research aims to establish and evaluate new ways for game personalization that is not overly complex in order to be usable with little alteration for other games. While there is research in adapting games based on emotional triggers and physiological data we aim to establish ways that can be used by existing games without requirements of unconventional methods of input. Thus, we will place our focus on modeling player preferences based solely on game input and player's choices within the game.

Moreover, while different ways are being explored in regards to what aspect of the game to adapt such as difficulty or aesthetics we will only focus on adapting side-quests that is usually found in Role Playing games or Action/Adventure games.

1.4. Structure

Having established the focus of this research, in this subsection we will describe the purpose and content of each chapter of this paper.

- In Chapter 2, the Literature Review section we gather a pool of knowledge needed to navigate this subject and the theoretical framework on which this research builds upon. We will introduce the theory of player modeling and present previous research on the topic of player typology in order to understand different types of players and their motivations. Furthermore, we will present commercial games and research with adaptive game elements and discuss their contributions and shortcomings.

- In Chapter 3, the Design chapter we will firstly describe the design and approach of our adaptation manager. We will present the different potential play personas of our game and the behavior characteristics that can be used to identify them. Furthermore, we will describe how the adaptation manager selects quests to present to players based on the player model. Afterwards, we will describe the design a game prototype that we will use to evaluate the adaptation manager and its development including a proof of concept test.

- Chapter 4 or Evaluation will describe our path in validating whether our adaptation manager can raise players' engagement with the game by describing the experiment methodology using the prototype game and a series of surveys. We will present our results and findings based on the experiment and feedback given by the users. Finally we will discuss what those result mean for adaptive game design and how the can be used to built upon the user experience.

Chapter 2

Literature Review

In order to understand the context and scope of this research we need to introduce some key concepts and their development in the research field: dynamic player modeling (and by extension player typology) and adaptive gameplay.

Player modeling is a technique borrowed from the similar notion of user modeling in marketing or student modeling in intelligent tutoring system research. The basic idea is simple: the game maintains a profile of each player that captures the skills, weaknesses, preferences, and other characteristics of that player. This model is updated by the game as it interacts with the player. In turn, the game can query the player model to determine how to adapt its behavior to that particular player, such as by asking which of several possible tactics will be most challenging or satisfying to the player [17].

Player Typology (or classification or taxonomy as it can be referred to based on the context) refers to the process of classifying players into different types based on their preferences, behavior or personality. In the last decades with videogames' popularity rising the need to model human personality in a game playing context [36] naturally arose to give insight to developers as to what their different players enjoy or dislike in their games and what type of target group to focus on. Plenty different approaches have been taken for this subject, a brief summary of which will be presented in the next section.

Adaptive Gameplay is a player-centered approach by adjusting games mechanics, dynamics or aesthetics [19] suit games responsiveness to player characteristics with the purpose of improving in-game behavior, performance or engagement [33].

Adaptive Gameplay is a promising way of personalizing games and has recently found some success in educational games as a way to model the learning experience in a tailored way of fun.

2.1. Player Modeling

Player modeling is the study of computational models of players in games. This includes the detection, modeling, prediction and expression of human player characteristics which are manifested through cognitive, affective and behavioral patterns. [43]. The first documented work to define player modeling is Houlettes Player Modeling for Adaptive Games from 2003 who proposed creating models of individual player by monitoring gameplay actions such as the number of explosives a player might throw or the amount of type they spent with low health [17]. He suggested that the game's AI can use that information to change and evolve with time to suit the player. Similarly Charles and Black included player-modeling by using input from gameplay metrics like Houlette and by inquiring the player in their proposed framework for "player-centered" games [12]. Charles and Black note that player models have two main purposes: classifying player behavior, and to instill human-like qualities into a non-player character.

After the concept was initially proposed it attracted a lot of attention in the realm of game design research and thus a lot of different attempts for Player Modeling have been made. For example, in PaSSAGE [40] D. Thue modeled the behavior of players based on Robin's Laws of Good Game Mastering player types of Dungeons and Dragons games [22] in order to create a player-informed interactive storytelling experience. On the other hand, Sifa et. al [34] modeled players of the game Tomb Raider: Underworld post-play by applying Archetypal Analysis [15] on in-game metrics such as player deaths, causes of death and use of in-game Help system. Due to its broad scope player models were created for different purposes and with different metrics for each game's unique needs making the scope and definition of the concept slightly obscure.

Luckily a vocabulary and categorization for different player modeling techniques was developed by Smith et. al [35]. They define four independent facets that define the kind for a model:

Figure 2.1: Breakdown of player models

Scope	Purpose	Domain	Source
Individual *applicable only to one player* Class *applicable to a sub-population* Universal *applicable to all players* Hypothetical *unlikely to be applicable to any players, but interesting nonetheless*	Generative *literally produces details in place of a human player* Descriptive *conveys a high-level description, usually visually or linguistically*	Game Actions *details recorded inside of the game's rule system* Human Reactions *details observable in the player as a result of play*	Induced *learned/fit/recorded by algorithmic means* Interpreted *concluded via fuzzy/subjective reasoning from records* Analytic *derived purely from the game's rules and related models* Synthetic *justified by reference to an internal belief or external theory*

- the scope of application (Individual, Class, Universal or Hypothetical)
- the purpose of use (Generative, Descriptive)
- the domain of modeled details (Game Actions or Human Reactions)
- the source of a models derivation or motivation (Induced, Interpreted, Analytical or Synthetic)

Each type of facet and what it represents can be seen in Figure 2.1.

Our research will focus on a Class, Descriptive, Action, Synthetic model since our purpose is to model players dynamically inside the game by their behavior and categorize them into "types".

Player modeling is an intriguing idea but one of its biggest shortcomings is defining player characteristics that can be important enough to affect player's enjoyment of a game when used for adaptive purposes. Thus, designers look into player typology research to find what it is about games that makes people enjoy them in different ways or what can make them dislike a game.

2.2. Player Typology

As already mentioned the task of modeling human personality in a game playing context has interested researches for many decades. The earliest attempts can

be dated in 1961 by Caillois & Barash [10] who proposed four different forms of play behavior:

- Agon (games of competition)
- Alea (games of chance)
- Mimicry (role-playing games)
- Ilinx (games inducing vertigo)

Player typology is very helpful for adaptive game design because it can help us identify different types of players in the same game and as as a result how to identify and and please each type. Below we will present the most popular player taxonomies that we use in this paper to gain insight into the behavior of our potential players.

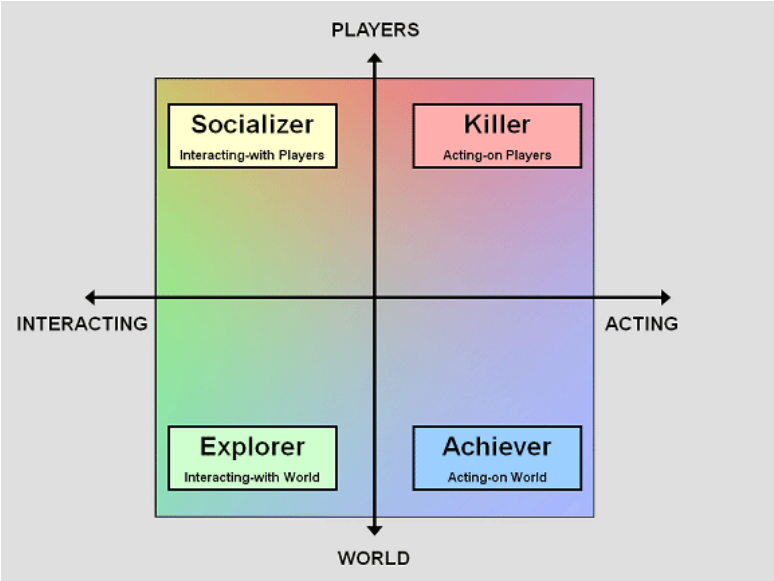
2.2.1 Bartle's Player Taxonomy for MMORPGs

The first attempt of a qualitative player taxonomy was Bartle's [1] research into kinds of players in Massively Multiplayer Online games (MMOs). He identified four types [1]:

- **Achievers**: interested in rising in levels and getting 100% completions Players who focus on obtaining some level of success, as measured by points, prizes, material possessions, or other valuation criteria. Known as the Diamonds, they strive to gain rewards, recognition and prestige, with little or no advantage in gameplay or advancement.
- **Explorers**: players who seek out the thrill of discovery, learning about anything that is new or unknown. Referred to as the Spades because they tend to dig down and uncover things, explorers feel a rush of excitement when they discover a rare artifact or a secret pathway.
- **Socializers**: these are individuals who are attracted to the social aspects of a game, rather than the game strategy itself. They are the Hearts of the

[1] https://yukaichou.com/gamification-study/user-types-gamified-systems/

Figure 2.2: Breakdown of player models. Image found at Gamasutra[2]



game world, because they gain the most enjoyment from interacting with the other players in the game. For them the game is the social vehicle that allows they to engage others and build interesting relationships.

- **Killers**: these players live for the competitive elements of the game. They are referred to as the Clubs because they like to take it to their competition. They love the opportunity to compete (and beat) the other players.

The bases of the Bartle Types consist of two pairs of complementary player goals: Acting or Interacting (content), and Players or World (control). As demonstrated in 2.2 Bartle represented these goals as two lines and each quadrant corresponds to one of the four observed play style preferences. The graph also shows us that some types can be mutually exclusive. For example, an Achiever may also be an Explorer but not a Killer or vice versa.

Even though innovative for its time, Bartle's taxonomy suffered from several shortcomings. Bartle proposed that every player has a preference for one of the types making them mutually exclusive and the qualitative nature of the study poses the risk of becoming self-fulfilling. The questionnaire asks respondents to choose between player patterns which in its nature creates a separation bias. However it inspired various other researchers to discover a trait theory of why

and how we play videogames.

Yee [44] aimed to fill these gaps and expand on researching why different people play MMOs. Yee's play model identifies three main components of player motivation: Achievement (with Advancement, Mechanic and Competition as subcomponents), Social component (socializing, relationship and teamwork as subcomponents) and Immersion (Discovery, Role-Playing, Customization, Escapism as subcomponents). Bartle's Achiever and Killer types appear to overlap with Yee's Advancement and competition motivations as well as Bartle's Explorer type with the mechanics and discover elements. Like Bartles model, Yees components have a limited focus on one specific game type, Massively Multiplayer Online Role-Playing Games (MMORPGs), therefore it is probably not suitable for a broad range of game genres.

2.2.2 BrainHex and trait-based models

The research area of player typology has a long way ahead of it, as demonstrated by the fact there are many typologies aiming to be the most correct or at least most applicable player classification. Further, research in this area was divided for some time over the trait vs. type discussion. Early player typologies attempted to position players within distinct types, while later work saw player types more as traits, as discussed by Bateman et al. [4]. One such model BrainHex [27] [28], was designed as buidling up on the existing typologies and acting an interim model to enable investigations toward a definitive player trait model.

The BrainHex model [27] [28] intends to provide a typology of playing preferences motivated by combining existing findings from player typology research with neurobiological insights into the presumed underlying mechanisms. The BrainHex the questionnaire consists of 21 questions (e.g., Exploring to see what you can find. for the Explorer player type) that have to be rated on a 5-point Likert scale ranging from I love it! to I hate it!. Furthermore, for each of the seven player types, participants have to rate three statements. Additionally, participants have to rank seven other statements (e.g., A moment of jaw-dropping wonder or beauty for the Seeker player type) from worst to best. They identified 7 player types:

- Seeker: enjoy exploring things and discovering new situations. They are

curious, have sustained interest, and love sense-simulating activities.

- Survivor: enjoys the intensity of a horror experience
- Daredevil: are excited by the thrill of taking risks and enjoy playing on the edge. The enjoyment of game activities such as navigating dizzying platforms, rushing around at high speeds while still in control characterizes the Daredevil.
- Mastermind: enjoy solving puzzles, devising strategies to overcome puzzles that defy several solutions, and making efficient decisions.
- Conqueror: are challenge-oriented. They enjoy struggling against impossibly difficult foes before eventually achieving victory and beating other players. They exhibit forceful behaviors, channel their anger to achieve victory and thus experience fiero (as mentioned by Lazzaro [23])
- Socializer: enjoy interacting with others. For instance, they like talking, helping, and hanging around with people they trust. Socializers are trusting and easily angered by people who abuse their trust.
- Achiever: are goal-oriented and motivated by the reward of achieving long-term goals. An achiever often gets satisfaction from completing tasks and collecting things (e.g., achievements).

The Brainhex model has been used oftentimes in game personalization research to various degrees of success. Orji et al. [29] investigated ways to tailor health games for different gamer types by correlating the BrainHex model to the Health Belief Model (HBM) [31] to 6 out of the 7 types. Birk et al. [5] designed a social game Pot Farm to explore how the Brainhex (amongst other models) correlate to the effect of predictors of enjoyment associated with the satisfaction of player needs in social games as identified by the PENS questionnaire [32]. They reported correlations of the need for Competence to the Mastermind player type and the need for Intuitive Control to the Daredevil type.

Some additional insight was provided in a study by Fortes et al. [16] that later analyzed data from the questionnaire using Structural Equation Modeling (SEM)

[21] to evaluate how well the model represents the player preferences for different styles of play. Their results were not able to measure 7 different playing styles as originally suggested however they distinguished 3 different playing motivations.

- action orientation (represented by the conqueror and daredevil archetypes)
- esthetic orientation (represented by the socializer and seeker archetypes)
- goal orientation (represented by the mastermind, achiever, and survivor archetypes)

The above example show us that even though the Brainhex model has a lot to contribute to game personalization research it needs to be handled carefully when it comes to game context and using it for features that can be clearly distinguished from each other when attempting to use it for adaptivity purposes. For the purpose of this research we do not aim to directly evaluate the Brainhex model's predictive power but use the research behind it as a way to gain insight into the different elements players prefer in the games. Moreover, we will model our players based on their in-game behavior instead of a written questionnaire to avoid the context problem and we will use the Action-Aesthetic-Goal Orientation spectrum so that our features are distinguishable enough to explore how they can be used to adapt a player's experience effectively.

2.3. Adaptive games

Player-centric design and game personalization can take many forms and purposes. Some methods are adaptive, meaning that their systems are continuously updating themselves in a dynamic way based on player actions, while others might be predetermined at the beginning of the game. The most prevalent form of adaptivity is for Dynamic Difficulty Adjustment (DDA). Furthermore it can be used for changing game aesthetics or at times story (or at least parts of it) and maybe even quests or features of the game. We will explore these different types of personalization in the sections below.

2.3.1 Dynamic Difficulty Adjustment

The videogame experience is tied to the concept of flow, they can be boring if it's too easy and frustrating if it's too difficult [14]. Videogames try to remedy that issue by offering "difficulty modes" usually when the game starts that allows the players to choose their preferred level of challenges (usually Easy-Normal-Hard). However this method lacks flexibility and can lead to mismatches between player ability and overall game difficulty [18]. Thus, researchers are exploring how to reach the ideal game that adjusts its difficulty dynamically, governed by the players performance [25].

While the content of adaptive features vary between games and genres [2], a common way to tailor player's challenge level is through the adjustment of player mechanic such as aiming systems, speed of enemies or the abundance or scarcity of inventory items [18] in a "Rubber Band" fashion. Rubber Band AI basically means that the player and their opponents are virtually held together by a rubber band: If the player is pulling in one direction (playing better or worse than their opponents), the rubber band makes sure that their opponents are pulled in the same direction (that is they play better or worse respectively) [25]. This technique has seen some commercial success in games such as Max Payne and Resident Evil 4.

Player modeling has found its place in DDA as well, with Missura et al. [25] builing a difficulty model that consists of clustering different types of players, finding a local difficulty adjustment for each cluster, and combining the local models by predicting the cluster from short traces of gameplay. Togelius et al. [41] [42] attempted to create procedural racing tracks for a driving game by modeling player performance and behavior such as speed, times crashed on wall etc. and transferring that data to an emulated controller to partial success.

2.3.2 Carbine Studios' Wildstar

The Massively Multiplayer Online Role Playing game made by Carbine Studios and published by NCSoft Wildstar [3] introduced a game system loosely based on the Bartle taxonomy that allow players to choose secondary gameplay that fits

[3] https://www.wildstar-online.com/

Figure 2.3: WildStar's path selection.

their playstyle. They game offered 4 different "paths" with unique custom content like missions, rewards, and abilities. Players were asked to choose 1 of them at the character creation phase for each of their characters. The available paths and their correspondence to Bartle's taxonomy is:

- Soldiers designed to appeal to the Killer archetype with quests such as Assassination (killing specific targets), Demolition (blowing things up with grenades) etc.
- Explorers designed to appeal to the archetype of the same name, with quests such as cartography and exploration of the game map
- Scientists designed to appeal to Achievers by having quests that include accumulating rare or powerful treasures and learning about the lore of the world (which also partially appeals to Explorers)
- Settlers inspired by the Socializer archetype with task to expanding towns by creating new buildings aiming to help the community of the game.

WildStar's path system received positive reviews by critics thanks to its in-

novation and re-playability value [4]. Some complaints about the system from the community however were that there is no way to change paths after choosing one at the begining of the game [5]. Also even though the system was designed to appeal to player's preferences but players had no way of knowing which path they would prefer when creating their character. The above problems would be solved with a more dynamic way of modeling player's affinity to one of the 4 playstyles before committing to one. The system could even update and change itself based on player's attitude on the existing quests.

2.3.3 Silent Hill: Shattered Memories

Another commercial example of personalization in a video game is Silent Hill: Shattered Memories [6], a psychological-horror game that used a psychological test conducted by an non-playable psychologist character inside the game create a "psyche profile" for the player. Also, the profile was updated by in-game behavior such as observing if player makes quick decisions or takes time to analyze their options, or what items the observe in the game and for how long. That profile was used to personalize in-game models such as the appearance of other characters or enemies and environmental elements and even elements of the story that could also related to the ending. The creators stated that their choices were informed by personality research but unfortunately no analytical research has been written for it [7].

The purpose of the personalization was to make the horror in the game "personal" to have a bigger impact on players and the in-game questionnaire was able to tie in with the rest of the game because of the nature of its story. Your character has lost their memories after a traumatic experience and the psychologist helps you piece them back together, avoiding making the questions and physiological test feeling contrived. However, that self-reporting process can hardly transfer to other games without becoming disruptive and including surveys into games is a

[4] https://www.pcpowerplay.com.au/feature/why-wildstars-path-system-should-be-in-every-mmo,389976

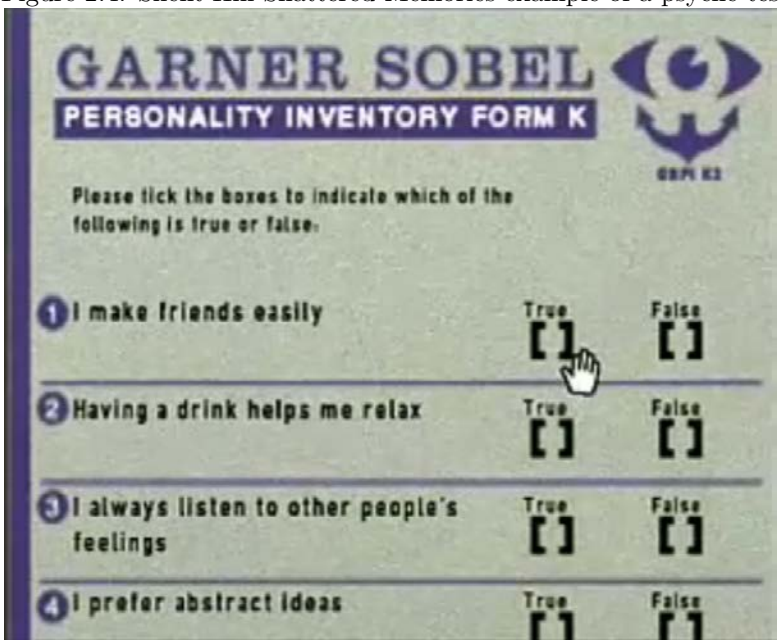
[5] http://massivelyop.com/2015/10/23/nexus-telegraph-the-problem-with-wildstars-paths-and-how-to-fix-them/

[6] http://www.konami.jp/products/silenthill_sm_wii/

[7] https://www.youtube.com/watch?v=OszjLIxbI9c

mechanic that can quickly wear off.

Figure 2.4: Silent Hill Shattered Memories example of a psyche test



2.3.4 Research projects on adaptive games

Since personalization and adaptivity in games is still an experimental field commercial examples employing those techniques are scarce and their applications even though seemingly successful have not been scientifically evaluated. So now we are going to look into research projects in quest and feature-based adaptivity.

Scarlet Skellern

An interesting adaptive game was designed by Tanenbaum et al. [37] [38] who dynamically adapted their game's Scarlet Skellern visual colors and music to create a different atmosphere based on the player's mood. Items the player has the ability to interact with and dialogue choices were designed in a way to detect the player's mood between a range of emotions such as Happy, Sad or Scared. However, their approach was meant as a way to create a different narrative meaning to the game through affective design rather than personalizing the game's content.

Figure 2.5: The color component feedback system in Scarlet Skellern

Figure 2. Default "Melancholy" Visual State of *Scarlet Skellern.*

Figure 3. "Happy" Visual State of *Scarlet Skellern.*

Feature-based adaptivity

Busch et al. [9] created an adaptive persuasive mobile game that presented different content for players of the Mastermind type and the Seeker of the BrainHex model type with puzzles and exploring missions respectively to empirically evaluate the questionnaire an regards to enjoyment of different content in the game based on the types descriptions. Participants were asked to fill in the Brainhex questionnaire and they were given the version of the game that matched their player type if it was one of the two fore-mentioned. Then they were given the alternate version and were asked questions to evaluate their enjoyment of the

game.

The results did not prove a correlation between their different content and enjoyment of the game but the authors reported some valuable information as to how to improve. One problem was that the two player types might not have been distinguishable enough to create unique player experiences and the Brainhex model has some overlapping elements between types that makes it difficult to discover meaningful cause-effect statements. Furthermore, they suggest that there can be different factors that affect play experience in a specific game that the Brainhex questionnaire doesn't cover.

Similar findings were reported by Rogers et al. [30] who did an exploratory study on a prototype survival game to compare enjoyment of specific game elements to Brainhex types for the purpose of future adaptivity. They included different game elements like a fighting system, a crafting system and conversation with NPCs and hypothesized which player types might enjoy them more. Their results indicate that even though the Brainhex typology cannot be used as the sole tool for adaptivity they might be used more efficiently to recommend potential new game features for feature-based adaptivity based on gameplay behavior, rather than as a trigger of adaptation itself.

2.4. Contribution of this research to the field

As we can see the adaptive game design is still in an experimental phase, but it is making small appearances in the game industry. More focus on it is being placed by researchers who all take different approaches to game personalization and theory that can aid in reaching satisfactory adaptivity. Based on the related works we see that adaptive games can differ on 3 different aspects:

- the aspect of the player that is being modeled (e.g. personality, preferences, behavior)
- the content that is being adapted on the game (e.g. enemy AI, story, environmental elements)
- the desired effect on the user (e.g. sense of flow, learning, enjoyment)

This research will focus on modeling player behavior from inside the game in order to understand players' references. We believe that modeling based on playing behavior is the less intrusive and most natural way to gain data on the user.

Then we will use that model to adjust and present game tasks or "quests" in a way that presents mechanics that are more likely to appeal to the individual player. For example a player that repeatedly engages in the combat system of the game might appreciate to be given tasks that will allow them to do more varied battles. We will provide further details of our system's design in the next Chapter.

Chapter 3

Design

3.1. Hypothesis

Our goal is to capture the individuality of each player and use that to personalize the content in a way that optimizes player engagement. We define our main Hypothesis as such:

Players will prefer guests that are adapted to their player type

Because the player type is determined through in game play, we also need to define a sub Hypothesis:

In game behavior can detect if a player is Action or Aesthetic Oriented

3.2. Concept Design

Because of the complexity of the hypothesis, in order to reach this goal we need to split it into separate steps.

1. Select meaningful play style characteristics
2. Model those characteristics on each player in a reliable way.
3. Integrate the model into a game adaptation manager and personalize the game.

4. Verify that the personalization has the desired effect.

In the section below we will examine this steps and build the theoretical framework upon which our prototype will be developed.

3.2.1 Genre

Our design will focus on the Role Playing and Adventure game genres. These type of games usually include side quests that are independent from the main story, making them an ideal target for task adaptation since it allows us to dynamically change content in the game, without interfering with the coherence of the main plot. Morever, these genres offer a variety of different tasks and gameplay elements for the players as opposed to "linear" games thus attracting different types of players that exhibit different approaches to their problem solving.

3.2.2 Player personas

The first and most important step to reach our goal is to identify characteristics in each player's playstyle that can affect their enjoyment of a game. An additional requirement for our characteristics is that they need to be valuable in an adaptivity-context.

To find answers to that question we direct our attention towards existing research into player behavior and motivation as described in Chapter 2 of this paper. Specifically we looked at Bartle's player taxonomy and the Achiever/Explorer/-Socializer player types. The Killer player type was set aside because it usually describes players that express themselves through player-to-player interactions, which is not relevant in our Single Player game design.

Based on the descriptions of those 3 player types by Bartle, we define 3 player personas:

- **Explorers**: The Explorers are driven by the need to learn about the game's universe and its rules. We can recognize them by their need to explore the game's map and examining hidden items. They prefer quests that include puzzles or riddles and leads them to new areas of the game.

- **Socializers**: Socializers are interested in people and their stories. This extends to their preference of interacting with the game's NPCs and learning their background stories. They might exhaust all the dialogue option with the NPC and also avoid fighting with enemies unless necessary. They prefer peaceful solutions in their quests using persuasion instead of violence and want content that leads them to more dramatic tension in the story.

- **Achievers**: Achievers want to have a sense of security in the game. They collect items to make a stronger character and attempt to get a higher score or complete a collection/achievement. Thus, they prefer challenging quests that they can beat through repetition and rewards them for a better performance. They also prefer if the game includes more achievements or side-goals.

A summary of these types can be seen in Table 3.1.

Table 3.1: Initial player personas

-	**Explorer**	**Socializer**	**Achiever**
Motivation	Knowledge	Identity	Security
Behavior indicators	Exploring, Problem Solving	Talking to Characters, Avoids Fighting	Completing collections, Retries for higher score
Quest preferences	Solving puzzles, Hidden items/areas	NPCs with rich background stories, Solving through Persuasion	Rewards for good performance, Leader-boards, Achievements/-Collections

3.2.3 Adaptation Manager

As we've mentioned, our approach will focus on task or *quest* adaptation. Different type of players will be given different quests to solve in the game. Thus,

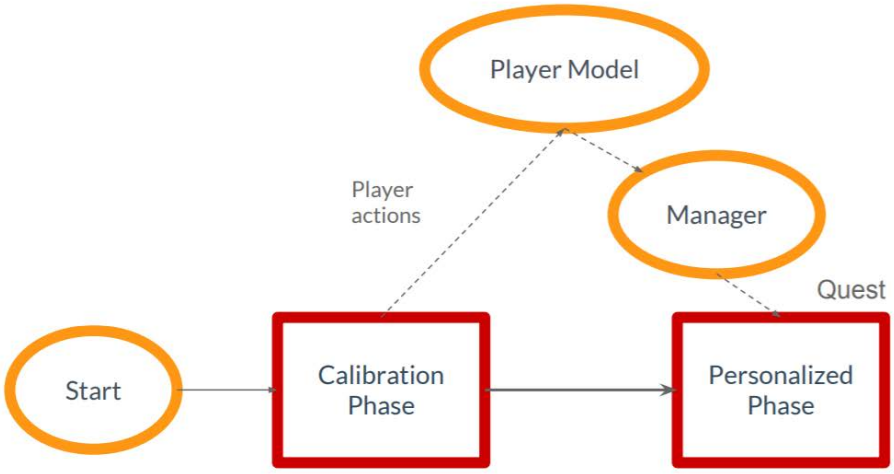
we need an adaptation manager that at any point in the game knows the player's model and the possible side quests that can be assigned to NPCs in the game.

In order for our adaptation manager to work more efficiently, we need the game to have a *Calibration Phase* at the beginning of the game. A model for the player will be initialized with a value of 0 for each player type and the player is given content to play that includes various different possible gameplay elements. Whenever the player exhibits one of the descriptive behaviors of each player type, the corresponding model value will be increased by an appropriate amount. At this phase, the game will not be personalized yet but it will serve as an environment that helps us understand the player so that we can begin the personalize effectively.

Afterwards, once the Calibration phase is done, we move on to the *Personalized Phase*. In this phase, the player will be given a personalized quest to appeal to his interests. Each quest in the game, has a suggested player type indicating which type of player is predicted to prefer said quest. At this point, this categorization cannot be done automatically but has to be determined by the designer, following the guidelines of player typology and the defined player personas. For example if a Quest includes having to look for a hidden item in a remote area, the Explorer type is expected to like this quest more than the other types.

Thus, when the game needs a new quest to assign to the player, the adaptation manager selects one from its available pool of quest informed by the player's model and adapts the content of the game accordingly. This logic can be seen in Figure 3.1.

Figure 3.1: How the adaptation works



3.2.4 Preliminary User Test

In order to test the feasibility of this design, we run a short preliminary user test. Our goal is to determine whether in-game behavior can indeed be used as a metric for personalization, and what type of game elements would appeal to each player type. The methodology was as follows:

1. Fill in pre-survey and Bartle test (to determine game literacy and player type)
2. Track user choices in prototype game
3. Play 2 mini games
4. Fill in post survey for each mini game

Testbed environment

In order to determine the reliability of in-game behavior as indicator for player type, we developed a small game environment in Unity 3D. Players can explore the map and collect items as well as shoot running targets around the map to achieve a high score and their actions are tracked by the game.

Game 1: Sliding block

In the sliding block puzzle game, the purpose is to move the red block to the exit by moving the other blocks out of its way. The blocks only move vertically or horizontally according to their initial direction. We chose this type of game because we expect it to appeal to players that like experimentation or puzzle solving in videogames. The game can be downloaded for free on the Android play store [1]

Figure 3.2: Sliding block game

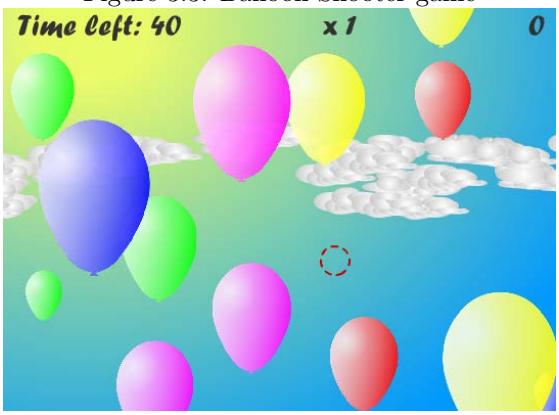
Game 2: Balloon shooter

For the balloon shooter, players have to shoot to burst balloons at different distances. The purpose is to accurately shoot as many as possible for a higher score. The further the balloon the more points the player receives for bursting it. We chose this game because it requires good mouse-eye coordination and players are rewarded based on skilled performance of the task. The game can be played online [2]

[1] https://play.google.com/store/apps/details?id=com.bitmango.go.unblockcasual

[2] https://www.gamesloon.com/free-action-1/shooting-gallery-games-276/balloon-shooter-51821.html

Figure 3.3: Balloon Shooter game



Preliminary User Test Results

The user test was run on 12 players of various gaming backgrounds. We compared the user's player type with the amount of items the found in the game and the targets they shot. Some positive correlations were found between the Explorer/Socializer types that chose to collect more items as opposed to the Killer/Achiever types who opted to shoot more targets.

Figure 3.4: Correlation of targets Shot by Player Type

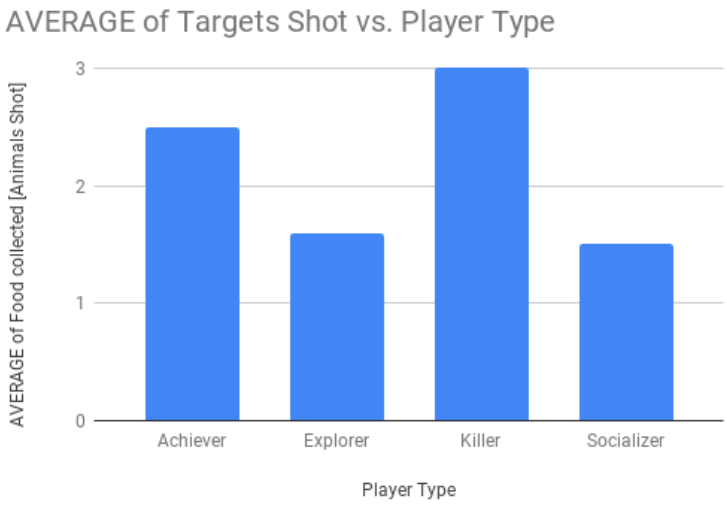
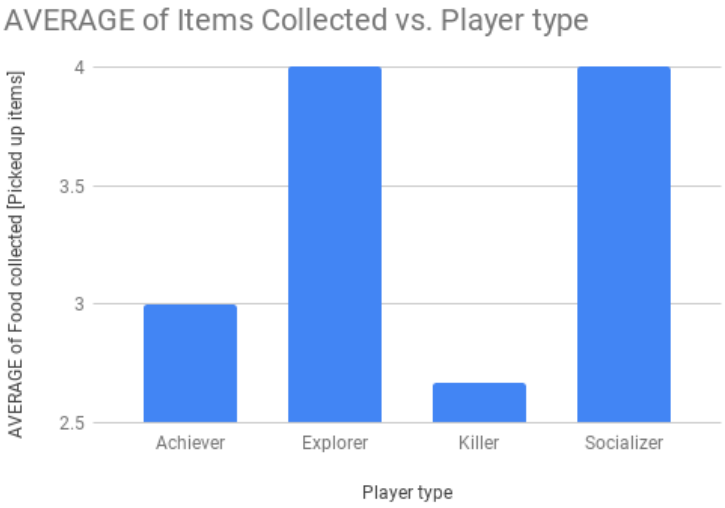


Figure 3.5: Correlation of items collected by Player Type



However, based on our assumptions, we were expecting the puzzle game to be preferred by the Explorer types and disliked by Killers and the shooting game preferred by Achievers and disliked by Explorers. Alas, no direct correlations between enjoyment of the games and player types was found as shown in the graphs below.

Figure 3.6: Enjoyment of Balloon shooter game for each type

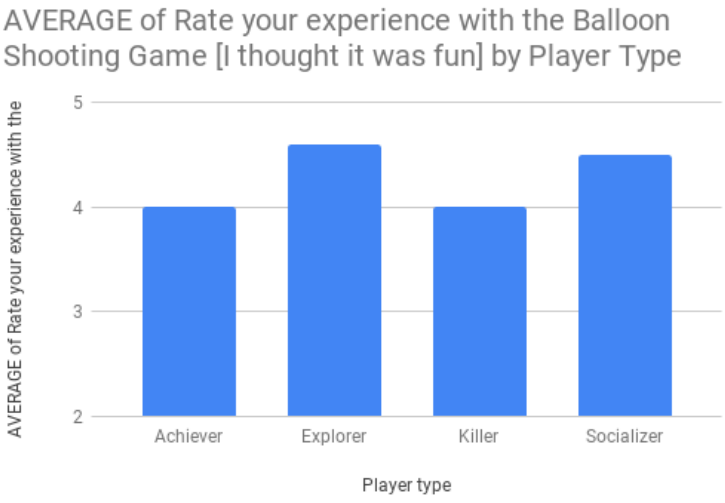
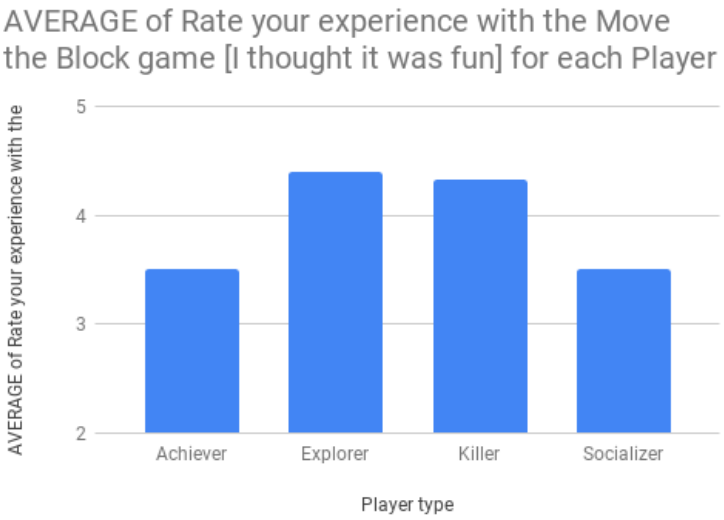


Figure 3.7: Enjoyment of Move the block game for each type



The results of the preliminary test were encouraging in the prospect of detecting the player type through gameplay but not with designing quests to appeal to each type. One concern that was raised was that because of the playful nature of the game, the responses to enjoyment of each game were fairly high by all users.

Moreover, after a short interview with users it was discovered that even though the puzzle game was designed to appeal to the explorer type, different types might also enjoy it for different reasons. For example Achievers liked the game because of the sense of accomplishment when completing the challenge faster. This overlap made it difficult to draw correlations between type and enjoyment of a particular game.

3.2.5 Revised Design

Based on our observations with the preliminary test and additional research in to the topic of player typology and personalization, we revised our design to follow the **Brainhex model** for our player personas, instead of Bartle's taxonomy. The Brainhex model offers various advantages that will help us overcome the difficulties of the preliminary test. By its nature, Brainhex types are not meant to be mutually exclusive and its questionnaire is *trait oriented* rather than dichotomous, giving us more detailed insight into players' usual behavior which might be a mix

of different elements. Moreover, as a more recent and well studied typology it has been applied in other researches as shown in our Literature Review section, giving us additional background into its strengths and shortcomings.

In addition, we made the decision to limit our player personas to 2. Because of the complexity of player typology, and the non-exclusive nature of the Brainhex model, as shown in our preliminary test there is a big possibility of overlap between player preferences and types. Limiting our personas to 2 very different types will help us avoid this overlap and give us clearer results as to why each player prefers different type of content in the game.

In conclusion, we propose 2 personas designed after the Brainhex's model Action orientation and Aesthetic orientation categories. We named them *Bravery* and *Compassion* respectively to easily reference them and add a poetic effect. The new personas can be seen in Table 3.2

- **Bravery**: The Bravery type is Action oriented and enjoy becoming proficient in the game's mechanics and exhibit competitive behavior. They are not easily disheartened by challenging tasks that require good reflexes and hand-eye coordination.

  Indicators: A bravery type player will seek out enemies in the game and practice killing them more efficiently. They will not shy away from a difficult monster, only to gain more experience and come back to repeat the challenge.

  Quest preference: In order to satisfy the Action oriented type we need quests that test their mastery of the game's mechanics but also offer the chance to retry until they are good enough to overcome it.

- **Compassion**: Compassion type users are oriented towards the Aesthetics of the game. They are driven by curiosity to find strange and wonderful things inside the game and learning more about the people in it and their personal stories.

  Indicators: We can detect them in the game by how much they explore the map and their attempts to interact with items or environmental elements such as trying to unlock doors or inspect weird items.

Quest preference: We can please them with quests that allow them to achieve diplomatic solutions to problems and gives them more information about the world's universe. Moreover they are more likely to use lateral thinking in to complete quests and enjoy having to inspect the map for solutions.

Table 3.2: Revised player personas

-	**Bravery**	**Compassion**
Orientation	Action	Aesthetic
Motivation	Repetition, Challenge	Curiosity, Diplomatic gameplay
Favorite Games	Call of Duty, Super meat boy	Final Fantasy, Zelda
Behavior indicators	Shows good reflexes, defeats foes	Explores the map, Attempts to unlock locked things
Quest preferences	Defeating impossible foes, struggling until they achieve victory, being in control in high speed, good reflexes	finding strange and wonderful things, interested in people and their stories

3.2.6 Challenges

Even with this concept design, adaptive game design has several obstacles and challenges to overcome and some of them are expected to appear in our prototype.

A player can exhibit different type of behavior in the same game and are not exclusively one player type. In addition some of the actions the player makes might not be conscious choices but things they assume they have to do in order to proceed in the game.

Thus, the adaptation will need some time to "calibrate" to the individual user and give the player some time to learn all the mechanics and controls before it starts updating the model to avoid making false assumptions. Moreover we will need to ensure that the player has a good understanding of what their choices in the game are and that they have the freedom to act as they prefer.

One assumption that we need to make in order to adapt the game to the individual player is that the game will be played by the same person from the beginning until the end. Even though it was popular one or two decades ago for a person to lent their game console to a friend it is rare from 2 people to share the same playthrough.

Lastly, our design runs the risk of making the player feel like they are "missing out" on some content if it's not an option available to them. We hope to minimize that feeling by applying adaptivity to side quests that are not part of the main game and hope that players might see it as an opportunity to replay the game with a different playstyle, adding re-playability value to the game.

3.3. Prototype Implementation

In order to test our theories we developed a game prototype that captures the basic ideas of our design in order to have people of different game-playing backgrounds play it. In this section we will describe the process of making the prototype and explain how it works with our research.

3.3.1 Development environment

In this section we will describe the technical requirements of developing the prototype and whenever needed, link to the resources online.

- Personal Computer
- Unity Personal edition Version 2017.3.1f1 [3]
- JetBrains Rider 2018.1 [4]

[3]https://store.unity.com/products/unity-personal
[4]https://www.jetbrains.com/rider/

Figure 3.8: The player character

3.3.2 Premise

The premise of the game is about a young boy living in village set in a fantasy/medieval era. The boy usually has to run errands for his parents such as looking for herbs and fruits in the forest. He also tries to gain his independence by helping the town's people to earn his own gold.

The 3D model for the character was purchased from the "Fantasy RPG Warrior Pack" (Appendix C.1) and slightly modified in Unity.

3.3.3 Aesthetics

For the game we chose a 3D environment so the players can be easily immersed in the game's world. As we mentioned the game takes place in a fantasy era and monster and witches will appear later on. Thus we want our aesthetics to contribute to that magical feeling and we aim to present our world like a fairy tale. Thus, our assets have vibrant playful colors and the environmental elements are not always realistic but sometimes aim to be cute and "dreamlike". Across the map we will spread particle effects such as flying dandelions and falling petals.

Most of the assets that were used to design this atmosphere are from the Dreamscapes (Appendix C.2) and the Fancy Village (Appendix C.3) packs from

the Unity asset store.

3.3.4 Controls

The game's environment is 3D, thus the user can control the player character with the WASD or the directional buttons. The gameplay includes a shooting mechanic to shoot the rabbits as shown in Figure 3.9. The player holds the Right Click mouse button to enter a First Person Camera and an aiming cursor appears in the center of the screen. Then using the left click mouse button the player shoots an arrow in the direction of the aiming cursor.

Secondly the player can interact with items that can be picked up when close to them and pressing the E button.

Thirdly occasionally the player has to speak to other characters. The dialogue is initiated in the same way as interacting with items. A dialogue box appears on the bottom center of the screen with the character's lines. Usually the player has to reply by selecting one of the available options that appear on the right of the dialogue box. An example of this can be seen in Figure 3.13.

The assets to control this mechanic were also found on the asset store and slightly modified when needed, the list can be found below:

- 3rd person Controller + Fly (Appendix C.10)
- Let's try Assets (Appendix C.11)
- Dialogue System for Unity Demo version (Appendix C.12)

Figure 3.9: The shooting mechanic

Figure 3.10: Interactible items

3.3.5 Scene 1: Player model calibration phase

As discussed above, the adaptation will work best if given some time to calibrate to the individual player before suggesting content. Thus, the first "Scene" of the game has the objective to gather data on the player's preferences within the game. To achieve that we have designed a simple quest. Players are asked to find 5 food items on the map to bring back for dinner to his family. The player has different options as to how to collect those items. They can either collect items that can be found around the game world usually in hidden areas or shoot rabbits that are wandering around the map with his bow for meat. There are 6 items on the map total and 6 rabbits so the player can finish the quest by any combination of mechanics.

The purpose of the mechanics and the game goal is to detect whether people will prefer the action-center mechanic of shooting targets rather than exploring the map to find items that they can pick up. Each rabbit that the player shoots counts as 1 towards their "Bravery" archetype, while each item they pick towards their "Compassion" archetype. By having an initial description of the player's preferences of the game we can begin adapting the game based on our design by transitioning to Quest 2.

Additionally, the player can find a house in the area with a locked door. If the door is inspected by the player it is also marked by the system as a Compassion type behavior. On the other hand, one of the rabbits was programmed to run

slightly faster than the other rabbits. If the player chases and kills that rabbit regardless of its challenge it is marked as a Bravery type behavior.

Figure 3.11: Birdview of the forest in Scene 1

The assets used to create this scene were purchased or downloaded for free whenever available from the asset store:

- Fancy Village (Appendix C.3)
- Dreamscapes (Appendix C. 2)
- Nature Starter Kit 2 (Appendix C.7)
- Post Processing Stack (Appendix C.8)

3.3.6 Scene 2: Adaptive phase

After we have gathered information about the current player preferences in our game, we can begin adapting the quest system. Below are the Possible Quests that were designed to appeal to certain player personas and their requirements for selection by the adaptation manager.

In this phase of the game we created an environment that can allow for different tasks to be given to the user, a small village. In this village the player will be asked to help the citizens with a problem they are having, which can be easily adapted by the adaptation manager based on the player's model. Once the player enters the scene, they will be approached by the Quest Giver

Figure 3.12: The village Scene from the prototype game

The assets used to create this scene were purchased or downloaded for free whenever available from the asset store:

- Fancy Village (Appendix C.3)
- Standard Assets (Appendix C.9)
- Fantasy Kingdom Pack Lite (Appendix C.6)
- Modular Fantasy Bridges (Appendix C.5)
- Fantasy RPG Warrior Pack (Appendix C.1)
- Polygon Adventure (Appendix C.4)

Possible Quest 1

Quest Name: A mysterious creature
Quest Giver: Town mayor
Background: A mysterious creature has appeared near the town bridge. Do you think you can investigate the situation and get it to leave?

Gameplay: The player is informed by the town mayor that he cannot leave the town because a monster is blocking the bridge. He also lets us know that

the monster is harmless but no one can understand it because it doesn't speak language. The player proceeds to talk to the monster who indeed cannot make sentences but the player can make out the words "son" and "windmill".

With this hint, the player figures out that they need to find the windmill and talk to the miller. The miller informs us that the troll actually used to be a human and his great-great grandfather but was cursed to become a monster. The complete wording of its curse has been lost through the generations but he remembers this segment: *"You will only be freed, when you find the sun's seed"*

The player can decode the curse and conclude that it's refer to sunflowers, some of which can be found in the town square. Once we find that sunflower we can give it to the monster which is finally transformed back to its human form.

Preferred type: Thanks to the diplomatic gameplay of this quest and the need for exploration and attention to NPC's stories, it is predicted to be preferred by the **Compassion** player type

Figure 3.13: "A mysterious creature" Quest, the creature and the key to its curse

Possible Quest 2

Quest Name: A vicious invader
Quest Giver: Town guard

Background: A vicious monster is terrorizing the town! Can you help the town guard defeat it?

Gameplay: The player is told by the town guard that we need to hide home because a monster is attacking the town. The player declares that we are old enough to help and the town guard lets us help in the fight. Players will initially need to shoot and break the rocks launched by the monster using a bow.

Depending on the how many rocks out of the 11 that are launched, the player successfully destroys the ending varies:

- 0-3: the monster caused too much damage, and the townspeople had to flee
- 4-7: the monster was chased away, but it might come back
- 8+: the monster was successfully defeated and the village is safe again

The player is given the option to retry as many times as the like, in order to achieve a better ending.

Preferred type: Thanks to the reflexes needed to successfuly break the targets, and the challenging nature of the quest that requires repetition to master, it is predicted to be preferred by the **Bravery** player type.

Figure 3.14: "A vicious invader" quest, monster throwing rocks and shooting interface

Chapter 4

Evaluation

Our evaluation's goal is to validate the following elements of our concept design:

1. Reliability of player type detection
2. Verify that the personalization has the desired effect.

4.1. Methodology

We chose to conduct this evaluation over the Internet. During our preliminary test, some users experienced difficulty getting used to the controls on a new laptop, whereas by uploading the game online and sending them the link they can play it from their computer at the leisure of their own home. Thus, the testbed games were deployed in OpenGL and uploaded on a personal website hosted at the Keio University website.

- **Step 1:** Game Habits and Brainhex Survey (annex in the Appendix Section - A)

  Users are asked to fill in a questionnaire inquiring their habits of game playing. This information will be used to determine whether game literacy has an effect on understanding the mechanics of the game. In addition, 9 of the questions of the Brainhex questionnaire that have possible relations with the player personas defined earlier will be asked to investigate correlations

between player's self-reported attitudes and their behavior inside the game to validate whether we are modeling player characteristics in a reliable way.

- **Step 2:** Playing the First Quest of the prototype (Calibration Phase)

  User will play the Calibration Phase of the game where their choices will be tracked and their player type will be determined.

- **Step 3:** Playing the personalized Quest 2 of the prototype game

- **Step 4:** Playing an mismatched version of Quest 2 of the prototype game

  Users will then be asked to play the 2 versions of the game. To maintain validity within the experiment, subjects were not told which version they were playing.

- **Step 5:** Comparative Game Engagement Questionnaire (annex in the Appendix Section - B)

  Users will be asked questions about their experience with both game versions and which elements they preferred. Questions were modeled after the Game Engagement Questionnaire [7]

- **Step 6:** Short interview

  Because of the many different facets that come into play when it comes to testing entrainment mediums, numeric results might not be enough to draw satisfactory conclusions. Thus we will conduct a small interview with the users to determine how the chose they preferred version and why.

4.2. Results

10 users undertook the test, 5 male and 5 female between the ages of 22-35. Most of them are videogame fans, with 70% reporting that they played videogames at least once a week, as can be seen in Figure 4.2. However, only 30% categorized themselves as hardcore gamers, while most (50%) reported they are casual gamers.

Figure 4.1: Pie chart for question "I typically play videogames"

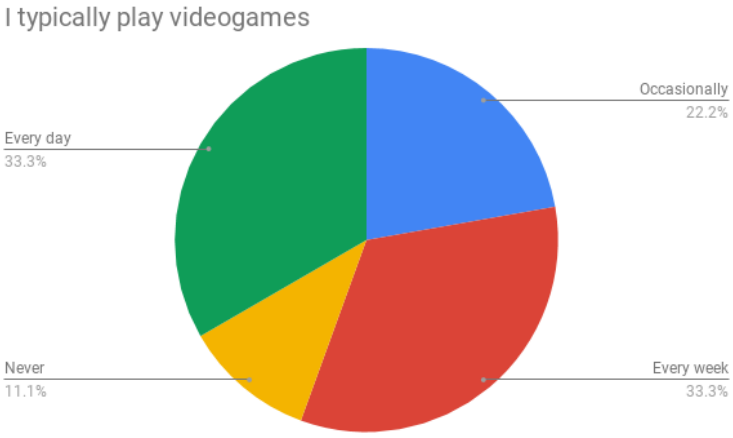
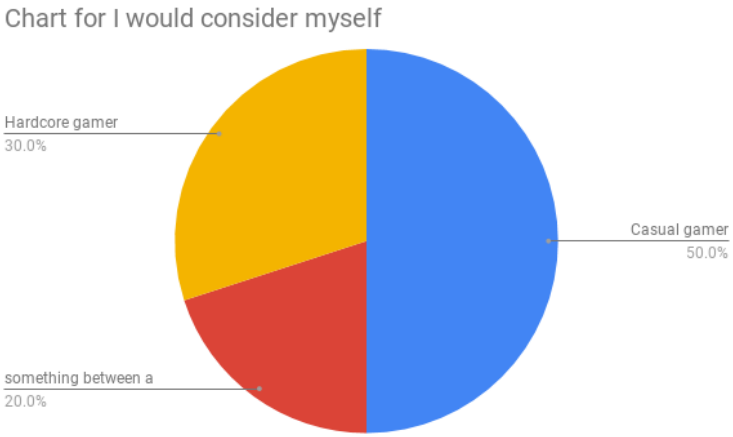


Figure 4.2: Pie chart for question "I would consider myself"



User's experience with the game overall was satisfactory, with the Compassion quest scoring 4 in the question "I thought it was fun" and the Bravery version 3.6. For the question "I felt bored" the Compassion quest scored 1.9 and Bravery 2.

4.2.1 Modeling of player characteristics

In regards to detecting player type via gameplay, 50% users were detected as Bravery and the other 50% as Compassion. In the graphics below we will show

correlations between users predicted player type and their self-reported data in the Brainhex questions:

- Exploring to see what you can find
- Wondering what's behind a locked door
- Looking around to enjoy the scenery
- The struggle to defeat a difficult boss
- Being in control in high speed
- Completing a punishing challenge after failing multiple times

Figure 4.3: Self reported data for Aesthetic Orientation for Detected Type

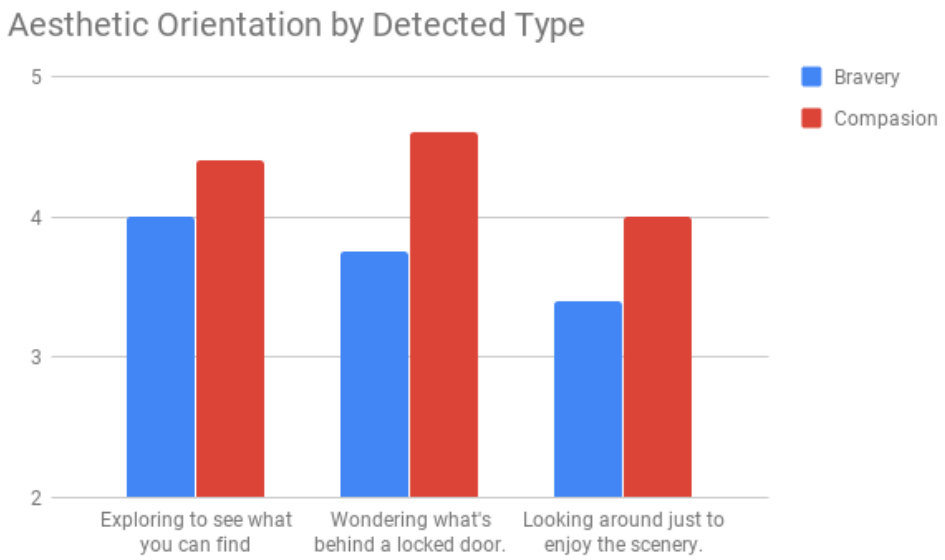
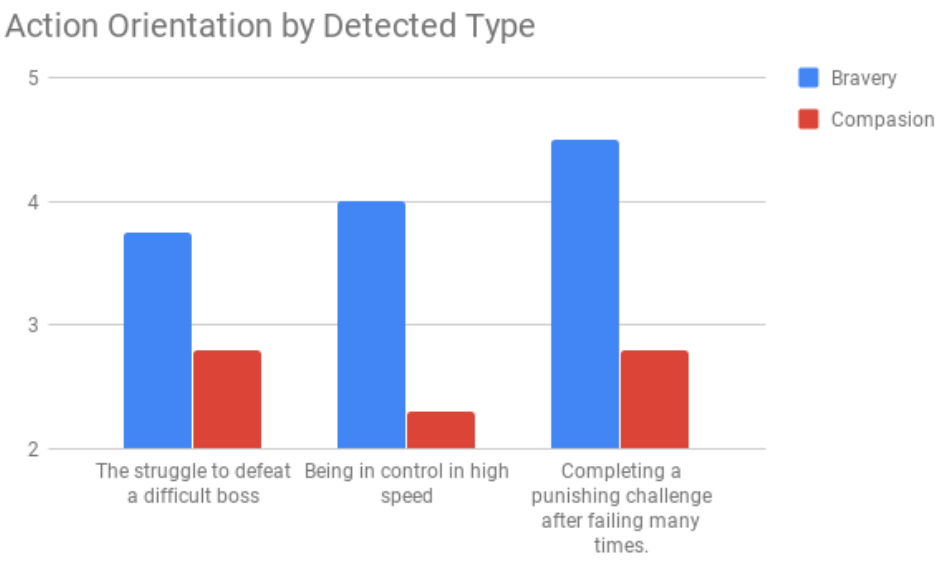


Figure 4.4: Self reported data for Action Orientation for Detected Type



We can see in Figures 4.3 and 4.4 that the Brainhex experience questions were rated higher by their respective player type than the opposite, showing player characteristics as defined by the Brainhex questionnaire can be somewhat detected by in-game actions.

We also noticed that the Aesthetic oriented questions were rated higher than the Action questions overall regardless of player type. This can be explained by the phrasing of the Action orientated questions that use negative-natured words such as "struggle" and "punishing" whereas the Aesthetic oriented question describe positive feelings thus creating a positive bias.

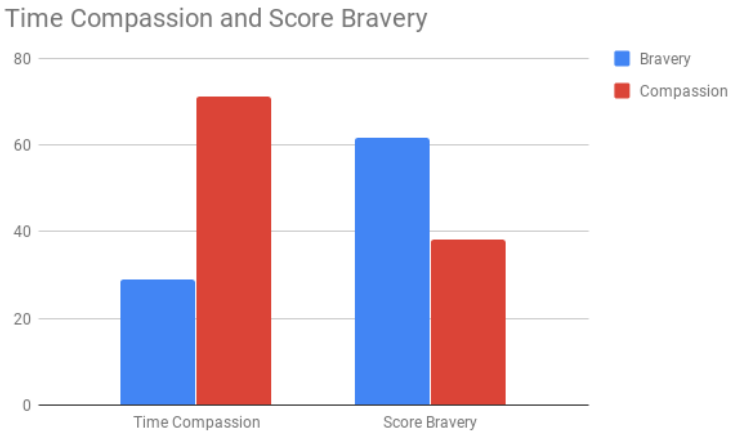
4.2.2 Effect of personalization

In order to determine whether personalization had indeed a positive effect we asked the user which version of the game they preferred and compared it with the player model's prediction. in **70%** of the cases, users did indeed prefer the personalized version. 20% of the mismatched users expressed during the short interview that occasionally they like trying something new and being challenged with a game mechanic they are not familiar with, thus preferring the non-personalized version.

Additionally, we compared the average play time of the Compassion quest and the Highest Score achieved in the Bravery quest to the detected player type. As seen in Figure 4.5 players detected as Compassion type chose to play the corresponding quest longer, sometimes exploring the map more and speaking to characters again rather than their Bravery counterparts.

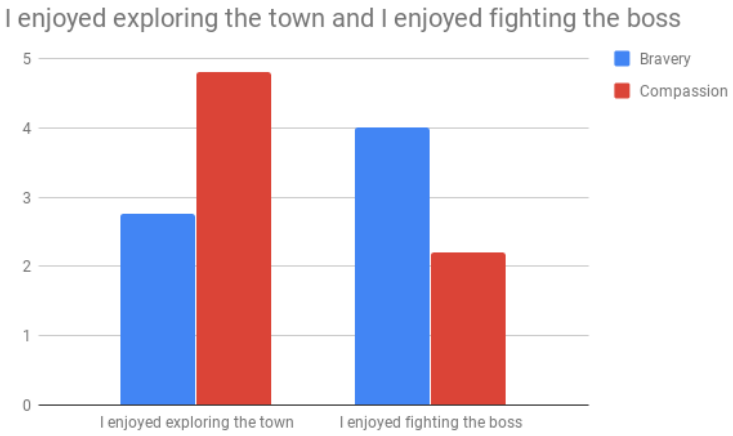
Similarly, Bravery type players achieved a better score in the Bravery quest than the Compassion types. The time of play in Bravery quest was not used as a comparison measure because oftentimes the shooting mechanic required in the quest required the user to practice to get used to it before trying to beat the quest giving us unreliable play time.

Figure 4.5: Average time played for Compassion Quest and Score Achieved for Bravery quest by player type



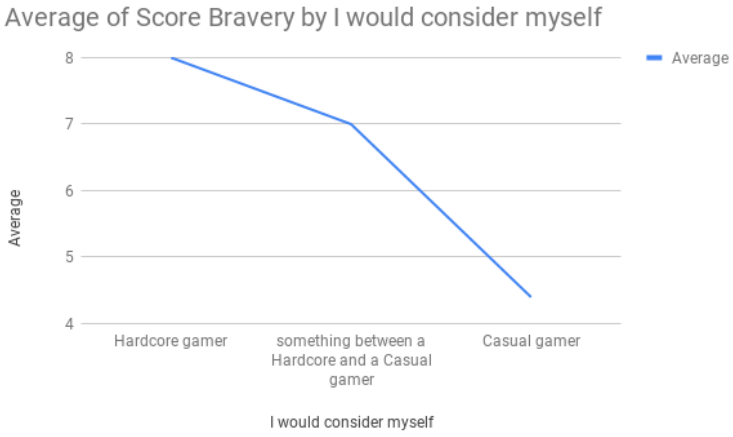
Finally, we asked users some more specific questions about their experience with the game's elements, such as how much they enjoyed exploring the town or fighting the boss. As expected, exploring was rated higher by Compassion user and fighting by Bravery users.

Figure 4.6: Average time played for Compassion Quest and Score Achieved for Bravery quest by player type



However, an element to take into consideration arose when we compared the players' game literacy level with their score in the Bravery quest. Players that identified as hardcore gamers scored 8 on average while casual gamers with an averaged 4.

Figure 4.7: Average score in Bravery quest by game literacy level



4.2.3 User Feedback

Overall, there were no outstanding complains with the game and users appear to enjoy the experience. Some of the players indicated that they would like the

Bravery quest to include more story elements and the Compassion quest to have more possible interactions with items in the game environment.

Occasionally users were observed trying to "break the bounds" of the game by walking towards the edge of the world or in areas that were not part of the quest. 2 users said that they enjoyed looking around the game environment to discover possible bugs.

In addition, 5 of the casual gamers users expressed that the Bravery quest was too difficult for them, but they understand that is the purpose. An interesting proposal was to use the personalization mechanics to help the user grow used to those challenges, similar to Dynamic Difficult Adjustment.

Moreover, 2 users that were mismatched by the adaptation manager shared an interest in trying new game mechanics that they are unfamiliar with, and sense of accomplishment that pairs with overcoming those challenges.

Prior to the user testing, only 2 of the players were familiar with adaptive game design and its potential. When the concept was explained to them, users expressed an interest in this design approach and would like to see further implementation of it. Specifically, casual gamers that are interested in playing more games but often are intimidated by the enormous variety of games a content shared that this design approach would help them enjoy those games regardless of their limited free time. One user particularly was quoted saying "Sometimes I am overwhelmed by the amount of Quests in some games and this system would help me navigate through them".

However, 2 of the hardcore players expressed a concern that adaptivity should not come at the cost of the designer's freedom to present a complete experience to the player.

4.3. Discussion

Overall, the game received positive feedback and users rated both versions as enjoyable. Even though this is not part of our evaluation goal, the fact that there were no outstanding problems with the game experience show that our data can be judged reliably and both versions were perceived as complete, enjoyable games.

In regards our Sub-Hypothesis, validating the reliability of player type detec-

tion in-game, the results appear promising. Overall, players rated the experiences related to their in-game detected player type higher than the opposite one, with the difference being more significant for Action oriented questions than the Aesthetics oriented.

As indicated, this might be a fault in the phrasing of the Brainhex questions, including words such as "punishing" and "struggle" giving a slightly more negative bias than the light-hearted questions for the Aesthetic types. More detailed questions and additional in-game metrics will help us achieve clearer results in future implementations.

When analyzing the effect of the personalization for our Main Hypothesis, results favored our design, with 70% of the users reporting that they preferred the version predicted by the system. This is further validated by our playing time and player performance data as well as detailed questions to the users, favoring the personalized version over the mismatched.

In cases the system failed to correctly predict the user's preference, qualitative feedback by the users indicated the tendency some players have to seek out new experiences and feel accomplished by challenging something unknown. This is a factor that future designs need to take into account in order to more effectively adapt the content to players.

Some additional observations that were made is that players that identified as "hardcore" gamers were more likely to achieve a higher score in the challenging Bravery quest. Moreover, casual gamers would need more time to learn how to operate the shooting mechanics than the hardcore and midcore players.

This indicates some potential correlation between game literacy and performance in the game which can affect the game experience. It is possible that players prefer a game that they perform well at, rather than one in which they struggle.

However, this might fact might also give us room for some possible expansion of the concept to include game literacy as a metric for adaptivity and design challenges to appeal to audience with ample experience in games. In addition, the same logic can be applied in personalizing a game in order to engross a player in a steady manner in game mechanics that they can enjoy but are unfamiliar with.

Chapter 5

Conclusion

5.1. Concept Validation

We started this research in order to explore new ways that adaptivity can be achieved in games without being obtrusive to the player or the game designer. With exploration into player typology theory we observed different player behaviors that can be used to determine individual player's preferences in a videogame.

The Brainhex model gave us ground for establishing different player personas and potential metrics of in-game behavior that can help us dynamically model the "type" of the player within the game without the need of tedious questionnaires.

Based on this theory we created a prototype environment to validate the use of those behavior metrics as triggers for categorizing the player preferences of the game. We tested the prototype environment along with self-reported data of the Brainhex model questionnaire to find correlations between in-game behavior and user's preferences of games in general. Our tests showed that we can indeed draw correlations between in game behavior and the player's preferences and the metrics we used were accurate to a moderate degree.

Using this player model, we designed an adaptation manager that selects a "quest" to present to the player based on their preferences, once again informed by player typology theory and common patterns in Role playing and Adventure videogames. We implemented 2 different quests designed to appeal to 2 different types of players and integrated them with the player model.

In order to validate the predictive accuracy of our adaptation manager, users

were given 2 versions of the game, the one matched with their player type and a mis-matched one and they were asked to fill in a post-survey about their experiences with both games.

Observations made from the gameplay and by user feedback gave us more insight into how to provide a more satisfying experience to the player. Some aspects of gameplay to take into consideration when designing for adaptive games is the tendency of some players to seek out new experiences and be challenged to exit their comfort zone. Especially for gamers that identify as casual or are not very familiar with games, the adaptive version can help them get used to new games and limit the feeling of "overbearingness" that comes with complicated games with a lot of content.

5.2. Limitations

Our work is not without its limitations, the main one being the lack of a completely validated player typology theory. The brainhex model gave us some insight into the different type of players and experiences we need to design, however player typology theory has a long way to go before it is complete and gains the ability to cover all players in all genres. More accurate descriptions of player types and ways to detect them will greatly improve the effectiveness of this concept.

Likewise, our design is limited by the amount of metrics designed to detect player behavior in game. Designing additional triggers inside the game would provide a more accurate model of the player and their preferences and avoid overlap between different player types. Moreover, our design include only 2 player types excluding some potentially vital exhibitions of play behavior and preferences.

In addition, by its nature player modeling is a technique that is more effective when applied on a user for a long period of time. The more data we can gain on the user, the more accurate their model will be. However our experiment could only run with a short, approximately 20 minute game in order to be run with as many users as possible and to avoid fatiguing the users and affecting our results. A more desirable approach would be to give a longer game to the users to play in their leisure within a span of e.g. a week to create a more accurate profile.

Lastly, the test could only be run with a small amount of users but in order to

draw more specific conclusions, the experiment needs to be run with many more users of different playing background. There are plenty of different factors that could affect our design that we were not able to test because of the small sample size, such as how the game will be perceived my people that are not at all familiar with games or deem themselves as very hardcore gamers.

5.3. Future Work

This research will be continued to include more additional triggers of play behavior inside the game. Some candidates that were considered but not implemented include mapping the player's steps to measure what percentage of the map they explored and the accuracy with which they eliminated targets with their bow. Furthermore, we want to include more player types for example the ones included in the Goal Orientation category of the Brainhex model and their respective triggers to appeal to a wider audience and make more informed decisions about the individual player.

A possible expansion for the concept is to continue updating the model during the personalized phase in order to correct the player model and continue adapting the game with presenting more future quests to the player. That being said, the continuation of the design needs to take into account that players occasionally want variety in games and inclusion of elements they are not familiar with but can learn to conquer. A possible approach would be to occasionally present the player a quest of a different player type and measure their performance in it.

References

[1] Bartle, R. Hearts, clubs, diamonds, spades: Players who suit muds. *Journal of MUD research 1*, 1 (1996), 19.

[2] Bateman, C. *Beyond game design: Nine steps toward creating better videogames*. Cengage Learning, 2009.

[3] Bateman, C., and Boon, R. *21st Century Game Design (Game Development Series)*. Charles River Media, Inc., 2005.

[4] Bateman, C., Lowenhaupt, R., and Nacke, L. Player typology in theory and practice. In *DiGRA Conference* (2011).

[5] Birk, M. V., Toker, D., Mandryk, R. L., and Conati, C. Modeling motivation in a social network game using player-centric traits and personality traits. In *International Conference on User Modeling, Adaptation, and Personalization*, Springer (2015), 18–30.

[6] Bontchev, B., and Vassileva, D. Assessing engagement in an emotionally-adaptive applied game. In *Proceedings of the Fourth International Conference on Technological Ecosystems for Enhancing Multiculturality*, ACM (2016), 747–754.

[7] Brockmyer, J. H., Fox, C. M., Curtiss, K. A., McBroom, E., Burkhart, K. M., and Pidruzny, J. N. The development of the game engagement questionnaire: A measure of engagement in video game-playing. *Journal of Experimental Social Psychology 45*, 4 (2009), 624–634.

[8] Busch, M., Mattheiss, E., Orji, R., Fröhlich, P., Lankes, M., and Tscheligi, M. Player type models: Towards empirical validation. In *Proceedings of the*

2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems, ACM (2016), 1835–1841.

[9] Busch, M., Mattheiss, E. E., Hochleitner, W., Hochleitner, C., Lankes, M., Fröhlich, P., Orji, R., and Tscheligi, M. Using player type models for personalized game design-an empirical investigation. *IxD&A 28* (2016), 145–163.

[10] Caillois, R. *Man, play, and games*. University of Illinois Press, 1961.

[11] Canossa, A. *Play-Persona: Modeling Player Behavior in Computer Games*. Danmarks Designskole, 2009.

[12] Charles, D., and Black, M. Dynamic player modeling: A framework for player-centered digital games. In *Proc. of the International Conference on Computer Games: Artificial Intelligence, Design and Education* (2004), 29–35.

[13] Cowley, B., and Charles, D. Behavlets: a method for practical player modelling using psychology-based player traits and domain specific features. *User Modeling and User-Adapted Interaction 26*, 2-3 (2016), 257–306.

[14] Csikszentmihalyi, M. Toward a psychology of optimal experience. In *Flow and the foundations of positive psychology*. Springer, 2014, 209–226.

[15] Cutler, A., and Breiman, L. Archetypal analysis. *Technometrics 36*, 4 (1994), 338–347.

[16] Fortes Tondello, G., Valtchanov, D., Reetz, A., Wehbe, R. R., Orji, R., and Nacke, L. E. Towards a trait model of video game preferences. *International Journal of Human–Computer Interaction* (2018), 1–17.

[17] Houlette, R. Player modeling for adaptive games. In *AI Game Programming Wisdom*. Charles River Media Inc., 2004, 557–558.

[18] Hunicke, R. The case for dynamic difficulty adjustment in games. In *Proceedings of the 2005 ACM SIGCHI International Conference on Advances in computer entertainment technology*, ACM (2005), 429–433.

[19] Hunicke, R., LeBlanc, M., and Zubek, R. Mda: A formal approach to game design and game research. In *Proceedings of the AAAI Workshop on Challenges in Game AI*, vol. 4, AAAI Press San Jose, CA (2004), 1–5.

[20] Jeng, S.-P., and Teng, C.-I. Personality and motivations for playing online games. *Social Behavior and Personality: an international journal 36*, 8 (2008), 1053–1060.

[21] Klem, L. Structural equation modeling.

[22] Laws, R. D. *Robin's laws of good game mastering.* Steve Jackson Games, 2002.

[23] Lazzaro, N. Why we play games: Four keys to more emotion in player experiences. In *Proceedings of GDC*, vol. 306 (2004).

[24] McCrae, R. R., and John, O. P. An introduction to the five-factor model and its applications. *Journal of personality 60*, 2 (1992), 175–215.

[25] Missura, O., and Gärtner, T. Player modeling for intelligent difficulty adjustment. In *International Conference on Discovery Science*, Springer (2009), 197–211.

[26] Myers, I. B., McCaulley, M. H., and Most, R. *Manual, a guide to the development and use of the Myers-Briggs type indicator.* Consulting Psychologists Press, 1985.

[27] Nacke, L. E., Bateman, C., and Mandryk, R. L. Brainhex: preliminary results from a neurobiological gamer typology survey. In *International Conference on Entertainment Computing*, Springer (2011), 288–293.

[28] Nacke, L. E., Bateman, C., and Mandryk, R. L. Brainhex: A neurobiological gamer typology survey. *Entertainment computing 5*, 1 (2014), 55–62.

[29] Orji, R., Mandryk, R. L., Vassileva, J., and Gerling, K. M. Tailoring persuasive health games to gamer type. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ACM (2013), 2467–2476.

[30] Rogers, K., Kamm, C., and Weber, M. Towards player-centric adaptivity: Interactions of gameplay behaviour and player traits in a survival game. In *Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play Companion Extended Abstracts*, ACM (2016), 269–276.

[31] Rosenstock, I. M. Why people use health services. *The Milbank Quarterly 83*, 4 (2005).

[32] Ryan, R. M., Rigby, C. S., and Przybylski, A. The motivational pull of video games: A self-determination theory approach. *Motivation and emotion 30*, 4 (2006), 344–360.

[33] Schrader, C., Brich, J., Frommel, J., Riemer, V., and Rogers, K. Rising to the challenge: An emotion-driven approach toward adaptive serious games. In *Serious Games and Edutainment Applications*. Springer, 2017, 3–28.

[34] Sifa, R., Drachen, A., Bauckhage, C., Thurau, C., and Canossa, A. Behavior evolution in tomb raider underworld. In *Computational Intelligence in Games (CIG), 2013 IEEE Conference on*, IEEE (2013), 1–8.

[35] Smith, A. M., Lewis, C., Hullett, K., Smith, G., and Sullivan, A. An inclusive taxonomy of player modeling. *University of California, Santa Cruz, Tech. Rep. UCSC-SOE-11-13* (2011).

[36] Stewart, B. Personality and play styles: A unified model. *Gamasutra, September 1* (2011).

[37] Tanenbaum, J., and Tomizu, A. Affective interaction design and narrative presentation. In *AAAI 2007 Fall Symposium on Intelligent Narrative Technologies* (2007).

[38] Tanenbaum, J., and Tomizu, A. Narrative meaning creation in interactive storytelling. *International Journal of Computational Science 2*, 1 (2008), 3–20.

[39] Teng, C.-I. Online game player personality and real-life need fulfillment. *International Journal of Cyber Society and Education 2*, 2 (2009), 39–50.

[40] Thue, D., Bulitko, V., Spetch, M., and Wasylishen, E. Interactive storytelling: A player modelling approach. In *AIIDE* (2007), 43–48.

[41] Togelius, J., De Nardi, R., and Lucas, S. M. Making racing fun through player modeling and track evolution.

[42] Togelius, J., De Nardi, R., and Lucas, S. M. Towards automatic personalised content creation for racing games. In *Computational Intelligence and Games, 2007. CIG 2007. IEEE Symposium on*, IEEE (2007), 252–259.

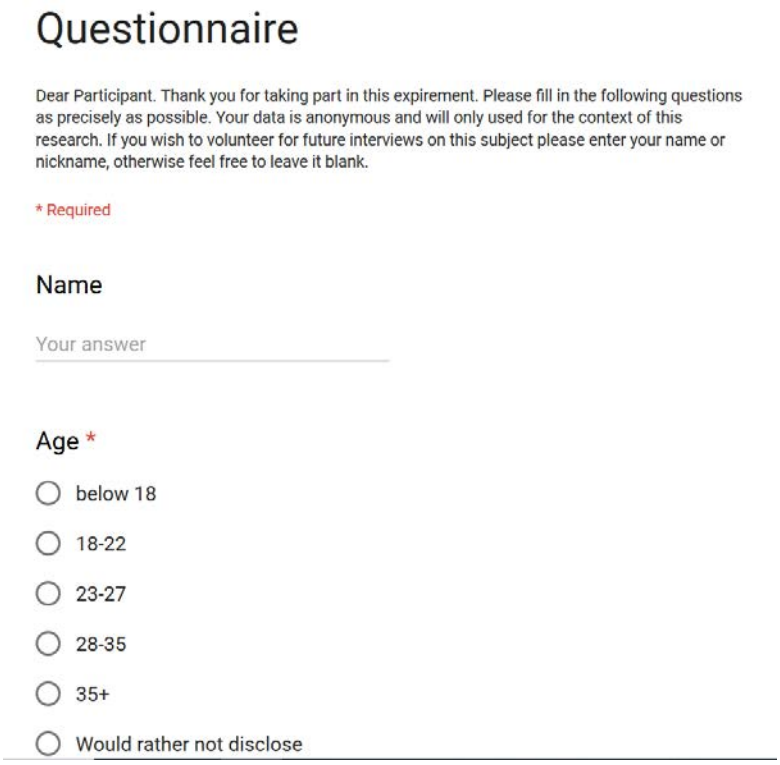
[43] Yannakakis, G. N., Spronck, P., Loiacono, D., and André, E. Player modeling. In *Dagstuhl Follow-Ups*, vol. 6, Schloss Dagstuhl-Leibniz-Zentrum fuer Informatik (2013).

[44] Yee, N. Motivations of play in mmorpgs.

[45] Zammitto, V. L. *Gamers' personality and their gaming preferences*. PhD thesis, Communication, Art & Technology: School of Interactive Arts and Technology, 2010.

Appendix

A. Pre-survey applied before playing the prototype



Questionnaire

Dear Participant. Thank you for taking part in this expirement. Please fill in the following questions as precisely as possible. Your data is anonymous and will only used for the context of this research. If you wish to volunteer for future interviews on this subject please enter your name or nickname, otherwise feel free to leave it blank.

* Required

Name

Your answer

Age *

- below 18
- 18-22
- 23-27
- 28-35
- 35+
- Would rather not disclose

Figure A.1: Pre-survey excerpt 1

I typically play videogames (on any platform) *

- ◯ Every day
- ◯ Every week
- ◯ Occasionally
- ◯ Rarely
- ◯ Never

I would consider myself *

- ◯ Hardcore gamer
- ◯ something between a Hardcore and a Casual gamer
- ◯ Casual gamer
- ◯ I have no idea!

Figure A.2: Pre-survey excerpt 2

Figure A.3: Pre-survey excerpt 3

Picking up every single collectible in an area.

	1	2	3	4	5	
I avoid playing this way	○	○	○	○	○	I often play this way

Working out how to crack a challenging puzzle.

	1	2	3	4	5	
I avoid playing this way	○	○	○	○	○	I often play this way

The struggle to defeat a difficult boss.

	1	2	3	4	5	
I avoid playing this way	○	○	○	○	○	I often play this way

Responding quickly to an exciting situation.

	1	2	3	4	5	
I avoid playing this way	○	○	○	○	○	I often play this way

Figure A.4: Pre-survey excerpt 4

Working out what to do on your own.

	1	2	3	4	5	
I avoid playing this way	○	○	○	○	○	I often play this way

Wondering what's behind a locked door.

	1	2	3	4	5	
I avoid playing this way	○	○	○	○	○	I often play this way

Looking around just to enjoy the scenery.

	1	2	3	4	5	
I avoid playing this way	○	○	○	○	○	I often play this way

Devising a promising strategy when deciding what to try next.

	1	2	3	4	5	
I avoid playing this way	○	○	○	○	○	I often play this way

Figure A.5: Pre-survey excerpt 4

Being in control at high speed.

	1	2	3	4	5	
I avoid playing this way	○	○	○	○	○	I often play this way

Completing a punishing challenge after failing many times.

	1	2	3	4	5	
I avoid playing this way	○	○	○	○	○	I often play this way

STOP here and play the prototype!

○ Ok done!

Figure A.6: Pre-survey excerpt 4

B. Post-survey applied after playing the prototype

Food collected in Forest Scene *

	0	1	2	3	4	5	6
Animals Shot	○	○	○	○	○	○	○
Picked up items	○	○	○	○	○	○	○

In regards to the exploring quest:

	Strongly disagree	2	3	4	Strongly Agree
I thought it was fun	○	○	○	○	○
I thought it was hard	○	○	○	○	○
I felt bored	○	○	○	○	○
I felt challenged	○	○	○	○	○
I felt frustrated	○	○	○	○	○
I would continue playing that game	○	○	○	○	○

Figure B.1: Post-survey excerpt 1

In regards to the shooting quest:

	Strongly disagree	2	3	4	Strongly Agree
I thought it was fun	○	○	○	○	○
I thought it was hard	○	○	○	○	○
I felt bored	○	○	○	○	○
I felt challenged	○	○	○	○	○
I felt frustrated	○	○	○	○	○
I would continue playing that game	○	○	○	○	○

Between the 2 games, which one did you prefer? *

	1	2	3	4	
Shooting quest	○	○	○	○	Exploring quest

Figure B.2: Post-survey excerpt 1

In regards to the exploring quest: I enjoyed talking to the NPCs *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

In regards to the exploring quest: I enjoyed solving the curse *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

In regards to the exploring quest: I enjoyed exploring the town *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Figure B.3: Post-survey excerpt 1

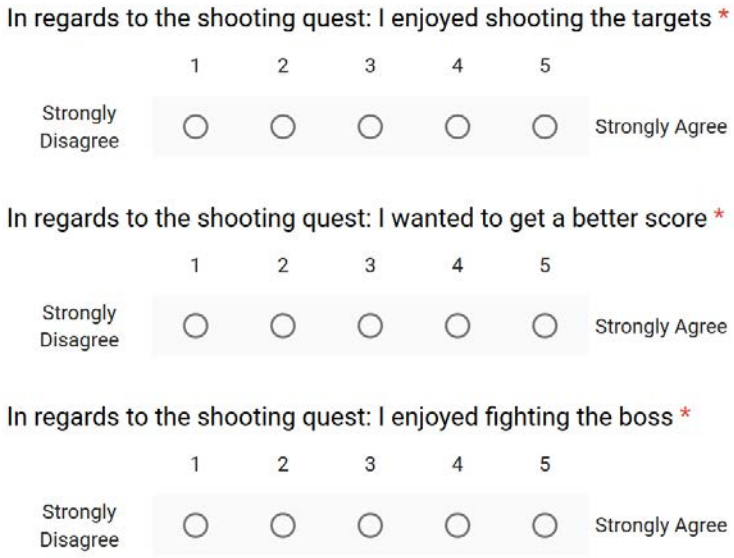


Figure B.4: Post-survey excerpt 1

C. Unity resources

The following section describes the resources used to create the evaluation prototype. They can be found in the Asset Store, the majority are available for free but occasionally purchases had to be made.

C.1 Fantasy RPG Warrior Pack

This package contains 9 various types of animated lowpoly characters and 2 types of canons. Models can be easily edited, due to being made from separate parts.

https://assetstore.unity.com/packages/3d/characters/creatures/fantasy-rpg-warrior-pack-80377

C.2 Dreamscapes

The package contains a handful of models, textures and particle effects for nature assets such as trees, rocks, flowers etc.

https://assetstore.unity.com/packages/3d/environments/dreamscapes-50924

C.3 Fancy Village

This package allows you to create your own village in a fantasy style. It contains buildings, vegetation and other game objects.

https://assetstore.unity.com/packages/3d/environments/fantasy/fancy-village-58614

C.4 Polygon Adventure

A low poly asset pack of characters, buildings, props, items and environment assets to create a fantasy based polygonal style game.

https://assetstore.unity.com/packages/3d/environments/fantasy/polygon-adventure-pack-80585

C.5 Modular Fantasy Bridges

Contains 9 models of fantasy bridges.

https://assetstore.unity.com/packages/3d/environments/fantasy/modular-fantasy-bridges-99940

C.6 Fantasy Kingdom Pack Lite

This is a hand-painted cartoon style pack which contains 4 buildings and 30 assets.

https://assetstore.unity.com/packages/3d/environments/fantasy/fantasy-kindom-building-pack-lite-78378

C.7 Nature Starter Kit

Nature Starter Kit 2 contains trees and bushes compatible with the built-in tree generator https://assetstore.unity.com/packages/3d/environments/nature-starter-kit-2-52977

C.8 Post Processing Stack

Includes visual effects like Antialising, Depth of Field, Motion Blur
https://assetstore.unity.com/packages/essentials/post-processing-stack-83912

C.9 Standard Assets

This collection of assets, scripts, and example scenes can be used to kickstart your Unity learning or be used as the basis for your own projects.

https://assetstore.unity.com/packages/essentials/asset-packs/standard-assets-32351

C.10 3rd person Controller + Fly

This package provides a basic setup for a 3rd person player controller, containing basic locomotion (walk, run etc) and a mecanim animator controller.

https://assetstore.unity.com/packages/templates/systems/3rd-person-controller-fly-mode-28647

C.11 Let's try Assets

These assets are made in order to follow along with the Let's Try tutorial series found at Unity's learn site (https://unity3d.com/learn/tutorials/lets-try)

https://assetstore.unity.com/packages/essentials/tutorial-projects/let-s-try-assets-66207

C.12 Dialogue System for Unity (Demo version)

Dialogue System for Unity makes it easy to add interactive dialogue and quests to your game. It's a complete, robust solution including a visual node-based editor, dialogue UIs, cutscenes, quest logs, save/load, and more. The core is a lean, efficient conversation system.

https://assetstore.unity.com/packages/tools/ai/dialogue-system-for-unity-11672