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Suggestion System for Players based On peRsonaliTy

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Resumo

À medida que a indústria de vídeo jogos cresce, a concorrência tornou-se uma realidade para a maioria dos criadores e publicadores de jogos. Novas formas de atrair o jogador e melhorar a sua experiência de jogo estão a ser pesquisadas e desenvolvidas, sendo uma delas a adaptação de conteúdos de jogo durante o próprio jogo. Esta adaptação é muitas vezes baseada em comportamentos ou na personalidade do jogador.

Neste trabalho, foi nosso objetivo melhorar a experiência de jogo para os jogadores, ajudando-os a tomar decisões dentro do jogo. Para tornar isto possível, foi criado um jogo com um companheiro que teria a função de ajudar o jogador sempre que este pedisse. Esta ajuda seriam baseada na personalidade do jogador usando a dimensão Conscientiousness e as suas facetas correspondentes do Five Factor Model.

Após a avaliação da nossa solução, não se pode concluir que esta abordagem seria a melhor para todo o espectro da dimensão Conscientiousness. A maioria dos sujeitos avaliados não pediu nenhuma recomendação ao companheiro. No entanto, para os que pediram obtivemos resultados positivos para pessoas com baixa pontuação nesta dimensão.

Palavras-Chave: Modelos de Jogador, Jogos, Modelos de Personalidade, Jogos Adaptativos.
Abstract

As the gaming industry develops, competition has become a today's reality for most game developers and publishers. New ways to attract players and improve their gaming experience are being researched and developed, one of them being the adaptation of game content during gameplay. This adaptation is often based on player behavior or on player's personality.

In this work our objective is to improve the players gaming experience by helping him make decisions within the game. To make this possible, a game was created featuring a companion that would assist the player whenever he asks. These aid were based on the player's personality using the Conscientiousness dimension and its corresponding facets of the Five Factor Model.

After the evaluation of our solution we could not conclude that this approach would work for all the spectrum of the Conscientiousness dimension. Most of the subjects evaluated did not ask for a recommendation. However, for the participants that did ask for advice on which quest they should take, we got positive results for people that scored low on this dimension.

Keywords: Player Models, Games, Personality Models, Adaptive Games.
Dedication

I dedicate this work to my family.
Acknowledgements

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Chapter 1

Introduction

The gaming industry has grown significantly in the past decade, not only because people all over the world, from all ages and genders, are playing and enjoying games (according to Jane Macgonigal\(^1\) over then a billion worldwide play video games) but also because the industry groups together many different job disciplines and creates many job opportunities all around the world.

It all started in the 1940s when Thomas T. Goldsmith, Jr. and Estle Ray Mann present an invention called the “cathode ray tube amusement device”\(^2\), being today’s considered to be the first video game ever created. Through the years, games have evolved greatly and it has become more and more imperative for game developers and publishers to improve player's experience, not only to keep players engaged but also to expand their audiences to other potential people. Nowadays, over 1500 commercial games are published every year and all of them compete to engage players with their product. That is why most of games are so streamlined, because there is a risk involved on not being successful.

This document proposes a methodology for game designers to create games that may appeal to a wide range of people with different personalities. We also think that this work may be quite useful to introduce new players to the gaming world. We will try to achieve this by aiding them on their choices based on that persons’ personality. By knowing previously what player type we are dealing with, and when he needs to make a decision within the game, we can suggest what we think is the best choice for him according to his personality. In the end we will try that the overall gaming experience for that person to be the best one possible.

1.1 Motivation

According to the Entertainment Software Association (ESA)\(^3\), in the United States, in 2013, 58% of the country population plays video games, where 55% are male and 45% are female [5]. This shows us that, despite more than half of the USA is playing video games, there is still a very large set of people that video games have not yet reached. There may be an interest in the video gaming industry to reach these people, as more people usually means more money, but, how could they reach them? First of all, maybe we should ask ourselves why do people play games.

Csikszentmihalyi[2] proposed a new concept that he called Flow. Flow is a state that happens when a person is in complete focus in an activity that comes with a high level of enjoyment and fulfillment. Csikszentmihalyi developed many theories on how to get people in their Flow state, but the most inspiring

\(^{1}\)http://www.ted.com/conversations/44/we_spend_3_billion_hours_a_year.html
\(^{2}\)http://classicgames.about.com/od/classicvideogames101/p/CathodeDevice.htm
\(^{3}\)http://www.theesa.com/
of them all is perhaps his definition of the Flow Zone, which not only can be applied to video games but to all sorts of activities that a human being can enjoy, being that work or hobby.

World of Warcraft (WoW)⁴ is one of the most well known video games, both because of its popularity and because, for a 2004 game, it is still played by many people⁵. In 2011, according to MacGonigal, players have spent over 5.93 million years playing it. Wow is a massively multiplayer online role-playing game (MMORPG) created by Blizzard Entertainment. Role-playing games (RPGs), or computer RPGs (CRPGs), are video games where players control a character that is immersed in fictional virtual world. In WoW, players characters can explore the world, fight monsters, complete quests and interact with non-playable characters (NPCs) or other players that can be connected to the game at the same time. Many studies were made upon this game, and perhaps one of the most important was the “Daedalus Project”⁶. This particular project is very interesting because it gathers data from an enormous variety of MMO players, including WoW players, and can give us a clue on why gamers spend so much time in this types of games.

![Figure 1.1: World of Warcraft.](image)

Another very popular game is “The Sims”, or “The Sims” series⁷. This game is a life simulation video game with a bit of strategy mixed into it. Developed initially by Maxis (2000-2008) and later by The Sims Studios (2008-present), “The Sims” is one of the most successful video game series in the history of video games. In May 2011 the series had sold more than 150 million copies worldwide reaching the status of the best selling PC franchise of all time. As strange as it may sound, Will Wright, the game designer behind “The Sims”, predicted that the game should have been a commercial disaster⁸ and it was rejected the first time he tried to publish it. But then, what made this game so popular? We know that every gamer, or player, experience games in many different ways and because of the flexibility of “The Sims”, every player could have their own personal experience. Some like to build houses, others like to decorate theirs, others like to simple make a carrier with their sims, or raise a family, there is even the possibility for detailing the character aspect so it can look like the player, family and friends in real life. There are endless possibilities and so many different ways to play the game, with none being better than the other. That is why “The Sims”, in my opinion, can appeal to such a high number of people, because the way it resembles real world, it stops being a something strange and difficult to understand, in the way that the player can intuitively know that in order to survive his characters need to eat, for example, and starts to be something else that everyone can enjoy, relate and be part of.

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⁴[http://us.battle.net/wow/en/](http://us.battle.net/wow/en/)
⁸[http://gamestudies.org/0601/articles/paulk](http://gamestudies.org/0601/articles/paulk)
Currently the gaming industry is also progressively looking more into player models. An example is the game WildStar\(^9\), developed by Carbine Studios, where the player, aside from the class and race of his character, also needs to choose a path in which his character will be more rewarded for completing certain quests. For example, if the player chooses the path of a warrior he will get specific quests that will be in accordance with that path. This may not seem different from what the player chooses in WoW, but in WildStar they clearly stated that they have taken player models into account while designing this player paths. This show us that the industry is taking in account that there are many different players and they enjoy games in different ways from each other. By looking into players personality games can try to adjust themselves into players’ needs making the experience more enjoyable.

1.2 Problem Description

The main goal of this work is to create a system that can aid less experienced players in role playing games, where the player has to make important decisions that will affect the gameplay. This system will be incorporated in a RPG, created by us, that will suggest which choices the player should select according to his personality. Since, mainly in these types of games, players may made some decisions that will influence the way the game can be played (specially in the beginning where choosing the race and class of the character may influence the player experience, normally till the end of the game), the goal of this work will be to try to maximize players enjoyment and help gamers not feel so overwhelmed by all the choices they can make. We, therefore, aim to provide a better gaming experience for the players.

With the above in mind, we have created a game where the player will need to make certain decisions. In this case the player will need to choose which quests to take in order to have the best recommendation possible for the guild that will guide his future to later join the army. To help him with his decisions, a companion was created. This companion would only give advice if asked to. For this, we designed seven quests from which the player would need to choose (he could choose neither or a maximum of three different quests). The quests he picks, would influence the final recommendation for what guild he should enrol in.

With this work we wish to improve the player’s experience during gameplay, by aiding them in making important decisions, improving the overall enjoyability of the game experience. By providing the player with the best options for a certain moment and by taking into account his personality, we aspire to improve the players enjoyment in the game.

\(^9\)http://www.wildstar-online.com/uk/
In the next chapter we will be focused on related work, discuss the concept of Flow, some of the player models that groups individuals with similar characteristics, we will talk about some examples of adaptive games and finally, we will also talk a bit about the Deadalus Project. On chapter three we will discuss our solution for improving the players enjoyment in more detail and on chapter four we will discuss the results of this experiment. The final chapter is reserved for the conclusions on this work and also some recommendations for future work.
Chapter 2

Related Work

In this section we will discuss some concepts and works that are related with this experiment. First we will talk a little bit about the concept of Flow and why it is important in games. Next we will talk about some of the existing player models, focusing on the one used for the design of this work. We will also talk about adaptive games, what they are and what has been done relative to this subject. And finally we talk about the Deadalus Project and how it’s data can help improve games, especially the RPG genre.

2.1 Flow in Games

As the video game industry grows, the need to engage gamers has become one of the major concerns for game developers and publishers alike. Flow has been widely referenced across multiple fields, including the gaming industry, as a positive psychological concept. This concept can be used to maximize player’s enjoyment during gameplay.

Normally there are eight elements in flow, according to Csikszentmihalyi’s research [2]. These elements are, challenge, an activity must require skill, action and awareness, that need to be merged, goals, which need to be clear, feedback, focus, the player needs to focus on the task at hand, a sense of control, loss of self-consciousness and the transformation of time. It is important to notice that not all of these components are necessarily needed for someone to experience flow but some of them need at least to be present.

The Flow Zone is a state were a person is totally engaged in an activity, which depends on the challenge of the activity and the amount of skill that the person has in the moment she is performing it.

![Flow Zone Diagram](image)

Figure 2.1: Flow zone.
As the chart on figure 2.1 shows, to maintain a person in his flow state, the activity needs to be balanced with the person level of skill. The challenge must be adequate to the skill of the person so that she does not experience anxiety or boredom. For example, in a game, in its early phases, where the player is not so skillful, if the challenges are more difficult than the amount of skills or experience that the player has in that moment, the player may experience some anxiety, or if the challenge is too easy but the player is more experienced, than he may feel bored. However if we keep the right amount of challenge difficulty correctly matching the player skills, then the player will be in the flow zone.

When we are talking about reaching the mass audiences, we must not forget that every person is different and experiences life, and games, in many ways. Due to this fact, the flow zone and skills of each person are different, like a fingerprint. While a game maybe fine for players that occasionally play games, for experienced or novice ones it will not be as effective. Game developers can try to get as many flow variants as they can through sessions of playtesting, but normally they are not wide enough to represent the variety of people that they might want to reach.

In his thesis, Chen [7] proposed a design methodology to maximize flow in games during the process of game design. Developers can expand the game Flow coverage by including a wide spectrum of gameplay with different difficulties and flavors, they also can create a player oriented active dynamic difficulty adjustment (DDA) system that would allow different players to play on their own pace, or they can also embed those DDA choices into the core of the gameplay mechanics and let the player make their own decisions throughout the game. This system would allow game designers to create games that are more dynamic and flexible, making more people enter and stay in their flow zone and finish the game. Chen tested these methods in two different games where he compared the results between using or not the DDA system.

In the first game, “Traffic Light”\(^1\), players’ needed to predict and click a certain button, as late as they can, before the traffic light turns red. The players had three tries in each round where, if they manage to win two of them, they could keep their total score and proceed to the nest room. If they would fail, their total score would be lost. Also, between each round, the player would be asked if they wanted to play the game in a slower or in a faster pace. The test results showed that player oriented DDA based on choices extends the time a player spends in the game from one to two minutes to about five minutes and twelve seconds, despite the constant DDA choices breaking the player Flow state.

The second game goes by the name of “flOw”\(^2\), where choices to test player oriented DDA are part of the gameplay. In this game the player uses the mouse to control a creature where it was to consume other creatures with the objective of evolving and advancing into the abyss. The game is divided into twenty levels, where in each one a new creature is introduced to the player, creating the possibility for the appearance of new challenges. In this game, players can customize their experience naturally by choosing to eat different types of food and swimming further way from other creatures. The “flOw” experience was considered by the gaming community as a very addictive experience and reached more than 350,000 downloads in the first two weeks [7].

Chen concluded that flow is much more than challenges and skill, at least when we talk about games, and gave the examples of “The Sims” and “Cloud” where the gaming experience does not have this two factors as their main gameplay mechanic, and still have proven to be very enjoyable for a major variety of people.

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\(^1\)http://www.jenovachen.com/flowingames/trafficlight.htm
\(^2\)http://www.jenovachen.com/flowingames/flowing.htm
Sweetser and Wyeth [8] proposed a new concept to evaluate flow in games. They called it the GameFlow criteria that consist in eight different elements, **concentration**, **challenge**, **skills**, **control**, **clear goals**, **feedback**, **immersion**, and **social interaction**.

They grab the Flow theory from Csikszentmihalyi’s and adapted it to game concepts. They determined that for a game to be enjoyable, it requires a certain amount of concentration from the player. In other words, a task requires the player attention in order to be more absorbing. According to Csikszentmihalyi, when all of a person’s relevant skills are needed to finish a certain task, no energy is left to process anything other than that task. The players’ attention should be grabbed quickly and maintained throughout the game. According to the Flow concept a very important aspect is the challenge of the task performed. If the challenge is greater or lesser than the skills of the person he will experience anxiety or apathy, respectively. Most of the satisfaction a player experiences in a game comes from the successfully surpassing difficult tasks, testing and mastering skills, and surviving danger. The difficulty of the challenge should gradually increase to help the player not to feel bored with the game. Preventing players fatigue can be accomplished by varying the tasks and their pace during gameplay.

Skill development and mastery is also important in a game. As said before, for someone to experience flow, the skill must match the challenge difficulty. In the game environment, players should begin by playing interesting and absorbing tutorials that will allow the play to became more evolved with the game.

The player needs to feel that he has the control over his actions in the game and he must feel that every input he gives to the game will be interpreted and translated correctly. When the game has errors, it can make the player feel that he has lost control over it. Games in which each of the players decisions have a direct impact in the gameplay are highly replayable, because each time a different decision can make the game entirely different. There should not exist actions that do not have direct impact in the game and feel that are not important for the purpose of winning or loosing the game.

Also a game should have a goal or purpose, that should be clear and the player must know exactly from the beginning of the game what he should do to finish the game. The player must be provided with appropriate feedback so that the flow state is not broken. This feedback is of the most importance for players to determine the distance and progress that remains for them to finish the task or the game itself.

Ultimately the gameplay experience should be effortless for the player to feel involved in the game and the game should support and create opportunities for social interaction. Although social interaction is not a direct element of flow, as it can interrupt immersion in games, it is most certainly a factor of enjoyment.

With all this elements in mind Sweetser and Wyeth validate two games using this GameFlow criteria. The games were Warcraft 3 and Sony’s Lords of EverQuest, being both real-time strategy, fantasy games release very closed to each other (2002 and 2003 respectively), with the only difference between the two being that one was highly rated and the other was not.

Although this GameFlow criteria can give us a prediction in how games will perform, Sweeter and Wyeth concluded that it could be better used as a guide for an expert review or as the basis for constructing a good play-testing session.

We can conclude that flow is a very important factor in understanding why we play games as its primary goal is to entertain through motivation which can be directly related to the definition of flow itself.
2.2 Player Models

Player modeling is the study of computational models, being its primary goal to understand how each individual player experiences interaction with a game. As we have seen, the diversity of the masses are a big problem for game developers, as each individual has his own taste, engaging all the different players can prove to be quite a challenge.

The next studies are an attempt to categorize the different players types based on psychological theories and I will briefly name some of them.

2.2.1 Four Bartle Types.

The Four Bartle Types model is based on the observation and analysis of people’s behavior during gameplay. This model defends that there are four different types of player: killers, achievers, explorers and socializers. The killers tend to like to compete themselves with other players and prefer fighting them compared with fighting non-controllable characters (NPCs). Achiever players like to gain “points”, level up, get better equipment or other concrete measurement of success present in the game. Explorers like to, as the name suggests, explore the game world, discover new areas, create maps and learn about hidden places. Players that fall in the type of the socializer prefer the social aspect of a game, so they like to interact with other players and, in some occasions, NPCs.

These four categories derived from two major primary gameplay interests, content (acting/interacting) and control (players/world), that are mutually excluded. The content interest is the action to simply and directly interact with objects in the game world and the control interest is related to how the players like to experience the game world.

As we can see on figure 2.2, killers and achievers like to act upon other players or the world itself, respectively, while the socializers and the explorers prefer to interact more with other players or the game world, respectively. We can also see that killers and socializers prefer to interact with other players, while achievers and explorers prefer to interact more with the game world.

A very promising game that uses the Bartle types is the game WildStar, mentioned before, where they based the paths that a player can choose, in the character creation phase, on these player categories. The player can choose between the paths of soldier, explorer, settler and scientist, which can be directly mapped into the Bartle types, killer, explorer, socialiser and achiever, respectively.
2.2.2 The Four Keirsey Temperaments.

David Keirsey identified four main temperaments from the Myers-Briggs sixteen types of personality models. The Myers-Briggs types (MBT) are a psychological test made to measure the psychological preferences in how people perceive the world. The four Keirsey temperaments are, therefore, the artisan, the guardian, the rational and the idealist. Much like the previous model, Keirsey temperaments can be mapped in a four quadrant graph.

As we can see in the diagram of figure 2.3, the artisans and the idealists both prefer change, they like freedom or opportunities, while the rational and the guardians prefer structure, rules and organization. We can also see that both idealists and rational people like to have possibilities and prefer the abstract, and on the other hand the artisans and the guardians prefer the concrete. The distinctive human behaviors that he used were the internals against externals (abstract vs. concrete) and change against structure (freedom vs. rules).

So we can say that artisans want the power to be free and act at will on people and things, the guardians want security of possessions obtained by following the rules, the rational seeks satisfaction of understanding how things work and the idealists like to cooperate with people.

The Keirsey temperaments may seem very similar to the Bartle Types, however Bartle focus more on aspects of gameplay while Keirsey sees a more general preference for internal or external change in peoples temperaments. Steward [14] however believes that this two types are analogous because the basic two valued motivations are very similar and the types and temperaments generated by those motivations are also very alike.

2.2.3 Demographic Game Design Model and the Unified Model.

Bateman proposed the Demographic Game Design (DGD1) model that focus on market oriented game design. He introduced four new types of players, the conqueror, the manager, the wanderer and the participant, each with two subgroups to distinguish between experienced (hardcore) and casual players, where conquerors present both strategic and logistics skills, the managers present strategic and tactical skills, the wanderer is normally diplomatic and tactical, and the participant presents diplomatic and logistical skillset.
Stewart [14] proposed that the DGD1 together with the four Bartle types and the four Keiser temperaments to be combined forming the unified model, as the DGD1 feels the gaps between both the Bartle and the Keiser model. We can see this unified model in more detail in figure 2.4.

2.2.4 Lazzaro’s Fun Types.

Lazzaro’s Fun types [9] divide the players based on their motivation during gameplay and on what their emotions are. These types can be:

- “Hard Fun”, when the player like opportunities for challenge, strategy, and problem solving, normally experiencing feelings like frustration and triumph over adversity;
- “Easy Fun”, when players enjoy intrigue and curiosity. This type can be related to emotions like wonder, awe and mystery;
- “Altered States”, when players treasure the enjoyment from their internal experiences in reaction to the visceral, behavior, cognitive, and social properties. These players normally like to experience emotions of excitement or relief;
- “The People Factor”, when players use games as a mechanism for social experiences. These players usually like to experience amusement, pleasure from other misfortunes and pleasure from a successful pupil that he mentors.

2.2.5 The Big Five Factor Model.

The Five Factor Model is a theory that divides a person personality in five dimensions or traits. These five traits are Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism. This dimensions, also known as the O.C.E.A.N., that do not overlap and seem to be found through a wide range of participants of different ages and culture. Each of those traits are divided into six different facets, that are specific and unique aspects of the broader personality trait. Openness to experience distinguishes creative intellectual people from realistic pragmatic ones. Conscientious people have a tendency to control their impulses, they prefer to plan rather than having a spontaneous behavior. The extraversion trait deals with the desire for external stimulation. Agreeableness deals with cooperation and social harmony. And finally, the neurotic trait reflects how strongly one experiences negative emotions.
VandenBerghe [10], a Creative Director out of Ubisoft Montreal, made a correlation between the Big Five motivational factors to game design elements. He proposed the five domains of play, novelty, challenge, stimulation, harmony and threat. Novelty, which can be mapped to openness to experience, is the presence, or absence, of new, interesting, dramatic, or beautiful in a game. Challenge, that maps to conscientiousness, appears when the games requires that the player overcomes some sort of obstacle, avoid danger, or even collect achievements. Stimulation, which maps to extraversion, is the part of the game that excites, through direct thrill-rides or through social interactions. Harmony, which can be mapped to agreeableness, happens when the players behave in a particular way towards other people or characters. And finally threat, which maps to neuroticism, happens when a game can induce negative emotions in the player, like addiction, anxiety, anger, or sadness.

Those domains can be used to measure how satisfying games are, what kind of players would enjoy certain games better then others, what parts of the game are not satisfying and what kind of players could start or stop enjoying the game if certain changes would to be made.

In the following sections we will explain each trait and it’s corresponding facets in more detail, so we can better understand them. This descriptions are present in the International Personality Item Pool Representation of the NEO PI-R website³.

2.2.5.1 Extraversion

This dimension is marked by pronounced engagement with the external world. Extraverts normally enjoy being with people, are fun of energy, and often experience positive emotions. They tend to be enthusiastic, action-oriented, individuals who are likely to say “Yes!” or “Let’s go!” to opportunities of excitement.

On the other hand, individuals with low scores on the Extraversion trait (Introverts), lack the exuberance, energy, and activity levels of the ones that score higher. They tend to be quiet, low-key, deliberate, and disengaged from social world. Their lack of social involvement should not be interpreted as shyness or depression. The introvert simply needs less stimulation than an extravert and prefers to be alone. The independence and reserve of the introvert is sometimes mistaken as unfriendliness or arrogance. In reality, an introvert who scores high on the agreeableness dimension (see below) will not seek others out but will be quite pleasant when approached.

Next we will see in more detail each of the facets of this dimension.

Friendliness Friendly people genuinely like other people and openly demonstrate positive feelings toward others. They make friends quickly and it is easy for them to form close, intimate relationships. Low scores on this facet however, are not necessarily cold and hostile, but they do not reach out to others and are perceived as distant and reserved.

Gregariousness Gregarious people find the company of others pleasantly stimulating and rewarding. They enjoy the excitement of crowds. Low scorers tend to feel overwhelmed by large crowds and therefore actively avoid them. They do not necessarily dislike being with people sometimes, but their need for privacy and time to themselves is much greater than for individuals who score high on this facet.

Assertiveness High scorers Assertiveness like to speak out, take charge, and direct the activities of others. They tend to be leaders in groups. Low scorers tend not to talk much and let others control the activities of groups.

³http://www.personal.psu.edu/j5j/IPIP/
Activity Level  Active individuals lead fast-paced, busy lives. They move about quickly, energetically, and vigorously, and they are involved in many activities. People who score low on this facet follow a slower and more leisurely, relaxed pace.

Excitement-Seeking  High scorers on this facet are easily bored without high levels of stimulation. They love bright lights and hustle and bustle. They are likely to take risks and seek thrills. Low scorers are overwhelmed by noise and commotion and are adverse to thrill-seeking.

Cheerfulness  This facet measures positive mood and feelings, not negative emotions (which are a part of the Neuroticism domain). Persons who score high on this scale typically experience a range of positive feelings, including happiness, enthusiasm, optimism, and joy.

2.2.5.2 Agreeableness

Agreeableness reflects individual differences in concern with cooperation and social harmony. Agreeable individuals value getting along with others. They are therefore considerate, friendly, generous, helpful, and willing to compromise their interests with others. Agreeable people also have an optimistic view of human nature. They believe people are basically honest, decent, and trustworthy.

Disagreeable individuals place self-interest above getting along with others. They are generally unconcerned with others’ well-being, and therefore are unlikely to extend themselves for other people. Sometimes their skepticism about others’ motives causes them to be suspicious, unfriendly, and uncooperative.

Agreeableness is obviously advantageous for attaining and maintaining popularity. Agreeable people are better liked than disagreeable people. On the other hand, agreeableness is not useful in situations that require tough or absolute objective decisions. Disagreeable people can make excellent scientists, critics, or soldiers.

Trust  A person with high trust assumes that most people are fair, honest, and have good intentions. Persons low in trust see others as selfish, devious, and potentially dangerous.

Morality  High scorers on this facet see no need for pretense or manipulation when dealing with others and are therefore candid, frank, and sincere. Low scorers believe that a certain amount of deception in social relationships is necessary. People find it relatively easy to relate to the straightforward high-scorers on this facet. They generally find it more difficult to relate to the not so straightforward low-scorers on this facet. It should be made clear that low scorers are not unprincipled or immoral; they are simply more guarded and less willing to openly reveal the whole truth.

Altruism  Altruistic people find helping other people genuinely rewarding. Consequently, they are generally willing to assist those who are in need. Altruistic people find that doing things for others is a form of self-fulfillment rather than self-sacrifice. Low scorers on this facet do not particularly like helping those in need. Requests for help feel like an imposition rather than an opportunity for self-fulfillment.

Cooperation  Individuals who score high on this facet dislike confrontations. They are perfectly willing to compromise or to deny their own needs in order to get along with others. Those who score low are more likely to intimidate others to get their way.

Modesty  High scorers on this facet do not like to claim that they are better than other people. In some cases this attitude may derive from low self-confidence or self-esteem. Nonetheless, some people
with high self-esteem find immodesty unseemly. Those who are willing to describe themselves as superior tend to be seen as disagreeably arrogant by other people.

**Sympathy** People who score high on this facet are tenderhearted and compassionate. They feel the pain of others vicariously and are easily moved to pity. Low scorers are not affected strongly by human suffering. They pride themselves on making objective judgments based on reason. They are more concerned with truth and impartial justice than with mercy.

### 2.2.5.3 Conscientiousness

Conscientiousness concerns the way in which we control, regulate, and direct our impulses. Impulses are not inherently bad. Occasionally, time constraints require a snap decision, and acting on our first impulse can be an effective response. Also, in times of play rather than work, acting spontaneously and impulsively can be fun. Impulsive individuals can be seen by others as colorful, fun-to-be-with, and zany.

Individuals who score high on the domain avoid trouble and achieve high levels of success through purposeful planning and persistence. They are also positively regarded by others as intelligent and reliable. On the negative side, they can be compulsive perfectionists and workaholics. Furthermore, extremely conscientious individuals might be regarded as stuffy and boring. Unconscientious people may be criticized for their unreliability, lack of ambition, and failure to stay within the lines, but they will experience many short-lived pleasures and they will never be called stuffy.

**Self-Efficacy** Self-Efficacy describes confidence in one's ability to accomplish things. High scorers believe they have the intelligence (common sense), drive, and self-control necessary for achieving success. Low scorers do not feel effective, and may have a sense that they are not in control of their lives.

**Orderliness** Persons with high scores on orderliness are well-organized. They like to live according to routines and schedules. They keep lists and make plans. Low scorers tend to be disorganized and scattered.

**Dutifulness** This facet reflects the strength of a person's sense of duty and obligation. Those who score high on this scale have a strong sense of moral obligation. Low scorers find contracts, rules, and regulations overly confining. They are likely to be seen as unreliable or even irresponsible.

**Achievement-Striving** Individuals who score high on this facet strive hard to achieve excellence. Their drive to be recognized as successful keeps them on track toward their lofty goals. They often have a strong sense of direction in life, but extremely high scores may be too single-minded and obsessed with their work. Low scorers are content to get by with a minimal amount of work, and might be seen by others as lazy.

**Self-Discipline** Self-discipline is what many people call will of power and refers to the ability to persist at difficult or unpleasant tasks until they are completed. People who possess high self-discipline are able to overcome reluctance to begin tasks and stay on track despite distractions. Those with low self-discipline procrastinate and show poor follow-through, often failing to complete tasks—even tasks they want very much to complete.

**Cautiousness** This facet describes the disposition to think through possibilities before acting. High scorers on the Cautiousness facet take their time when making decisions. Low scorers often say or do first thing that comes to mind without deliberating alternatives and the probable consequences of those alternatives.
2.2.5.4 Neuroticism

Neuroticism refers to the tendency to experience negative feelings. Those who score high on Neuroticism may experience primarily one specific negative feeling such as anxiety, anger, or depression, but are likely to experience several of these emotions. People high in neuroticism are emotionally reactive. They respond emotionally to events that would not affect most people, and their reactions tend to be more intense than normal. They are more likely to interpret ordinary situations as threatening, and minor frustrations as hopelessly difficult. Their negative emotional reactions tend to persist for unusually long periods of time, which means they are often in a bad mood. These problems in emotional regulation can diminish a neurotic's ability to think clearly, make decisions, and cope effectively with stress.

At the other end, individuals who score low in neuroticism are less easily upset and are less emotionally reactive. They tend to be calm, emotionally stable, and free from persistent negative feelings. Freedom from negative feelings does not mean that low scorers experience a lot of positive feelings; frequency of positive emotions is a component of the Extraversion domain.

Anxiety The “fight-or-flight” system of the brain of anxious individuals is too easily and too often engaged. Therefore, people who are high in anxiety often feel like something dangerous is about to happen. They may be afraid of specific situations or be just generally fearful. They feel tense, jittery, and nervous. Persons low in Anxiety are generally calm and fearless.

Anger Persons who score high in Anger feel enraged when things do not go their way. They are sensitive about being treated fairly and feel resentful and bitter when they feel they are being cheated. This scale measures the tendency to feel angry; whether or not the person expresses annoyance and hostility depends on the individual's level on Agreeableness. Low scorers do not get angry often or easily.

Depression This facet measures the tendency to feel sad, dejected, and discouraged. High scorers lack energy and have difficult initiating activities. Low scorers tend to be free from these depressive feelings.

Self-Consciousness Self-conscious individuals are sensitive about what others think of them. Their concern about rejection and ridicule cause them to feel shy and uncomfortable around others. They are easily embarrassed and often feel ashamed. Their fears that others will criticize or make fun of them are exaggerated and unrealistic, but their awkwardness and discomfort may make these fears a self-fulfilling prophecy. Low scorers, in contrast, do not suffer from the mistaken impression that everyone is watching and judging them. They do not feel nervous in social situations.

Immoderation Immoderate individuals feel strong cravings and urges that they have difficulty resisting. They tend to be oriented toward short-term pleasures and rewards rather than long-term consequences. Low scorers do not experience strong, irresistible cravings and consequently do not find themselves tempted to overindulge.

Vulnerability High scorers on Vulnerability experience panic, confusion, and helplessness when under pressure or stress. Low scorers feel more poised, confident, and clear-thinking when stressed.

2.2.5.5 Openness to Experience

Openness to Experience describes a dimension of cognitive style that distinguishes imaginative, creative people from down-to-earth, conventional people. Open people are intellectually curious, appreciative of
art, and sensitive to beauty. They tend to be, compared to closed people, more aware of their feelings. They tend to think and act in individualistic and nonconforming ways. Intellectuals typically score high on Openness to Experience; consequently, this factor has also been called Culture or Intellect. Nonetheless, Intellect is probably best regarded as one aspect of openness to experience. Scores on Openness to Experience are only modestly related to years of education and scores on standard intelligent tests.

People with low scores on openness to experience tend to have narrow, common interests. They prefer the plain, straightforward, and obvious over the complex, ambiguous, and subtle. They may regard the arts and sciences with suspicion, regarding these endeavors as abstruse or of no practical use. Closed people prefer familiarity over novelty; they are conservative and resistant to change.

Openness is often presented as healthier or more mature by psychologists, who are often themselves open to experience. However, open and closed styles of thinking are useful in different environments. The intellectual style of the open person may serve a professor well, but research has shown that closed thinking is related to superior job performance in police work, sales, and a number of service occupations.

**Imagination** To the imaginative individuals, the real world is often too plain and ordinary. High scorers on this scale use fantasy as a way of creating a richer, more interesting world. Low scorers on this scale are more oriented to facts than fantasy.

**Artistic Interests** High scorers on this scale love beauty, both in art and in nature. They become easily involved and absorbed in artistic and natural events. They are not necessarily artistically trained nor talented, although many will be. The defining features of this scale are interest in, and appreciation of natural and artificial beauty. Low scorers lack aesthetic sensitivity and interest in the arts.

**Emotionality** Persons high on Emotionality have good access to and awareness of their own feelings. Low scorers are less aware of their feelings and tend not to express their emotions openly.

**Adventurousness** High scorers on adventurousness are eager to try new activities, travel to foreign lands, and experience different things. They find familiarity and routine boring, and will take a new route home just because it is different. Low scorers tend to feel uncomfortable with change and prefer familiar routines.

**Intellect** Intellect and artistic interests are the two most important, central aspects of openness to experience. High scorers on Intellect love to play with ideas. They are open-minded to new and unusual ideas, and like to debate intellectual issues. They enjoy riddles, puzzles, and brain teasers. Low scorers on Intellect prefer dealing with either people or things rather than ideas. They regard intellectual exercises as a waste of time. Intellect should not be equated with intelligence. Intellect is an intellectual style, not an intellectual ability, although high scorers on Intellect score slightly higher than low-Intellect individuals on standardized intelligence tests.

**Liberalism** Psychological liberalism refers to a readiness to challenge authority, convention, and traditional values. In its most extreme form, psychological liberalism can even represent outright hostility toward rules, sympathy for law-breakers, and love of ambiguity, chaos, and disorder. Psychological conservatives prefer the security and stability brought by conformity to tradition. Psychological liberalism and conservatism are not identical to political affiliation, but certainly incline individuals toward certain political parties.
The Five Factor Model was the model chosen to be used in this work so we can measure players personality, because this is a more recent and updated personality model (also, it is open source) and we also wanted to see how well it would turn out for this project, we decided to choose the Five Factor Model instead of the more commonly used models like the Bartles types or the Keirsey Temperaments for measuring players personality in games. Using it, we can know what kind of individuals we are dealing with so that we can make the right suggestions to improve their gaming experience. For this purpose we decided to use the NEO-Five Factor Inventory (NEO-FFI) which is a psychological personality inventory with sixty items (twelve per domain) that measure and test the Big Five personality traits of a person. This test was created by Costa and McCrae[1] for people with more than seventeen years old and has been considered by many psychologists to be the best inventory for measuring traits within the Five Factor Model (FFM) of personality4.

As this is just an experiment, we decided to implement our solution with only the Conscientiousness dimension in mind as it is easy to map each facet to a game. Unfortunately, we needed to leave aside the Orderliness facet, as we did not found a convenient quest, in combination with the theme of the game, that would make sense to include.

2.3 Adaptive Games

The idea of adapting game content to the player is gaining more focus every year. As the gaming industry grows, the potential market also increases, and being so young, compared with the film industry for example, game developers and publishers are looking for new ways to engage the maximum number of people in their games. This is especially true in AAA games, where the marketing and production budgets are normally very high. What an adaptive game does is, based on the person that is playing, adapts, normally the difficulty of the challenge, to how the player is playing the game. For example, if a person is having too much difficulty clearing a level or challenge, the game may decide by itself to lower the difficult of the task so the player does not feel so frustrated. The same can be truth the other way around, if the game interprets that the player is clearing the challenges to easily, it can decide to turn the difficulty up.

In Rodrigo Dias work[3], he created a game that would adapt its gameplay to the player’s personality. He proposed a model that was responsible for collecting information about the player, and transforms it into usable knowledge, adapting the game and trying to immerse the player more into the gaming experience.

This model had two main components, one where the information was always available to be accessed, gather previously with an Meyer-Briggs Typology questioner to infer the players personality, and another where player’s typologies where to be used to distinguish the amount the different players. In this last component, there are five stages that function during the execution of the game, “Retrieve player data and performance”, where the player’s performance is measured, classified and analyzed, “Situate player in Experience Fluctuation Model (EFM)”, that has the goal to approximate the player’s experience while playing the game, “Re-define player personality”, where the player’s personality is approximated based on analysis of the collected data, “Re-assign player type and preferences”, when the preferred player type can be inferred by checking the knowledge based presented in the first model, and finally “Adapt game according to player type preferences and state in EFM”, at this point the system knows what content and challenges should be presented to the player, based on his personality and preferences. In figure 2.5 we can see the solution overview.

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4http://www.personal.psu.edu/ j5j/IPIP/
Figure 2.5: Grim Business architecture.

Figure 2.6: Grim Business adaptive content according to players' personality.
In the game that was created the player takes control of Lt. Darren Fletcher, with the main objective to kill everyone with three distinct weapons. According to the player personality, five main modifications could be made, in story, in general difficulty, in the objectives, in the resource management and in miscellaneous (this includes the incorporation of a special killing camera that focus the dying enemy, and the different physical paths in the level). In figure 2.6 we can see a more detail table on how the different aspects of the game can change according to the player personality.

The overall evaluation showed that the game created had very positive results according to the GameFlow classification and the solution presented can be a valid approach to player adaptation in certain games.

Another very interesting work was the work of Ivo Capelo [6], which is more or less the opposite of what Rodrigo Dias did. His main objective was to infer, from data gathered during gameplay, the personality preferences of players for future content adaptation. To reach that objective he also divided his work in two separate modules, one that would keep knowledge base on previous players that had played the game, and the other that would keep track of the current player’s decisions. Using the game Minecraft as the based scenario, he mapped each player temperament preference as a gameplay mechanic. He divided the scenario design in two stages, the architectural design, where the architecture of the scenario is build to better meet the experiment goals through the various options available, and the task assignment, where the scenario is populated with clusters by looking at emergent patterns from expected selections.

In the end, he achieved a success rate of 68.97%, meaning that the majority of players tested had their temperaments accurately predicted, with an 80% certainty for the temperaments of Rational and Guardian. However, the system failed to predict the other temperaments do to, supposedly, the lack of the Artisan and Idealist temperaments in his sample.

The work of Andre dos Santos Matias [4] was also very interesting regarding game content adaptation. He built an item recommendation system that implemented relevant techniques that may be integrated into games, being the general proposed to build, store and manage the player’s preference mode, allowing the game’s vendor to provide the player with valuable help in making a decision on what to buy and also allowing the storyline and quest given to be dependent on the player model.

The main suggestion system consisted mainly in five different modules, the main module which stored the full preference model and was responsible for communicating with the game, the minimax regret module, with decided which item is more appropriate for a recommendation, the elicitation strategy module that requested more player information when needed, the current solution strategy model, which decided what to ask the player in order to maximize information gain, and finally the recommendation strategy module, that was responsible for constructing a list of recommendations based on the item selected in the minimax regret module.

In the evaluation of his work all the players tested made sure to use the recommended system and ask the vendor for recommendation. The players also stated that they preferred a vendor who knew them better and offered them better recommendations.

Adapting game content will be a very important part of this project as our goal will be to make meaningful suggestions to players every time they need to make an important decision, hopefully improving their gaming experience.
2.4 Deadalus Project

The Deadalus project, now in hibernation, was a survey study made upon 35000 massive multiplayer online role-playing game (MMORPG) players. This study proved some very interesting facts like the average age of players (around twenty-six years old), if they were married or not (around 36% are married), do they work full-time (50% of this players work full time), do they have children (22% have children), and so on. They concluded that an MMORPG player spends, in average, twenty-two hours a week in this type of gaming environment and, unlike what most people think, these players are not solitary as normally they play with someone they know. Since MMORPGs are in fact highly social environments where new relationships can be forged the existing ones can also be reinforced.

The next sections will focus on some of the conclusions taken upon the surveys of the Deadalus project, made by Yee, and that will be relevant to understand the potential of the work we are proposing to do.

2.4.1 Character Creation Process.

In a MMORPG, in the begging of the game, the player goes through the character creation process[13], where he can customize his character. The Deadalus project survey showed us some very interesting information regarding the choices players made during this process and why they decided to make their characters as they are. 20% of the players surveyed say that they choose a certain class type for their character because they prefer it and normally go always for that class type when it is available, 17% of players like to look for particular aspects of character classes that are often independent of class types, which can be the class that is most challenging to play, or the class that have the most crowd control abilities, 11% of the players choose the race by going through all of them and choosing the one that most interests them as their first decision, 10% of players optimize their characters for a gameplay factor, like solo ability, utility in groups, or end game utility, 7% have no preference for class types or abilities, they primarily read through all the classes’ descriptions and then pick the most interesting for them, 5% choose their characters based on their appearance regardless of functionality, another 5%, normally being role playing gamers, like to choose their characters with a specific combo of class, race and gender that they will choose first if available, 4% goes for a specific race, another 4% choose a character that best complements a friend or romantic partner they are playing the game with, 3% goes for their instinct and choose the a character that feels right and fun at that moment, 2% like to choose uncommon characters, 1% starts to choose their characters by first looking at the different racial abilities, and the final 1% chooses their characters based on their starting areas.

This study indicate us that different players choose their character differently which may be a good indicator that, depending on the persons personality, he will choose some aspects on the character creation progress that might be related to their personality. This might be an interesting work, as people with similar personality traits may choose similar characters, the first time they play an RPG game.

2.4.2 Preferred Class Types.

Class type seems to be a very important aspect[12], especially during the character creation process. 20% of players inquired said that, in fact, class type is very important during that phase of the game, while 67% affirmed that they usually stick with one class across multiple games.

In the Deadalus project, players where asked what classes they usually prefer across MMOs and why. The results, although very difficult to put together, where quite interesting. The most popular class,
with 16% of preference, are the healers followed closed, with 12% each, by the support and hunter classes. On the other hand the most unpopular ones are, with 1% of preference each, the druid and the light melee classes.

This information can prove to be quite useful for game designers, and to this project, because the class is so important for players, specially during gameplay. For example if they like to have some classes in their MMORPG or RPG game, they can look to this information and be able to choose the most popular ones to attract the maximum number of people to their game, if they do not want to put all of them in their game.

2.4.3 Player Life Cycles.

In the Daedalus Project, there is also a study on what are the motivations for players to play MMOs[11]. There they concluded that a player as a life cycle through its experience during gameplay. Normally a player, before he quits playing a game, passes through a set of five stages, entry, practice, mastery, burnout and recovery.

In the entry stage, generally the game newcomers, often describes their experience in terms of having unlimited potential and feeling euphoric for being in a whole new world. This phase also resolves around playing with a friend or a romantic partner, as they prefer to play the game with somebody else rather than alone.

In the practice stage, players start to see the boundaries and limitations of the game and a sense of progression starts to emerge. Either they realize that they need to advance to explore further or progression makes more sense now that the boundaries have been made clean. In this stage players also acknowledge the value of grouping up with others (guilds or belonging in a certain group) rather then play the game solo.

In the mastery stage some players’ start growing tired of grinding and treasure more having friendships, becoming their main focus of gameplay. Other players in this stage prefer to level up and gain more experience, so they can have, not only access to more high-end gear and exclusive content, but also to gain prestige. Some other players start to take on roles that impact or guide their guild or community, enjoy socialization and often shaping the social interactions of that society. Also in this stage we players start to engage on Player versus Player (PvP) mode, mainly because they now have a good degree of mastering of the game or they reached the level cap for their characters.

The burnout stage happens when players start to ask themselves why they keep playing the game. Either for solo players or players in guilds, gear-drop or leveling up stops being fun. Players in guilds start to feel the social obligations and work-like consequences of raiding often leading to stress and anxiety. This is also the stage when players often choose a new character because they want to feel the sense of progression and exploration all over again. A very small portion of the players actually feel that there is noting else for them to do in the game.

Finally in the recovery stage, players who burned out on the grid or the raiding are able to find a more casual re-entry into the game.

These stages are just a rough map of the player motivation lifecycle, and are not something that every player goes through. Although, despite this fact and that this survey was made with only MMO players, I think that this stages can give a very good incite on why players do or do not stop playing some games, for example, if many players stop playing a game and if they all where in the entry stage, that may be because the begging of the game is not very stimulating for new coming players or that are not many interesting things to do.
Chapter 3

Solution

The main goal of this work is to create a system that can help players (specifically players with less gaming experience) to make decisions if they need help. This help would be given in the form of recommendations or suggestions, based on the players’ personality. We used the *Big Five Factor Model* (as described in section section 2.2.5) to infer the players personality and recommend the best option for that player in particular.

Figure 3.1: Screenshot of the game.

In this chapter, we introduce a methodology to help designers personalize and improve player’s experience. In conjunction with other works, like the one of Capelo[6] for example, that can measure the player’s personality within the game instead of making a series of questions prior to playing the game (like we did for this approach), game designers can improve the players overall experience throughout the course of their games.

To support that this system works, we divided the experiment into three separate parts:

1. Evaluation of the player personality.
2. Experiencing the game.
3. Getting the final conclusion about the overall experience.

For this propose, we created a game from scratch using RPG Maker VX Ace\(^1\). RPG Maker is a very useful game engine for the creation of RPG’s, as it provides useful tools like, a tile set based map editor,

\(^1\)http://www.rpgmakerweb.com/
a simple scripting language for scripting events (in Ruby\textsuperscript{2}), and a battle editor. It also includes initial premade tilesets, characters, and events which can be used in the creation of new games. As it is very easy to insert new features to the engine, it is also very easy to include new graphics to the game, making it very accessible to create all sorts of experiences, although the engine is more focused, and therefore more useful, for the creation of 2D RPG games.

Next we will explain in more detail the process of building the game, including the creation of quests and overall story, and how the evaluation of the solution was made. The following sections are meant to describe not only the game itself, but also the whole player experience that would enable us to prove that this model can work. To perform the experience, a link was provided, in social media (mainly Facebook), were candidates answered a form (explained in section 3.2.1) and then download the game to try it out.

### 3.1 Game Design

As we were creating a game from scratch, and we wanted to implement tasks for the player to perform based on the Conscientiousness dimension, many iterations were made before we could get to the final result. Besides the design of the quests, it was also our objective to create a story so that the player could feel more engaged with the game.

In this case we decided to implement a game where a companion (in this case a fairy) would recommend important decisions to the player if he felt somehow lost and therefore felt the need to get some help. Next we will talk about the process of building the game as well as explain some of the decisions we make in the game story in order create a game that would fulfill our needs to achieve our initial objectives. The most important objective for us was to give good suggestions to players, that they would feel that they could always ask for help and that help would be the best suited for them.

#### 3.1.1 Game Story

As we already mentioned, the game story was of some importance to our work as we did not want players to feel disengaged or not interested in playing our game. The objective of the player would therefore be to take a series of challenges (quests) and based on the ones he would choose, a guild would be recommended for whom that would best suit him and that would help him in his training to became a warrior in the princess army.

The story starts by presenting the player character and his companion, a fairy. She starts by giving him basic information to where the player should go next. In this case, as we start inside the characters house, the fairy tells the player that his brother is waiting for him outside. This first scene was designed so that the player would understand that he has a companion that can help him know where to go next. In this case the fairy simply says to him where to go, without the player asking for any advice, however, our propose is to enable the player to ask for this advice himself if he feel the need for it.

Inside the house he can talk to his parents that basically are only there to reinforce that the brother is waiting for him outside the house and to wish him good luck. After the player gets outside the house the character's brother starts by explaining what his day will be all about. He tells him that the he will need to choose a guild in which we will enroll to start his training so he can then enrol in the army. The guilds were designed to match each facet of the Conscientiousness dimension, except for Orderliness, which we explained earlier, was removed because we could not find a proper way to include this facet in the game as it was. A more detailed information about each guild will be given later on this document (see

\textsuperscript{2}https://www.ruby-lang.org/
section 3.1.2). After the brother explains all the guilds available he tells him he will be waiting for him on the quests area to explain him what he as to do there. This is an opportunity for the player to get more used with the character movement controls before the game really starts.

When the player arrives to the place where a old man in standing next to a portal, the character’s brother grabs his attention again to explain to him that this man can recommend a guild for him to choose, based on the quest he has accepted and that the portal will lead him to a place where he can choose his guild when he feels his ready. This part of the story is not directly related to our solution, as it is more focused on the fairy suggestions for the player, however we decided to include this in the game because we wanted to give the player a sense of purpose for choosing certain quests.

After the elder introduction the brother takes us to the quest area. Here he explains us that we will need to choose three out of seven possible quests. This three quests, as explained before, will influence the final recommendation of the elder. In this area there are seven wells, corresponding to the seven quests that the player can preform, as well as a tent, where the player can rest and recover his health, and a overall panel that can inform the player of which quests he has started and which he has completed. After the brother explains how to enter a quest and what the overall panel and tent does, the fairy then gives an overall of what the player may expect from all the quests (for more details see section 3.1.3).

After this, the game introduction is now over and the player will need to choose which quests to accept or choose a guild. Choosing a guild can be done at any time, even if the three quests are not completed. He can also ask the fairy which guild he should choose or which quest he should accept next. The quests recommendation are the main focus on our work, the rest was put there to serve the
purpose of the story, despite being related to the player personality as well. The quests as well as the
guild recommendations will be discussed in further detail in future sections of this document.

Finally, when the player thinks he is ready or has done all the three quests we can only ask for the
elder recommendation and/or enter the portal to finally choose a quest. After choosing the quest the
game would then end. A log file, written during the course of the game will be completed with the player
information (such as, which quests where chosen, witch were the fairy recommendations, and some
information more). This file would then be upload by the player and a final form (see appendix A.3) would
be answered so we could have all the information we needed to analyse our solution’s performance.
3.1.2 Guilds

The guilds, as said before, were designed to give a purpose to the game story (the player will need to enroll in quests so he can have an idea of what guild to choose, and by the end if he still does not he can always ask for the elder recommendation that will be based of the quests taken during the game). Therefore the guilds also needed to be somewhat related to the player personality as well. We created a guild for each facet of the Conscientiousness dimension in the five factor model. All facets were included, except for Orderliness, as we could find a way to fit it in the game. The guilds created were the Arisi, Buiz, Kals, Ara and Lort guilds.

Next is a list of all the guilds, with the game description and the facet that they correspond to:

- **Arisi** (Self-Efficacy): “They feel that they are in total control of their lives and that they will always achieve success.”
- **Buiz** (Dutifulness): “They are very responsible and loyal people.”
- **Kals** (Achievement-Striving): “They drive to be recognized as successful which keeps them on track toward their high goals.”
- **Ara** (Self-Discipline): “They are always very focused on their tasks and they always stay on track.”
- **Lort** (Cautiousness): “They always think before acting. They may take their time to make a decision but when they do, it’s always very well thought.”

Each of the guild descriptions were based on the facet that they correspond (see section 2.2.5.3). In the game the fairy could also recommend the best guild for the player. This guild would be chosen by the higher facet score that the player would have on the Conscientiousness dimension.

3.1.3 Quests

In our solution we decided that all the facets should be present in at least one of the quests created. Each facet spectrum was divided into three equal parts so it would be easier to identify who scored lower, higher or average in a certain facet. This division was made so we could better categorize a player. Let us see, for example, the Dutifulness facet, being $x$ the score of the person in this facet (from 0 to 100):

$$
dutifulness(x) = \begin{cases} 
1 & \text{if } x < 33 \\
2 & \text{if } x < 67, x \in \text{score for Dutifulness facet} \\
3 & \text{if } x \geq 67 
\end{cases} \quad (3.1)
$$

If a player would get a 1 in the Dutifulness facet it would mean that he has a low score in that facet. If he would get a 2, that would mean that he has an average score on that facet. Finally, if he gets a 3, that means that he has a high score on that facet. This equation would be the same for all the facets on the Conscientiousness dimension.

Quest were then created with a specific facet in mind. However, we noticed that, after the quest design was finished, in most cases, more facets could be identified within that quest. These other facets may, or may not, be as preponderant as the originally thought facet, so we decided to attribute weights to each one of them on each quest. We will explain in more detail how the score for each quest was calculated based on this weights later on this document. After calculating how much the player would
like to perform each quest, the best one would be recommend for him if that quest was not yet been started. After the player finishes or accepts that quest, the second best quest calculated would be recommended. This recommendation would only be available if the player asks for it, as the objective of this companion is to help players only if they need assistance on where they should go next.

Table 3.1 shows us an overview of each quest and which facets are associated with them. When we have a + (plus) sign, it means that facet is more present than the other and therefore has more weight when we are calculating which quest the player should go next.

<table>
<thead>
<tr>
<th>QUESTS</th>
<th>FACETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quest 1</td>
<td>+ Self-Efficacy</td>
</tr>
<tr>
<td></td>
<td>+ Achievement-Striving</td>
</tr>
<tr>
<td></td>
<td>Cautiousness</td>
</tr>
<tr>
<td>Quest 2</td>
<td>+ Achievement-Striving</td>
</tr>
<tr>
<td></td>
<td>+ Self-Discipline</td>
</tr>
<tr>
<td></td>
<td>Dutifulness</td>
</tr>
<tr>
<td>Quest 3</td>
<td>+ Achievement-Striving</td>
</tr>
<tr>
<td></td>
<td>+ Self-Efficacy</td>
</tr>
<tr>
<td></td>
<td>Self-Discipline</td>
</tr>
<tr>
<td>Quest 4</td>
<td>Self-Discipline</td>
</tr>
<tr>
<td></td>
<td>Dutifulness</td>
</tr>
<tr>
<td>Quest 5</td>
<td>Obligation</td>
</tr>
<tr>
<td>Quest 6</td>
<td>Self-Efficacy</td>
</tr>
<tr>
<td></td>
<td>Self-Discipline</td>
</tr>
<tr>
<td></td>
<td>Cautiousness</td>
</tr>
<tr>
<td>Quest 7</td>
<td>+ Cautiousness</td>
</tr>
<tr>
<td></td>
<td>+ Self-Discipline</td>
</tr>
<tr>
<td></td>
<td>Dutifulness</td>
</tr>
</tbody>
</table>

Table 3.1: Quests associated with its corresponding facets

When the player would approach a well, corresponding to a certain quest, the fairy would give him a brief description of what that quest would be about. If the player accepts to enter the well the quest would not be accepted yet. Inside each well there were always a quest giver that would explain to the player, with a more detailed report on what the quest would be all about. Only then, the player would accept, or not, the quest he is at. The fairy giving a brief explanation of the quest goals was designed because we did not give names to each quest making it more difficult to remember which quest was which. Only after the player has heard all the information about the quest, he could decide if he would accept it on not (see fig. 3.7).

Next we will talk a little about each quest, what was it about and how which facets where were identified. He will also talk a little bit about how the likelihood of each quest was calculated.
3.1.3.1 Quest 1

Fairy quest description  This is “Quest 1”. In this quest the objective is to battle and defeat the ice Medusa. She is very powerful so be careful.

Quest giver description  Hello stranger. There is a monster up ahead. He is very powerful and only the bravest warriors and strongest can defeat. Do you think you can do it?
In this quest the player would have to battle a powerful boss, in this case an ice Medusa. This boss would have very high health and would be able to cast ice attacks on the player as well as a possibility of Healing herself during the battle. However she would be a bit vulnerable to Fire attacks.

Before the player engages the boss he could choose to equip himself with two different rings from a total of four, which would boost his abilities and hopefully help him defeat the Medusa. This rings would be available inside a chest that would only be visible if the player accepted the quest. Inside the chest it would be four different rings that the player could choose from:

- **Ring of Strength**: would give him a boost in his strength but would decrease his defense, his magic attack and his magic defence;
- **Ring of Protection**: which would boost his defence and magic defence and would also give him the ability to use the heal spell, however he would loose some attack;
- **Ring of Fire**: this ring would increase his magic attack and give him the skills of Fire Breath and Fire, however it would decrease his magic defence and make him vulnerable to ice attacks;
- **Ring of Ice**: finally this ring would increase his magic attack and magic defence, as well as give him the skills if ice and Water, but would also decrease his defence and make him vulnerable to Fire attacks.

The player could then choose any two ring combination he may find appropriate, to defeat this powerful boss.

This quest was originally designed to be difficult (so he would be able to cover the Self-Efficacy facet). The player who chooses this quest would probably enjoy the extra challenge, however, after the game was tested we could also find other traits for this quest like Achievement-Striving, as the player may repeat the quest until he finally defeats the boss, and the Cautiousness facet, as the player may plan to defeat the Medusa with a specific ring combination before he engages the boss.

We have calculated the likelihood of a player choosing this quest using the following equations:

\[
\text{se} = \text{self-efficacy}(x), \quad x \in \text{score for Self-Efficacy facet} \quad (3.2)
\]

\[
\text{as} = \text{achievement-striving}(y), \quad y \in \text{score for Achievement-Striving facet} \quad (3.3)
\]

\[
\text{c} = \text{cautiousness}(z), \quad z \in \text{score for Cautiousness facet} \quad (3.4)
\]

\[
\text{Quest1} = \frac{(se + as) \times 2 + c}{5} \quad (3.5)
\]

Equations 3.2, 3.3 and 3.4 are obtained the same way as equation 3.1. In equation 3.5, the Quest1 variable, gives us the total score of how much the player would like this quest. For this equation, we added 3.2 and 3.3, and then multiplied by 2 because (as we can see in table 3.1) the Self-Efficacy and Achievement-Striving facets have more weight in this quest than the Cautiousness facet. We also divide the sum of all facets, with their respective weights, and divide it by 5, so we could normalize the final result with the rest of the quests outcome, as not all have the same number, or weights, of facets involved.

If the player would be defeated by the boss he would have the possibility to try and defeat it again or try a different quest. On the other hand, if the player defeats the Medusa he would have then completed the quest and could no longer try again to engage it, as we would like the player to try other quests and we would not want to extend the time of gameplay. This is valid for all the quests below.
3.1.3.2 Quest 2

Fairy quest description This is “Quest 2”. In this quest you will need to help a man by answering a series of questions.

Quest giver description Hello stranger...Do you think you could help me? I need an item that it is said is in this dungeon. I tried to reach it but I'm afraid I'm a bit too dumb... I cannot solve this dungeons puzzles. The puzzles are a series of math and logic problems. Unfortunately I'm not very good at math or logic. I really would like to have this item, it is really important for me. Do you think you can help me?

This quest was composed by a series of math and logic puzzles that the player would need to solve in order to proceed. The goal is to help a man, that is not not very bright, get a item that is in the end of the dungeon.

After the player accepts the quest a door would open and the player can now solve the first puzzle. This is a math puzzle, as we can see in fig. 3.13. The answer for this puzzle would be 6 ($x-4 = 2$, $x = 6$). If the player would answer the question correctly the door on the right would open, otherwise the player could try to answer again until he would found the correct answer.

The next enigma would be a logic puzzle (see fig. 3.14) where the answer would be 26 ($4*2 = 8$, $8-1 = 7$, $7*2 = 14$, $14-1 = 13$, $13*2 = 26$). Again if the player answered correctly the door on the right would open, otherwise he could try again until he finally finds the correct answer.
The third puzzle is very similar to the first (see fig. 3.15), with only a slight increase in difficulty. Here the answer would be 28 \((x \times 6) - 34 = 134, x = 28\). Yet again, if the player could solve this puzzle, another door would open and he then could proceed to next stage, or if he fails we can try again until he figures out the correct answer.

The player would get to the location illustrated by fig. 3.16 and fig. 3.17 by following down a stairs that they only can get if they finished puzzle number three of this dungeon. First the player would be faced with a series of boulders that he need to push in order to get to the question that will open another door in the dungeon. The answer to the question on this room was 18 \((3+2+6+4+3+2 = 20, 4+2+7+1+1+3 = 18\). If the player got stuck on the boulder puzzle he could always restart by going up and down the
stares that lead to this room. As for the enigma, if the player answered the question correctly another
door would open or the player could try as many times as he wants until he gets the correct answer.

Figure 3.18: Quest 2 - Fifth puzzle.

Again this enigma is very similar to puzzles of fig. 3.13 and fig. 3.15. The solution for this particular
question (see fig. 3.18) is 12 ($x/4 + 23 = 26$, $x = 12$). Again if the player answers correctly a door would
open and he would get closer to the item, otherwise if he would fail, he could keep trying until he found
the correct answer.

Figure 3.19: Quest 2 - Sixth puzzle.

The final question would be, yet again, a logic one (see fig. 3.19). This was the most complicated
puzzle, the answer for it was 6 ($(4*3*2)/3 = 8$, $(3*5*6)/3 = 30$, $(2*1*9)/3 = x$, $x = 6$). As this would be the
final question if the player would answer it correctly the last door would open, giving access to the chest
where the item that the quest wanted could be found. As ever if the players answer was incorrect he
could try as many times as he want until he could find the correct answer.

After the player gets to the chest, and gets the item (an engagement ring), the quest giver thanks him
as he says that now he can marry his smart beloved. For this quest we considered the Achievement-
Striving facet as the player may became “obsessed” until he solves all the problems, we also considered
the Self-Discipline facet because the player may not know, at first, what the answer might be, and
therefore they need to persists in the task until they find the solution. We also considered that the
Dutifulness facet was also present, because we are helping a person getting something that he can not
get by himself. For this quest to be considered complete the player would have to get to the chest. If the
player leaves the quest before he finishes the final puzzle, his progress would be lost and next time he
would need to start the puzzles from the beginning.
To calculate the likelihood of a player choosing this quest we made a very similarly approach to what we did in the previous quest (see section 3.1.3.1). Next are the equations used:

\[ as = \text{achievement-striving}(x), x \in \text{score for Achievement-Striving facet} \]  
\[ sd = \text{self-discipline}(y), y \in \text{score for Self-Discipline facet} \]  
\[ d = \text{dutifulness}(z), z \in \text{score for Dutifulness facet} \]

\[ \text{Quest2} = \frac{(as + sd) \times 2 + d}{5} \]  

As we can see the equations are very similar to section 3.1.3.1. As before, equations 3.6, 3.7 and 3.8 are obtained the same way as equation 3.1. In equation 3.9, the \( \text{Quest2} \) variable, gives us the total score of how much the player would like this quest. As we can see in table 3.1, the \text{Achievement-Striving} and \text{Self-Discipline} facets have more weight than the \text{Dutifulness} facet for this quest, therefore, in equation 3.9, they weight more. That is why we multiplied by 2. The division by 5 is there to normalize the sum value of the facets score and the weight that they represent in this quest.

### 3.1.3.3 Quest 3

**Fairy quest description**  This is “Quest 3”. In this quest you will need to get to a young girl by passing through a series of patrolling orcs.

**Quest giver description**  Hello young man. Do you think you can help me? My granddaughter likes to play in this dungeon. The monsters here like her, but they don’t like anyone else. She is going to be late for school again. Her teacher is already really mad at her. It would be great if you can reach her in less than 2 minutes. I would do it myself but I’m old and slow and I can’t pass the orcs. Do you think you can get past them and tell her that I’m here waiting?

In this quest the player would need to go through a maze and pass a series of patrol orcs that will chase him if they see him. The goal is to get to a girl, to warn her that she is late for school. She is used to play on the dungeon and the orcs like her, but they don’t like anyone else. The player must then avoid them or they will kick him out of the dungeon. The player is also given a time to get to the girl. If he get to the girl in time, she will not be late for school, otherwise she will, but the player can choose to repeat the quest again if that is the case.

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For this quest we considered the *Achievement-Striving* facet because of the time limit constrain that may lead the player to be always pursuing better times. We also considered the *Self-Efficacy* facet as this may be a difficult quest to complete and may present an extra challenge to the player. And finally, we considered the *Self-Discipline* facet because the player may need to repeat the same path multiple times (if he gets caught) and, therefore, needs to focus on the task that was presented to him and stay with it until the end.

In order to know if a player would like to do this quest, again a very similar approach to calculate the likelihood of the previous quest were used. We can see the following equations that were used:

\[
as = \text{achievement-striving}(x), x \in \text{score for Achievement-Striving facet} \tag{3.10}
\]

\[
se = \text{self-efficacy}(y), y \in \text{score for Self-Efficacy facet} \tag{3.11}
\]

\[
sd = \text{Self-Discipline}(z), z \in \text{score for Self-Discipline facet} \tag{3.12}
\]

\[
\text{Quest3} = \frac{(as + se) \ast 2 + sd}{5} \tag{3.13}
\]

In this case the facets used were the *Achievement-Striving* and the *Self-Efficacy* facets, with more weight, and the *Self-Discipline* facet. The same way as before, we sum equations 3.10 and 3.11 and multiplied the result by 2, because of the corresponding facets weight on this quest. Then we sum equation 3.12 and divided all by 5 to normalize the value.

### 3.1.3.4 Quest 4

**Figure 3.21: Quest 4**

**Fairy quest description** This is “Quest 4”. In this quest you will need to recover jewelry from some monsters.

**Quest giver description** Well, well, well... What do we have here? A brave warrior perhaps... My name is Mila. Maybe you can help me. You see, this monster stole all my necklaces and I cannot get them back. Through that door down there, is a big hall full of monsters. The ones that stole me, ran over there, and now I cannot get to them. They are so many... And I cannot find the ones that did it. They seem to be multiplying as well. When you defeat one, other just comes right out. Do you think you can help me recover my four stolen necklaces?

In this quest the player would have to retrieve four necklaces to the quest giver. This necklaces can be obtained by battling monsters that have a probability of dropping the item that the player really wants.
They also can drop potions, so that the player can continue his search without the need to stop the quest in the middle, to go back to the quest area and heal in the resting tent. When the player accepts this quest and passes the door to the hall where all the monsters are, the visibility diminishes and they must fight one of the monsters before they can actually enter the main hall. This first monster combat is there for the player to understand better that he must fight the monsters in order to retrieve all the necklaces. This first monster would always drop one necklace and then would disappear. The player can now proceed to the main all were he can find and fight the monsters that have a probability of dropping one or two necklaces.

For this quest we considered the facet Self-Discipline because the player needs to be a bit persistent to find all the necklaces, as the monsters have a probability of dropping them, the player may be faced to repeat the same action multiple times in order to succeed in the task that was given to him. We also considered the Dutifulness facet because the player is doing this quest to help the quest giver to find all the items that she has lost.

The equations used to calculate the player chance of liking this quest were not so similar to the previous ones, as here we only have two facets present and their both have the same weight in this quest:

\[
se = \text{self-efficacy}(x), x \in \text{score for Self-Efficacy facet} \quad (3.14)
\]
\[
d = \text{dutifulness}(y), y \in \text{score for Dutifulness facet} \quad (3.15)
\]
\[
Quest4 = \frac{se + d}{2} \quad (3.16)
\]

For this quest we considered that the facets Self-Efficacy and Dutifulness were present and that they had the same weight. In this case we obtained the persons score for this two facets (equations 3.14 and 3.15) and sum the two values in equation 3.16. Again, we also divided this sum by 2 so that the value could be normalized and comparable with the values obtained before in the previous equations.

### 3.1.3.5 Quest 5

![Figure 3.22: Quest 5](image)

**Fairy quest description** This is “Quest 5”. In this quest you will have a choice to make. You will need to decide the fate of a couple in distress.

**Quest giver description** Hello stranger... Maybe you can be of better help than I can. There is a couple in trouble up head and there is a choice you can make. Either you save the couple or you get an
awesome powerful sword. I really want to save the couple but in the other hand that swords is really tempting. I don’t know what to do... Do you think you can do it?

In this quest was very simple as the player would only need to make a difficult choice. He would either save a couple, and maybe do what is right, or he could kill them but get a “Powerful Sword” that would help him in his training later on (this sword would have no impact on the game, as it was only supposed to be used after the player chooses a guild, if the game would continue beyond that point).

In the chamber there would be an angel and a devil. The devil would say the following to him:

“Remember you can get a powerful sword if you choose not to save them. The two of them killed a man once. They don’t deserve to live and the sword I will give would certainly help you on your training for the army once you choose a guild.”

On the other hand the angel would say in their behalf:

“Or you can save them instead. They’ve made some mistakes but they also deserve a second chance.”

The player could then make the decision to talk to the devil, and get a sword, or talk to the angel and save the couple. If the player would end up choosing to get the sword, the couple would be killed and the devil would give him the sword he promised (“HAHAHAHAH... Here, have your reward...”). However if the player would choose to save them instead, a bridge would appear and the couple could walk away, before they leave they thank the player and (surprise) they give a “Warrior Sword” (“Thank you very much young warrior. A very bad man once tried to kill us. We defended ourselves but unfortunately we had to kill him. It has him or us you see. Here take this sword as a demonstration of our gratitude for saving us.”). This was intended so that the player would not feel that he have been punished for choosing either way.

For this quest we only considered the Dutifulness facet, as this was a very simple quest with only a choice. As this facet measures a persons sense of duty and obligation low and high scores can equally enjoy this quest. High scores probability would like the possibility of saving the couple and low scores may like to just get the sword and be done with it.

In this quest, to calculate the score for the fairy to choose which quests she should recommend to the player, we used the following equations:

\[
d = \text{Dutifulness}(x), x \in \text{score for Dutifulness facet} \tag{3.17}
\]

\[
\text{Quest5} = \begin{cases} 
0 & \text{if } d = 2 \\
1.5 & \text{if } d \neq 2 
\end{cases} \tag{3.18}
\]

This is different from the previous calculations for the quests mentioned before. We decided to go with this approach because both low and high scores on this facet may enjoy this quest. We considered this quest would be indifferent to someone that scored average on the Dutyfulness facet. We gave a weight of 1.5 because of the normalization values obtained by the rest of the equations for the remaining quests. After some testing this seemed to be the best value to give to this quest if a person scored high or low in the corresponding facet.

### 3.1.3.6 Quest 6

**Fairy quest description** This is “Quest 6”. In this quest you will need to go through a maze to rescue a little girl from the fire dragon.
Figure 3.23: Quest 6 - The maze.

Figure 3.24: Quest 6 - Inside the tower.

Figure 3.25: Quest 6 - Battling the fire Dragon.
**Quest giver description**  Hey!! Glad someone showed up. My sister was kidnapped and the FIRE dragon is hiding her inside this sky maze. I cannot find the correct way. I don’t think the monster will be willing to give her back without a fight either, and I’m not very strong. Do you think you can help me?

For this quest the objective of the player was to find the quest giver sister that was kidnapped by a fire dragon. After the player accepts the quest, similarly to quest 1(section 3.1.3.1), a chest would appear where the player could equip rings to help him in the battle with the dragon (for reference of the rings available please go back to section 3.1.3.1 where a detailed description of what the rings do can be found).

To get to the girl the player would need to go through a maze, find the key to the tower door and then enter the tower. This tower would also be located inside the maze (the maze solution can be found in appendix B). The maze was composed by a group of floating islands and the player would need to step through some portals in order to travel from island to island.

After the player finds the key and enters the tower, he would be faced with a dragon guarding a cell were a girl is locked. Before he can release the girl he needs to fight the dragon and defeat it. This would be a similar boss battle to the one found on “Quest 1”, but instead of being weak to fire and using ice attacks (like the ice Medusa was, see section 3.1.3.1), this dragon is weak to ice or water and has the power to use fire. After the player go through the maze and defeat the dragon, the girl would be saved and the quest would be completed.

For this quest we considered the facets of Self-Efficacy, as the battle with the boss should have a degree of difficulty associated with it, and so this would provide an extra challenge to the player, Self-Discipline, because the maze is not trivial to solve and requires a lot of trial and error from the player, and Cautiousness as the player would need to plan where to go next in the maze, to stop going back to the starting point, and because of the rings the player would choose to fight the dragon.

The equations used for this quest were the following:

\[ se = \text{self-efficacy}(x), x \in \text{score for Self-Efficacy facet} \]  \hspace{1cm} (3.19)

\[ sd = \text{self-discipline}(y), y \in \text{score for Self-Discipline facet} \]  \hspace{1cm} (3.20)

\[ c = \text{cautiousness}(z), z \in \text{score for Cautiousness facet} \]  \hspace{1cm} (3.21)

\[ \text{Quest6} = \frac{se + sd + c}{3} \]  \hspace{1cm} (3.22)

As the facets in this quest have all the same weight we just sum equations 3.19, 3.20 and 3.21 and divided by 3 to normalize the value getting equation 3.22 that give us the likelihood the player choosing this particular quest.

3.1.3.7 Quest 7

**Fairy quest description**  This is “Quest 7”. In this quest, you will follow a map to an item that will help a girl to recover from blindness.

**Quest giver description**  Hello?? Is somebody there?? OH!! Sorry you startle me a bit... Hey!!! Maybe you can help me... Inside this dungeon there is a crystal ball. Unfortunately I’m blind and it is said that this ball could help me see again. However this dungeon has a pit covered with sand. If you step on it you will fall to the level below. That’s why I have a map but I cannot read it. And to get to the crystal ball you have to turn all the balls in the room green. Do you think you can help me?
In this quest the player is asked to help a blind girl get an item that would enable her to see. To get to the item the player needs to turn green all the balls present in a room, however he cannot step everywhere. Some of the areas in this quest are cover with sand and if the player would step on it, he would fall to the room below. However, every time he falls the balls do not reset. To help the player know where he can step, the quest giver gives him a map (see fig. 3.27) that the player can use whenever he wants. To turn one ball green the player only needed to step in front of it and it would turn from red to green, remaining green until the player finishes the quest or the player leaves the quest dungeon. After the player turns all the balls in the room green, a chest would appear in the middle of the room and the quest is completed.

For this quest we considered the facets **Cautiousness**, since the player would need to plan where to step (look at the map) before every other move, **Self-Discipline**, as the player may fall many times and needs to be persistent to finish the quest, and **Dutifulness**, as the player objective is to help a person to be able to see.

To calculate the chance of the player liking and choosing this quest, the following equation where used:

\[
\begin{align*}
c &= \text{cautiousness}(x), x \in \text{score for Cautiousness facet} \\
se &= \text{self-discipline}(y), y \in \text{score for Self-Discipline facet} \\
d &= \text{dutifulness}(z), z \in \text{score for Dutifulness facet}
\end{align*}
\]

\[\text{Quest7} = \frac{(c + se) * 2 + d}{5}\]  

Again equation 3.26 is very similar to the ones obtained for quest 1(section 3.1.3.1), quest 2(section 3.1.3.2) and quest 3(section 3.1.3.3). As the facets **Cautiousness** and **Self-Discipline** have more weight than the facet **Dutifulness**. For that reason we sum equations 3.23 and 3.24 and multiplied them by 2. Then we sum equation 3.25 and divided the result by 5 to normalize this value. The result (equation 3.26) would be the possibility of the player choosing this quest.

### 3.1.4 Elder Recommendation

When the player would feel that he is ready, or after he finishes the three quests, he can head to the area were the elder man is (see fig. 3.4), ask for his guild recommendation and step through the portal
to choose the guild he thinks he would like the most. The elder recommendation is given by taking into account what quests the player accepted and what quests he has completed and what facets those quests correspond to. The higher facet value would then be translated to the corresponding guild and that would be the recommendation. The player can step into the portal that would take him to an island where he could choose the guild he thinks he would like the most.

\[
\text{FacetScore}[^{\text{AS}}] = \text{FacetScore}[^{\text{AS}}] - (\text{QuestStarted} - \text{QuestsCompleted}) \quad (3.45)
\]

To calculate the recommendation given by the elder, we used the equations found on table 3.3. For each quest the player accepted we executed the equations corresponding to that quest. We also took into consideration the fact that a quest could be accepted but not completed. In that case we also applied equation 3.45 where we subtracted from the Achievement-Striving facet the number of quests that were not completed. In the end we would search the vector \text{FacetScore} for the facet with the higher recommendation, and give that one to the player.

<table>
<thead>
<tr>
<th>FACET</th>
<th>ABBREVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Efficacy</td>
<td>SE</td>
</tr>
<tr>
<td>Dutifulness</td>
<td>D</td>
</tr>
<tr>
<td>Achievement-Striving</td>
<td>AS</td>
</tr>
<tr>
<td>Self-Discipline</td>
<td>SD</td>
</tr>
<tr>
<td>Cautiousness</td>
<td>C</td>
</tr>
</tbody>
</table>

Table 3.2: Facets abbreviations for use in equations
<table>
<thead>
<tr>
<th>QUESTS</th>
<th>EQUATIONS</th>
</tr>
</thead>
</table>
| Quest 1 | \[
\text{FacetScore}["SE"] = \text{FacetScore}["SE"] + 2 \quad (3.27) \\
\text{FacetScore}["C"] = \text{FacetScore}["SC"] + 2 \quad (3.28) \\
\text{FacetScore}["AS"] = \text{FacetScore}["AS"] + 1 \quad (3.29)
\] |
| Quest 2 | \[
\text{FacetScore}["AS"] = \text{FacetScore}["AS"] + 2 \quad (3.30) \\
\text{FacetScore}["SD"] = \text{FacetScore}["SD"] + 2 \quad (3.31) \\
\text{FacetScore}["D"] = \text{FacetScore}["D"] + 1 \quad (3.32)
\] |
| Quest 3 | \[
\text{FacetScore}["AS"] = \text{FacetScore}["AS"] + 2 \quad (3.33) \\
\text{FacetScore}["SE"] = \text{FacetScore}["SE"] + 2 \quad (3.34) \\
\text{FacetScore}["SD"] = \text{FacetScore}["SD"] + 1 \quad (3.35)
\] |
| Quest 4 | \[
\text{FacetScore}["SD"] = \text{FacetScore}["SD"] + 2 \quad (3.36) \\
\text{FacetScore}["D"] = \text{FacetScore}["D"] + 2 \quad (3.37)
\] |
| Quest 5 | \[
\text{FacetScore}["D"] = \begin{cases} 
\text{FacetScore}["D"] + 2 & \text{if couple saved} \\
\text{FacetScore}["D"] - 2 & \text{if couple not saved}
\end{cases} \quad (3.38)
\] |
| Quest 6 | \[
\text{FacetScore}["SE"] = \text{FacetScore}["SE"] + 2 \quad (3.39) \\
\text{FacetScore}["SD"] = \text{FacetScore}["SD"] + 2 \quad (3.40) \\
\text{FacetScore}["C"] = \text{FacetScore}["C"] + 2 \quad (3.41)
\] |
| Quest 7 | \[
\text{FacetScore}["C"] = \text{FacetScore}["C"] + 2 \quad (3.42) \\
\text{FacetScore}["SD"] = \text{FacetScore}["SD"] + 2 \quad (3.43) \\
\text{FacetScore}["D"] = \text{FacetScore}["D"] + 1 \quad (3.44)
\] |

Table 3.3: Equations to calculate the recommendation by the elder
3.2 Experimental Process

Before player’s could start playing the game we needed to know their personality, so they where request to answer a form, next an email would be sent with the instructions to the rest of the experience. The player would then download and play the game, answering another form whenever they would finish a quest. In the end, players would need to submit the game log and answer the final that would collect overall information about the player and his decision during gameplay. In the following sections will explain in more detail all the process used to get the results that can be found later on (see chapter 4).

3.2.1 Before playing the game

Before the player could start playing the game, we needed to know his personality so we could give better suggestion to him during the actual gameplay. To achieve this, players would need to answer a form (see appendix A.1). This questions was obtained from the IPIP NEO-PI\(^3\) questionnaire, the normal version (there is also a short version of the questionnaire, however we decided to use the complete form in order to obtain more accurate results). We only choose the items from this questionnaire that were related to the Conscientiousness facet of the Big Five Factor Model (see section 2.2.5.3). Each question would affect a certain facet and, therefor, the overall score of the Conscientiousness dimension. Each answer would give a score (from 1 to 5) to that particular question, which would later on be added (depending on the facet the question is related to) and and the value obtained would be normalized. Again this calculation are part of the IPI-NEO questionnaire and were not created by us.

![Email sent to players (example).](http://www.personal.psu.edu/j5j/IPIP/)
After the player submitted this form an email would be sent with a link to download the game and a series of instructions for him to follow in order for us to collect all the data needed for the evaluation of this work (see fig. 3.28). In this email would also be included an extra file so the game could have access to the player personality. This file would be automatically created after the player submit the modified IPI-NEO form and would contained the results for his personality on the Conscientiousness dimension and it’s corresponding facets. This file would later be used by the game to get information about the players personality.

3.2.2 Playing the game

All subjects participating in this project were divided in two groups, one group received a game were the fairy would give the best recommendations, according to the player’s personality (quests with higher scores), and the other group receive the opposite, where the fairy would give the worst recommendations (quests with the lower scores).

After the player downloads and installs the file required in the correct location he could start playing the game. The file with the player’s personality would be read and the appropriate calculation, talked about in section 3.1, would be made, so the fairy could give the best or worst recommendations for the quests, depending on witch variant the player received.

3.2.3 Quest completion

Upon the player finish each quest, he would be asked to answer a form (see appendix A.2). The aim of this form was to measure if the quests were well designed in terms of flow, check if the player has done the quest by recommendation of the fairy or not, and how much he enjoyed it (see chapter 4 for results). To help the player not forget this task, a window would pop-up with the player UniqueID to remind him that he would need to answer the form.

The first two questions of this form, asked the player for his UniqueID (this was asked so we could keep track of all the responses from the same subject in the different forms) and which quest did he had just finished. The following questions were made to let us get the information if the player have done that quest by recommendation of the fairy or not. The remain questions were design according to the Game Flow criteria (talked about in section 2.1), to measure if the quests were well designed in terms of flow. We did not use some of the elements proposed by Sweetser and Wyeth [8], as some could not be applied to this game, like social interaction.

3.2.4 End Game

Following the player choosing a guild, the game would end and a final form would need to be answered (see appendix A.3). This form would give us the most important information about our experience like which quest the player liked the most and how frequent the player asked for the fairy recommendation and if he found them useful. We would also know some more information about the player, such as if he is an expert player in RPGs or not, for example.

The player would also need to send the log file, created by the game, to a specific link provided in the email (see section 3.2.1 and fig. 3.28).
Chapter 4

Results

In the previous chapter we talked about the process of acquiring data and how the game was made and translated into the different facets of the Conscientiousness dimension of the Big Five Factor Model. In this chapter we will talk about the results obtained upon performing this experiment.

The conclusion obtained in this chapter can be used for posterior work, in order to improve the player experience using this type of approach.

The data was collected in a period of one week, where a link to the experiment was provided through the social network (mainly Facebook). We had a total of one hundred and seventy one participants enrolled for this experiment, however only thirty eight answered the forms about individual quests and from those, only thirty one finished the experiment completely. However we used the data from the two batches, even if they did not complete the experience until the end, as we considered that their answers were also valid and can also be interpreted. The population sample was composed of individuals with ages ranging from 19 to 53 years old and with a mean value of 26.52 years old and a standard deviation of 8.918. As said in previous chapters the personality of each person was obtained using a modified version of the complete IPIP NEO-PI form, where only items corresponding to the facets of the Conscientiousness dimension were used (the modified form can be seen on appendix A.1).

From the chart in fig. 4.1, obtained from the batch of people who finished the experience completely, we can see their distribution on the Conscientiousness dimension and its corresponding facets. We divided individuals by their score on each facet by Low, Average and High. Each bar is also divided by gender. In this sample, we can see that we had fewer individuals with low scores in the Conscientiousness dimension, which also translates in fewer individuals with low scores in the rest of the facets, since this facets are part of the dimension itself.

In this experience we divided the enrolled individuals into two groups. To one group we gave a version of the game where the fairy would give the best recommendations possible for the person playing the game and another where we gave a version that would do the opposite (the fairy would recommend the worst choices).
Figure 4.1: Chart with the distribution of the population and their corresponding facet scores as Low, Average and High, divided by male and female.

4.1 Game Flow

From the data we collected, we can say that the quests were well design in terms of flow. From the one hundred and four responses for the quests form, eleven were from quest one, sixteen from quest two, fourteen from quest three, sixteen from quest four, seventeen from quest five, fourteen from quest six and sixteen from quest seven.

In terms of challenge we can see (fig. 4.2) that some of the quest (like quests one, four and five) the results may not be as good. This may be due to the fact that the quests were designed to be small and, therefore, some players may find that smaller quests are not so challenging.

In table 4.1 we can see the mean value of enjoyment, standard deviation and the number of participants in each quest. The level of enjoyment was measured with a 7-point Likert scale, ranging from 1 to 7.

<table>
<thead>
<tr>
<th>QUESTS</th>
<th>PARTICIPANTS</th>
<th>MEAN</th>
<th>STD DEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quest 1</td>
<td>11</td>
<td>5.09</td>
<td>1.30</td>
</tr>
<tr>
<td>Quest 2</td>
<td>16</td>
<td>4.69</td>
<td>1.82</td>
</tr>
<tr>
<td>Quest 3</td>
<td>14</td>
<td>4.93</td>
<td>0.92</td>
</tr>
<tr>
<td>Quest 4</td>
<td>16</td>
<td>5.06</td>
<td>1.18</td>
</tr>
<tr>
<td>Quest 5</td>
<td>17</td>
<td>4.06</td>
<td>1.78</td>
</tr>
<tr>
<td>Quest 6</td>
<td>14</td>
<td>5.21</td>
<td>1.25</td>
</tr>
<tr>
<td>Quest 7</td>
<td>16</td>
<td>5.13</td>
<td>1.50</td>
</tr>
</tbody>
</table>

Table 4.1: Mean value of enjoyment, standard deviation and number of participants for each quest
Figure 4.2: Flow charts for each quest.
4.2 Quests Result

The results on this section correspond to the form that players needed to answer after finishing each quest. The results correspond to a total of thirty nine different subjects that answered the form for one hundred and four quests. Some of the participants did not do all the three quests asked in the game.

From this results we noticed that a majority of the population did not follow the fairy recommendations in both variants of the game (as we can see in fig. 4.3) and that even the ones who followed them, the variant they played did not seem to matter in terms of accepting or not this recommendations. As we can also see in fig. 4.4, there was not a significant difference in enjoyment, from the subjects that follow the fairy recommendations, in both variants, despite the peek in the correct recommendations variant with enjoyment of six. Using the Mann-Whitney U Test with a significance level of 0.212 we concluded that the distribution of the enjoyment of each quest was the same across the two variants of the game.

Looking at the chart on fig. 4.5 we can conclude that maybe the solution we built works best for people who score low in the Conscientiousness dimension. We can deduct, from this chart, that the results seen in fig. 4.4 may not be the expected due to people with average and high scores on this dimension. Using the Mann-Whitney U Test for the level of enjoyment from low scores of the Conscientiousness dimension we obtain a result of 0.014 significance value which means that the distribution of the enjoyment is not the same across the variants of the game. However, the same is not true for average and high scores where we obtain significances of 0.783 and 0.872, respectively, which means that the distribution of enjoyment was the same across variants.

One of the problems with this experiment was that the players did not do all the quests available in the game, making it difficult to conclude if a player really enjoyed the quest recommended or not. One of the options to improve this results, in future work, may be to recommend some quests correctly and others incorrectly in the same game and then measure the enjoyment levels. One other option would be to let the players do all the quests, without any recommendation system, let him classify the enjoyment
Figure 4.4: From the population that follow the fairy recommendation, how much did they enjoy that quest. Being the xx axis the enjoyment of players measured using the 7 point-likert scale and the yy axis being the percentage of subjects.

Figure 4.5: From the population that follow the fairy recommendation, how much did they enjoy that quest, divided by their score on the Conscientiousness dimension.
in each quest and then see if the quests that would be recommended for him would be the same as the ones that the player most enjoyed.
4.3 Overall Results

In this section we used data from the final form. This batch corresponded to thirty one different subjects that concluded the experience until the end.

Figure 4.6: Results for the relation of how many hours the subject plays per week and if he followed the recommendations.

From the chart we obtained in fig. 4.6 we can conclude that only players that usually do not play games always followed the recommendations. As we predicted, this system is more useful to inexperienced players who need help making their decisions. We found interesting, however, that players with no experience in games, and played the version that gives them incorrect recommendations, rarely followed them. Unfortunately, we could not conclude if the players asked for the recommendations or not. In future work this is something to take into consideration, either ask the player if he asked for recommendations or register this action in the game log. Sadly this was not done in this experiment and so the data cannot be more conclusive.
Chapter 5

Conclusion

Creating a game that pleases everyone, even a non gamer, can prove to be quite a challenge. With our approach we tried to support that improving players enjoyment, with different personalities, within the same game could be possible. For this propose we used a genre of gameplay (RPGs) that could help us determine if such goal would be possible.

We started by assuming that players enjoyment in the game is directly related to his personality. To show this, we created a game where we tried to map the facets of the five dimensions on the Big Five Factor Model. Due to the complexity of creating a game with so many variants (in total, thirty facets) we decided to only implement a game were we considered the majority of the facets of the *Conscientiousness* dimension of the Big Five Factor Model (*Self-Efficacy, Dutifulness, Achievement-Striving, Self-Discipline, and Cautiousness*) into player choices during a game. We needed to remove the *Orderliness* facet, because we could not place a quest were this facet could be present, without diverging from the game story. The choices of the player were translated into quests that the he would need to choose.

We created this game from scratch using the tool RPG Maker Vx Ace were the objective of the player would be to choose a guild to proceed in his training to finally belong to the princess army. To help him in his decision, he needed to choose three quests, from a total of seven, where his choices would influence the elders recommendation of guild for him. The objective of our system was to help the player with the choices for the three quest. For that purpose, we created a companion (a fairy) that would suggest the best quests for him based on their personality.

During the creation of the game, and specifically the design of the quests, we made it so that all the facets that we wanted to test, were present in at least one quest. However, since it was very difficult to create a quest where only one of the facets was present, we decided to include multiple facets in the same quest but with different weights, since some facets may prevail relative to others.

Over the evaluation of the game, we divided our subjects into two groups. To one, we gave a version of the game where the fairy would give the correct recommendation of quests based on the player personality, and to the other we gave the opposite.

Overall we could not determine with certainty if the player experience was improved or not. The data collected was not conclusive in terms of the enjoyment for both variants. This may be due to the fact that the majority of the subjects did not ask for the companion recommendation. However, we can agree that for low scores on the *Conscientiousness* dimension our approach worked best.

There is much room to improve the methods used to validate this work. One of the main problems with our experiment was the lack of a way to tell if the player had asked for the recommendation or not. Another way this work might improve it’s results would be to use the full spectrum of the facets.
scale, from 0 to 100, instead of dividing it into a scale of 3, we would have more granularity in the recommendation of the quests and maybe we would have obtained better results.

Other option to validate this approach would be to, instead of letting the player only choose a maximum of three quests to perform and not letting him do more quests, we could have let the player play all the quest available, let them rate their enjoyment in each quest and then compare the quest the player most enjoyed with the ones that would be recommended by the fairy and infer if the system would really recommend the best choices possible.

Another option that could have been implemented would be to create a control group, that would get random recommendations, so we could accurately confirm that our approach would really improve the players enjoyment during gameplay.

5.1 Future Work

For future work we can recommend, besides everything we talked about in the last section, to use our methodology with other genres of games, like strategy games, and with other dimensions and facets.

We also recommend to maybe use a different approach to measure the players personality, like the Four Bartle Types or the Four Keisey Temperaments. The Five Factor Model, is not very much used to measure players personality within games as there is very little research on how to apply this model to games, so maybe for now, the Five Factor Model may not be the best model to use. Although, I must say that at some point I think that this model should be at least considered when we are talking about someones personality as it is more recent and more updated and, therefore, we should have more work/research done using games and this model, despite it not being so mature compared to others.
Appendix A

Appendix - Forms

This forms were created using the Google Forms tool\(^1\).

A.1 Previous to game form

![First part of the previous to game form.](http://www.google.com/forms/about/)

Figure A.1: First part of the previous to game form.

\(^1\)http://www.google.com/forms/about/
**Pre-paSSPORT**

*Required*

**Please rate the following items as they best suit you:**

<table>
<thead>
<tr>
<th>Very Inaccurate</th>
<th>Moderately Inaccurate</th>
<th>Neither Accurate Nor Inaccurate</th>
<th>Moderately Accurate</th>
<th>Very Accurate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete tasks successfully.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Like order.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Try to follow the rules.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Go straight for the goal.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Get chores done right away.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoid mistakes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excel in what I do.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Like to tidy up.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keep my promises.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work hard.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

« Back  Continue »  

28.6% completed

---

Figure A.2: Second part of the previous to game form.
Figure A.3: Third part of the previous to game form.
Figure A.4: Fourth part of the previous to game form.
Figure A.5: Fifth part of the previous to game form.
Figure A.6: Sixth part of the previous to game form.
**Pre-paSSPORT**

"Required"

Please rate the following items as they best suit you:

<table>
<thead>
<tr>
<th>Do the opposite of what is asked</th>
<th>Very Inaccurate</th>
<th>Moderately Inaccurate</th>
<th>Neither Accurate Not Inaccurate</th>
<th>Moderately Accurate</th>
<th>Very Accurate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do just enough work to get by.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have difficulty starting tasks.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act without thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don't see the consequences of things.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Am not bothered by disorder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Misrepresent the facts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Put little time and effort into my work.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postpone decisions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Often make last-minute plans.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Submit

Never submit passwords through Google Forms.

---

Figure A.7: Seventh part of the previous to game form.
A.2 Quests form

Figure A.8: Form to be filled for each quest taken.

A.3 Final Form
paSSPORT

* Required

Please insert your Unique ID: *

How many hours per week do you play games? *

- I don’t usually play games.
- Between 1 and 5 hours a week.
- Between 6 and 10 hours a week.
- Between 11 and 20 hours a week.
- More than 20 hours a week.

How would you rate your experience with role-playing games (RPGs)? *

- I don’t usually play games.
- I don’t usually play RPGs but have played other genres of games.
- Mostly action RPGs (Fable, Dark Souls, Risen...)
- Mostly tactical RPGs (Fire Emblem Awakening, Shadowrun Returns, Wasteland, ...)
- Mostly Massive Multiplayer Online RPGs (MMORPGs) (World of Warcraft, WildStar, Guild Wars, ...)
- I play all genres of RPGs

Continue »
paSSPORT

* Required

The recommendations of the fairy were useful.

1 2 3 4 5

Strongly disagree. 1 2 3 4 5 Strongly agree.

Did you follow the fairy recommendations?

1 2 3 4 5

Never. 1 2 3 4 5 Always.

Briefly explain why.


In your opinion, what are the traits that you find more important for companions in games?

Please list up to 5 traits only, separated by commas.


Please order the quest you did by order of preference:

If you need help remembering which quest is which, follow the following link: https://docs.google.com/forms/d/e/1FAIpQLScKQ1NUM6Kj8hZ0qU-UU6jX9Rm7NbyXZtC0s91UUL1IbR_3U/edit

<table>
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<th>Quest 1</th>
<th>Quest 2</th>
<th>Quest 3</th>
<th>Quest 4</th>
<th>Quest 5</th>
<th>Quest 6</th>
<th>Quest 7</th>
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</thead>
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<tr>
<td>1 (the quest I liked most)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
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</table>

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Figure A.10: Second part of the final form.
Appendix B

Appendix - Quest 6 Maze Solution

Figure B.1: Maze solution for quest 6
Bibliography


