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Dalibor Šuplika

APPLICATION OF ARTIFICIAL INTELLIGENCE METHODS TO IMPLEMENTATION OF AN ADAPTIVE COMPUTER ROLE PLAYING GAME

MASTER'S THESIS

Varaždin, 2021

UNIVERSITY OF ZAGREB

FACULTY OF ORGANIZATION AND INFORMATICS

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APPLICATION OF ARTIFICIAL INTELLIGENCE METHODS TO IMPLEMENTATION OF AN ADAPTIVE COMPUTER ROLE PLAYING GAME

MASTER'S THESIS

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Varaždin, September 2021

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Statement of Authenticity

Hereby I state that this document, my Master's Thesis, is authentic, authored by me, and that, for the purposes of writing it, I have not used any sources other than those stated in this thesis. Ethically adequate and acceptable methods and techniques were used while preparing and writing this thesis.

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Abstract

The theoretical part of the paper is an overview of selected artificial intelligence methods used in modeling non-playing characters in video games. The practical part of the work includes the creation of a video game in which the decisions of the player during the game cause changes in the selected segments of the game.

Keywords: computer game; artificial intelligence; adaptability; role playing game;

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1. Introduction

The topic of this master's thesis is the creation of a computer Role Playing Game, or most commonly known as a computer RPG, using the RPG Maker MV tool. The key feature of the game is that the game is adaptive, meaning that choices players make in the game affect certain other aspects of the game. For example, helping a certain Non-player character (NPC) will unlock an alternative way to approach the game. The game can still be completed without helping a single NPC, however the game will be a lot harder if that approach is taken.

I have decided to create a video game for my graduate thesis because I started playing video games at a very young age, and have always wanted to create my very own game. Through the course Multi-agent systems on Faculty of Organization and Informatics I have learned about the usage of agents and artificial intelligence methods, which I recognised as a natural environment for creating video games. Agents in video games are represented by NPCs, or Non-player characters, that the player can interact with. With that knowledge, I have decided that I want to create a video game to mark the end of my college years, seeing as I have spent a lot of my free time over the years playing them.

2. What Are Role Playing Games

There have been a lot of attempts to define role playing games, as well as role playing in general. Roughly, they can be divided into 2 categories: role playing games who's focus is on the experience and process of role playing, and role playing games which include descriptive elements about the gameplay and the game itself.[1]

2.1. Focus on Experience and Process of Role Playing

One of the very first definitions of role playing is that of Stephen Lortz in 1979, who defines a role playing game as "any game which allows a number of players to assume the roles of imaginary characters and operate with some degree of freedom in an imaginary environment"[1], with the key here being players assuming roles in form of their characters and the freedom to interact with the game world.[1]

Another alternative definition is by Padol from 1996, where they define role playing games as games that "Allows people to become simultaneously both the artists who create a story and the audience who watches the story unfold. This story has the potential to become a personal myth, shaped to meet the needs of its creators."[2] This definition provides a useful role playing perspective for those who want their characters to experience engaging stories. The emphasis on the story, which Padol sees as something created during role playing, and not as an activity in general, says little about the context in which the stories were created.[1]

A more general definition, that doesn't put the emphasis on the story element of role playing games, is the definition of Henriksen, proposed in 2002, where they state that a role playing game is "a media, where a person, through immersion into a role and the world of this role, is given the opportunity to participate in and interact with the contents of this world."[3] This definition again sidesteps the question: by what means do players interact with the game world?[1]

In all of these definitions, role playing is described in itself, but role playing games themselves are not clearly define. While they are valuable in their chosen range, they are less useful in defining role playing games as separate category. By looking closely at several of these definition, role playing can take place in many games, including games that are not considered role playing, and even completely outside the context of gaming itself.

2.2. Role Playing Games with Descriptive Elements

When the term role playing games is used, typically it's not referring to all versions of role playing games, but to one specific type of role playing games. These types are called forms of role playing games. This also attributes to the problem of defining a single definition of role playing games.[4]

In 2006, Dormans attempts to define role playing games by separating them into 4 types and defining each type separately, those being[5]: "pen-and-paper", "live-action", "computer", and "massively multiplayer".It is difficult to argue with the claim that a large number of role playing games fall into any of these categories, but more controversially, that these categories are sufficient.[1]

In 2006, Tychsen and others provide[6] an analysis on computer role playing games and pen-and-paper role playing games by comparing the both forms. In their analysis, they describe the process aspects and an provide an overview of features in common role playing games. In short, they state that all role playing games have the following characteristics:[1]

- "At the heart of role-playing games, there is an element of "storytelling with rules", and each game form provides unique ways of expressing this feature."[1][6]
- "Is set in a fictional world, established by the game premise: A shared understanding among the participants of the game setting, rules and similar game framework issues."[1][6]
- "Most of the game participants normally control a character through which they interact with the fictional world."[1][6]
- "There is usually a game master (or computer system performing the role of the game master) responsible for management of those elements of the game and fictional world outside direct control of the players."[1][6]

In addition, they further discuss what are the core functionalities of game masters and how the game master's functionality differs depending on the role playing game's form. They also conclude that the player acting as the game master should be swapped each time, rather than the same player always being the game master, because such behavior makes for far more interesting and diverse stories. [1][6]

Michael Hitchens and Anders Drachen[1] recognise a key problem with this list of shared characteristics, stating that it covers games that are normally not considered to be role playing games, such as first person shooters. If role playing games can be virtual, then software can act as the game master. From what was stated by Tychsen and others[6], first person shooters can be considered role playing games. They also contain an imaginary world, players (at least one player and software that acts as the game master) and a character through which the player can interact with the game world. It can also be said that first-person shooters contain or create stories as you play, especially games that aim to create an interesting story such

as BioShock, Deus Ex and Borderlands. Despite the fact that these games go well with the mentioned characteristics, they are rarely considered role playing games. They do contain elements of role playing games, however, containing elements of role playing games is not the same as actually being role playing games, because by that logic, it can be argued that all computer games are in some way role playing games.[1] In conclusion, any game where the player assumes the role of a fictional character inside a virtual world, where the player follows the game's story, and has to play by some rules could be considered role playing game, and that is not the case.

The definitions in this section work well for games that are commonly referred to as role playing games because they meet their requirements. Despite their advantages however, they are not precise enough to define which games are role playing games and which are usually not considered role playing games.[1]

From this chapter it can be concluded that there currently does not exist one single definition that defines what a role playing games is and what it is not. Most definitions can be used to describe games that are not generally labeled as role playing games, however, they do help in distinguishing role playing games from other types of games.

3. History of Role Playing Games

Role playing games as a formalized, written set of rules are a recent literary phenomenon, and have undergone multiple series of changes since their inception, probably more so than most other fields of literature. Porter[7] believes this is more due to the technological infrastructure available at the time of its inception than anything else, but still, comparing the early role playing games to today's, it can be seen that they have little in common.[7]

3.1. Traditional Role Playing Games

The history of the modern role playing games starts in 1915, when Herbert George Wells published Little Wars[8], a rule book for new players to start playing war games, which usually involved miniature soldiers, or other objects that represented them.

War games existed as a specialized entertainment scene, mostly for older men who are fascinated by history and strategy games. War games were games designed to recreate war strategies. These games introduced many elements that are still used in modern role playing games, such as: units containing health points or hit points and could be damaged by being wounded or other factors such as weather conditions, terrain that could affect unit movements, and some degree of randomness due to the use of coins and dice. Although this game was very interesting to many young men, it was a very complex game to learn as it did not have any official rules, so learning was largely dependent on people who already knew how to play to teach new players their version of the rules.[9] Wells wanted to solve this problem by publishing Little Wars[8], which would serve as an official rule book to War games. Wells sought to make the game more approachable to people of all age and gender, as specified in the first line of the book, right below the title: "A Game for Boys from twelve years of age to one hundred and fifty and for that more intelligent sort of girl who likes boys' games and books."[8]

At the end of 1960s, two game designers, Gary Gygax and David Arneson[9], were working on their own version of war games. At this point, Gygax and his friends had released Chainmail, a war game set in medival times, which contained elements of magic and fantasy. Because of this game, Gygax soon met his future business partner, David Arneson. They wanted to create a game which had an emphasis on the human element. After some thoughtful time went in to designing the game, they decided to play-test their game with a few friends, but instead of being just commanders like in traditional war games, they took on the roles of actual individual adventurers and acted as if they were those people while playing the game. All players were assigned a character with a unique personality and were asked to pretend to be that character and act accordingly. This game was the first role playing game ever played to this depth. Because of the overwhelming positive feedback from their friends, Arneson and Gygax decided to go into the business together. Arneson began organizing events similarly to the war games events, however, when players arrived at the event, they discovered that they were not generals commanding an army or reenacting past war events, they were in fact adventurers sent to explore a mysterious dungeon deep below the earth. The two game designers would

later go on to print the very first edition of Dungeons and Dragons (or shortly, D&D). From that point on, Dungeons and Dragons became a cultural icon, forever changing the way people viewed games, and it's effects and influence can still be seen in role playing games today.[9]

3.1.1. Porter's Generations of Role Playing Games

Porter[7] divides early role playing games in to generations to distinguish between the mechanics and conceptual bases of different systems.

3.1.1.1. Generation 0

Free-form, rule-less role playing, where a formalized system, as well as a good way to solve disputes, doesn't exist. This generation can also include structured events such as historical re-enactments, tournaments, fairs and feasts. Game mechanics also do not exist in this generation, as both objective and subjective realism are based on the knowledge of those who already know how to play the game. Examples of games that fall in to this generation are: Cops and Robbers, Cowboys and Indians, along with almost all games we used to play as children outdoors.[7] War games could also be a part of this generation prior to the release of Wells's rule book Little wars.[8]

3.1.1.2. Generation 1

Games with first formalized rule sets. This generation introduced the concept of fixed characters, specific attributes (including, but not limited to, Health points, Magic points, Strength, Agility, Intellect, etc.) and the use of dice to handle the aspect of randomness when attempting to perform a certain actions. Additionally, the generation saw the introduction of character generation by character classes (Warrior, Hunter, Mage, etc.), character levels, strict personality alignments, as well as world background being nebulously defined, if at all. The most popular game from this generation is Dungeons and Dragons.[7]. With the introduction of Well's book Little Wars, War games became a part of generation 1 role playing games.

3.1.1.3. Generation 2

Generation 2 games are mutations of generation 1 games. This generation came at the point when generation 1 games have been played so many times that players have started modifying them extensively, and incorporating their own ideas and concepts to the games. Influence of generation 1 games can still strongly be seen by what was included or excluded from the rules, such as classes and levels still usually being included, however not so strictly defined, while other game mechanics were attempted to be more realistic, or fix the flaws from generation 1 system (i.e. Level based hit points, armor that affects chance to hit rather than damage, alternate types of magic systems, etc.). Generation 2 backgrounds always include some overall background, which is covered in detail either directly (overall history, maps, campaign reference notes) or indirectly (personal history, societal norms, legal systems). Generation 2 games

saw a notable shift from dungeon crawls (which saw players navigate a labyrinth environment (most commonly referred to as "dungeon"), battling monsters, solving puzzles, avoiding traps, and looting treasures they come across) to plot-based adventures and non-hostile interaction with non-player characters of the game world. Notable games from this generation include: Warhammer, Space Opera, Chivalry and Sorcery, etc.[7]

3.1.1.4. Generation 3

Generation 3 games saw the implementation of so called "Meta rules" which is a rule system that is designed to be used with more than one genre, and which has a solid, expandable base. Game Mechanics in this generation may not be perfectly and objectively realistic, but are for the most part consistent, and consist of guidelines on how to expand the rules set to cover situations and scenarios that are not explicitly mentioned. Subjective realism is often good, however it is limited by the multi-genre nature of the meta rules system. The most notable difference between Generation 2 and Generation 3 games is the introduction of point based character generation in place of random dice rolls. Most Generation 3 games use a variable pool of points with which to purchase abilities, or some other non-random means to let the player choose exactly what they want. A Generation 3 background covers almost every aspect of a genre that characters will need to interact with (such as: currency, language, legal systems, travel, history, important personages and behind-the-scenes intrigue), as well as character personalities that allow deliberate design of a particular race, profession or attitude, which is then reinforced by the game-world. Notable games from this generation include: TimeLords, Traveller: New Era, Hero System, Pendragon, etc.[7]

3.1.1.5. Generation 4

Introduction of entirely new game mechanic that changed the normal flow of play in a Role Playing Game. Generation 4 games include changes to the plot in the middle of play, number of dice reduced or in same cases completely removed, removal of traditional attribute or skill systems. This generation puts an emphasis on story and plot rather than tactics and combat resolution. Porter[7] also notes how generation 1-3 are linear descendants of each other while generation 4 games are "like branches off the trunk of the same tree, spreading in different directions." Systems may or may not be meta rules, depending on their origins, but the majority of generation 4 systems are geared towards working extremely well in a particular genre. As for game mechanics, both objective and subjective realism are high when the two are compatible. If not, subjective realism is in most cases better. Rules may be designed to create a certain "feel" for the game setting, and as such, reward or punish certain types of character behavior. In a meta system, background for generation 5 games depends on the level of support given, but even when it comes to genre-less games, the game will still provide various notes on the aspects of creating a game world, running a campaign and other details required for good game mastering. Notable games from this genre include: Amber, Vampire, CORPS, etc.[7]

3.1.1.6. Generation 5+

Because this paper[7] was published in 1995, Porter states that there isn't any Generation 5 yet, however he assumed that they will be variation on generation 3-4 games, taken is some direction that will not be pen and paper role playing. They also state that one can imagine rules to be computerized to the extent that players no longer need to know them, but can simply describe their actions and the computer figures out the rest. Porter further predicted that "with the information storage increasing, and multimedia PC's becoming more common, an entire adventure could be placed on CD-ROM, with a built-in "computer game master", and if the information networks become more sophisticated, live role playing by Net might become more common."[7] Looking at one of the final words of Porter's paper:

> "This could gradate into virtual reality role-playing, or with the proper combination of hardware and software, many groups could conceivably play a game in the same universe at the same time. Imagine playing a superhero in virtual reality city where anyone you meet could be another player, where several professional GM's manage the background details, but the plot moves itself through the actions of the players, rather than being driven by a pre-arranged plot. "[7]

it can be seen that Porter described, very precisly, a modern day Massively Multiplayer Online Role-Playing Game (MMORPG). Porter finishes the paper by following up on this quote by saying "Is this going to happen on a large scale anytime soon? Doubtful. But it is worth thinking about..."[7] The first commercial MMORPG to be released was in 1997, only 2 years after Porter's paper was published, named Ultima Online, and in 1999 it was followed by EverQuest, which is considered to be the first extremely successful MMORPG game, selling 225000 copies of the game in total within 6 months of release, while having 150000 active subscribers, which was a massive achievement for it's time.[10] Porter predicted the way role playing games would be played in the future, however, not even they anticipated the massive growth of technology in such a short period of time.

3.2. Computer Role Playing Games

In 1979, the first ever commercially released computer role playing game was released, called "Akalabeth: World of Doom" by Richard "Lord British" Garriott. Computer role playing games are a genre of video games that are a subcategory to role playing games. Akalabeth was greatly inspired by Dungeons and Dragons and other similar role playing games. Computer role playing games were much more then computerized equivalents of traditional role playing games, because they combined elements of traditional role playing games and computer games. A lot has changed since the first copy of Akalabeth was sold, however, a lot of elements introduced in Akalabeth stayed the same in computer role playing games even today. Fans of role playing games still seek to acquire the highest level, collect the best gear and weapons, and to fight more and more powerful enemies, all in a search for a new grand adventure. Computer role playing games stand out a lot from games of other genres, because

only they will offer the player a combination of thrilling combat, tactics and strategies, character development, a fantastic world (and in some cases, worlds) to explore, branching story-lines and personal achievements. Some of the best known modern titles of the role playing game genre include The Witcher 3: Wild Hunt by CD Projekt RED, The Elder Scrolls V: Skyrim by Bethesda, Dark Souls by FromSoftware, and many more.[11]

Computer role playing games frequently get confused with other genres and it is sometimes very difficult to isolate features that are exclusive to computer role playing games. Modern games tend to include multiple genres and are best described as a combination or a hybrid or multiple genres such as BioShock by 2K Games, which is titled as First person shooter/Role playing game (FPS/RPG). It uses shooting mechanics from the first person perspective, however, if you would remove the shooter aspect from the game, it would still have a fantastic story attached to it, and it would stay unchanged from that perspective. In Dungeons and Desktops[11], a book by M Barton and S Stacks, they describe that what separates computer role playing games from other games of other genres is "their statistical-based role playing system", stating that designers of these games rely on "statistical calculation for the bulk of their gameplay mechanics, rather than physical manipulation."[11] In other word, they rely more on statistical reasoning, rather then the player's own ability to use a game controller or mouse and keyboard.Computer role playing games have a lot in common with traditional tabletop and pen-to-paper games, but despite that, they are very different them in several ways.

While traditional role playing games rely on the players' and the game master's ability to improvise stories as the game progresses, and not strictly following every rule in the rule book (sometime intentionally), computer role playing games rely on the game's hardware to enable billions of operations per second, and thus improve the game's ability to enforce complex systems and rules that players must follow. While this makes for more indepth character and system designes, it comes at a great cost to the in-game improvisation effect of role playing games. Game masters in traditional role playing games never bother to learn all the rules of the system because they are considered unnecessary and sometimes even undesirable. Their only goal is to create a creative and interesting game for other players. A good example of this was seen in 2014, during a PAX Prime convention, when a famous game master Chris Perkins was encountered with a situation he had no idea how to properly handle according to the official rules. The player of the game found themselves on a zeppelin while they encountered a dragon and wanted to "Impale the dragon with a zeppelin." After saying that he didn't know how the rules would even apply in this situation, if any even would, he demonstrated the improve effect that traditional role playing games have, and simply concluded "You just do it. You just run this thing right through!" While improvisation of this form by the game master plays a huge part of the fun in traditional role playing game, in computer role playing games such a thing is not possible, unless it was implemented during the game's development.[11]

4. Forms of Role Playing Games

Hitchens and Drachen[1] believe that a definition that specifically defines a game as a role playing game or not could be developed from analysing existing role playing game definitions and seeing if there are any similarities. In attempt to do so they separate the games into following forms of role playing games[1]:

- Pen-and-paper and Table-top
- Systemless
- Live Action Role Playing
- Single Player Computer
- Massively Multiplayer Online (MMO)
- Freeform
- Pervasive

4.1. Pen-and-Paper and Table-Top

Pen-and-paper and table-top refer to the first forms of role playing games, where players would sit around the table in the same room. In these types of games there exist 2 types of players. All but one player are knows as adventurers, knights, heroes, etc. and they control one character each, which they use to interact with the game world. The remaining player is generally know as the game master or dungeon master, and they control monsters in the game that players have to overcome, control the flow of the game's story, resolve player-based encounters according to the actions of the players, etc. It is their job to ensure the other players have a great time. The game consists of players describing the actions their character takes, the game master who describes the results of these actions, while at the same time moving the story forward, and elements of the game world that the players encounter. Pen-and-paper and table-top role playing games track their characters' information using character sheets. Character sheets describe characters in quantitative terms and qualitative description such as a characters personality and backstory, the characters stats, effects the character may be under at a certain time, etc. There are generally no restrictions when it comes to taking actions. As long as the player can imagine it, and their character is capable of performing such actions in any way, players are allowed to perform that action. It is then up to the game master to improvise on the situation to the best of their ability. Pen-and-paper and table-top role playing games are the forms from which all further role playing game forms originated.[1]

4.2. Systemless

This game form is very similar to traditional pen-and-paper role playing games in a way that it has about the same number of players, and having players perform similar action, while adding some elements of psychodramas. While traditional role playing games can have more then one game master, this game form stands out by putting an emphasis on having multiple game masters. Also, this game form focuses more on the character's qualitative aspects, such as their personality and history, while completely removing quantitative aspects from characters, such as their skills. Characters in this game form can still develop, however that development is on a character's personal and emotional level, rather then their strength to fight stronger enemies. Another key feature of systemless role playing games is that the game space expands from the table, or traditional play space the players would sit around, into an entire room, or sometimes multiple rooms at the same time. By doing this, the game is no longer played by sitting around the table, and instead has the players move around the rooms, assuming the role of their character and acting out their actions instead of just verbally describing what their are doing. Systemless role playing games also remove the effect of randomness, like rolling a die to see if an action was successful or not, and have the game masters resolve the encounters based on their assessment of previous actions and character backgrounds.[1]

4.3. Live Action Role Playing

While Live-action role playing games sound similar to Systemless role playing games at first, their do have some fundamental differences that separate them. Live-action role playing games generally involve a larger group from the previous 2 forms, or sometimes even several groups of players at the same time. The number of players in Live-action role playing games can exceed even a 1000 players, as a limit is generally not defined. Just like systemless role playing games, Live-action role playing games have players act out their actions and interact with one another, rather than sitting in one place and describing their actions. Live-action role playing games also hugely expand the game space. While systemless role playing games occupied a room, or rooms, Live-action role playing games are played in real world locations such as fields, castles, mansions, parks, etc. depending on what matches the game world setting the best. Live-action role playing games also have players dress up in costume during gameplay and use props like swords, bows, and staves to engage in combat with other players. Because Live-action role playing games take place in such large areas and include a large number of players, the use of multiple game masters is a necessity in this form, however their functions remain the same. Aside from regular players and game masters, there exists a third form of players in Live-action role playing games, those being game masters' assistants. Their role in Live-action role playing games is to act out predefined scenarios as instructed by the game master, which serve the purpose of setting up the stage, progressing the story, etc. What makes them different from other regular players is that their actions are not acted out, but rather scripted, and can sometime even be considered as NPCs, or Non-player characters because of that.[1]

4.4. Single Player Computer

Single player role playing games have a very obvious difference from other forms of role playing games that can be seen in the form's very own title, and that is "Single player". So far, every role playing game form involved multiple players and multiple player roles (player and game master). In previous chapters, it was already concluded that a software can play the role of a game master, but these are the first forms of role playing games that featured only 1 human being. Single player role playing games are directly inspired by pen-and-paper and table-top role playing games, sometimes even being digitized version of the actual original games, such as Pathfinder: Kingmaker, a 2017. adaptation of the original game Pathfinder, This form also occasionally saw the players controlling more than a single character during the game, especially in top down version of the games like Pathfinder: Kingmaker, and later in 3rd person role playing games such as Dragon Age.[1]

The biggest change with this form is the visualization of the game world itself on the players monitors. Before that, in most traditional role playing games, players used to visualize the game world and all its elements in their minds, sometimes occasionally having a small map of the game world present. While this can be viewed as a big improvement to role playing games, it can also be seen as a downside. As was previously discussed, computer role playing games come at a cost of player improvisations, as players can only perform actions that were directly implemented in to the game during it's development. Furthermore, this behavior caused a decrease in players role play aspect, as not only could they not perform actions that they thought were more representative of their character at the moment, but the games missed a key feature of traditional role playing games, which was human to human communication. Instead, this communication is replaced with Non-player characters (NPCs) inside the game world, that have a scripted communication when a player interacts with them. This scripted communication cannot compare with a thought process of a human being, as every person would react differently while portraying the same character. To give NPCs more diverse dialog, games started implementing decision based conversation, where the NPC would react differently depending on the chosen dialog option or if a certain action was performed beforehand. While the games could certainly tell a fantastic story, and two people playing the same game will have a different experience, they would in most cases feel a lot better if you could beat the game side by side with a friend, and not each one of you beating the game on their own. This was partially solved with the implementation of Co-op compatibility games. Co-op games are a form of single player RPGs that had an option for a new player (or players) to take control of a friendly NPC or party member and play the game along side the initial player. Early Co-op games were played on the same monitor, inside the same room, and sharing the same keyboard or using a second controller, and later, with the improvement of technology, each player would play on their own device that was connected to the same Local Area Network (LAN) as the initial player. And example of a single player game with co-op compatibility can be seen in The Lord of the Rings: The Return of the King (video game) by Electronic Arts and Borderlands series by 2K Games. The problem of improvisation at any given scenario inside a single player game will most likely never be solved, at least not any time soon. However, in 1997 the world

was introduced to a new form of role playing games, known as Massively Multi-Player Online Role Playing Games.[11]

4.5. Massively Multiplayer Online (MMO)

Massively Multiplayer online role playing games (MMORPG) are virtual universes in which players create their individual characters to explore the game world. They share a lot of features with Single Player role playing games, however they are different in one very big way, they are multiplayer, meaning that instead of one player playing the game, it's thousands of people playing the game at any time, each progressing through the game at their own pace. MMORPGs are the only type of computer games where millions of players interact with each other through avatars in a graphical virtual environment on a daily basis.[12] Unlike most single player games, MMORPGs put an emphasis on character creation, including elements such as multiple races, male and female genders, different hair styles and hair colors, the character's height, etc. The idea is to provide the players with a way to create a unique character to that stands out from characters of millions of other players also playing the same game. Furthermore, players can create multiple characters in almost every MMORPG and can swap between playing each individual character for as long as they see fit. Dedicated players can play the same character for multiple years without any limitations from the game itself, unlike Single player RPGs whose playtime averages about 20-40 hours[1]. Most MMORPGs have a consistent flow of new content released to the game, with smaller content updates (known as patches) being released approximately every 3-4 months, and big content updates (known as expansions) being released every 2, which means players can never complete the game forever. They can reach the end of the game for a current patch or expansion, however, this will not stop them from redoing that content multiple times to obtain the strongest weapons and armor or exploring some of the games older content. When a new update is eventually released for the game it always comes with new content for players to explore, which can be done on the same character, therefore, players can play the same character for multiple years. Because MMORPGs take place in one big world, that world is for the most part identical to a brand new player, and a player that has been playing the game for 3 years. While the games of this form do have a story, they typically don't involve drastic changes to the design of the game world itself, therefore, a player who has already reached the end of the game can still see and interact with a player that has just started playing. MMORPGs feature a lot of different activities aside from their main story line. These activities usually reward cosmetic items, achievements, character titles, mounts, etc. Even if completing a hard achievement, or earning a rare mount doesn't increase the player character's power, they are still heavily sought after because they grant a certain prestige to the player, and make them stand out from other players in the game, because they are among a very small percentage of players who received that reward.

MMORPGs were very popular when they were first released. The first two major games of this form were Ultima online, released in 1997 and EverQuest, released 2 years after in 1999. Both games kept a very similar player base over the years, and are believed to be the first popular MMORPGs.[11] While the MMORPG form existed, it was not "solved". To

clarify, there was no one definitive way to design an MMORPG game, which resulted in early MMORPG games being very different from one another, because developers were "throwing ideas at a wall and seeing what sticks". This same effect can be seen with mobile phones. By looking up early mobile phone designs, it can be seen that they were a lot different from one another. Some had a small screen and a keyboard, some were flip-flop, some had a bigger keyboard, etc. However, looking at mobile phones today, they all look pretty much the same. A rectangle with round edges, no keyboard, a front and back camera, and touch screen. This is because mobile phone manufacturers noticed that this design of mobile phones was far more popular then any other design before it, meaning that the design for mobile phones was solved. A design of MMORPG's was solved in 2004 by Blizzard Entertainment with the release of World of Warcraft. The game was a major success with the MMORPG genre, reaching record subscriber numbers (with a high point of 12 million subscribers in a month)[13], and defining the design of future MMORPGs looking to recreate the success of World of Warcraft. This can be seen by a huge number of games released after World of Warcraft known as WoW-clones, These games featured a lot of elements introduced by World of Warcraft, such as parties of 5 players, tank, healer and damage dealer classes, dungeons and raids as group content, etc.[14] World of Warcraft, and MMOPRG games in general, stood out among other online games at that time, not only by their unique game design and high skill ceiling, but because of the games social aspect. The majority of questions you had could be solved by exploring the game world and reading the game texts, or by interacting with other players who have already figured out your problem. MMORPGs were designed with that social aspect as a key feature, forcing players to interact and play with one another to overcome the content of the highest difficulty. Because of this, it was normal for players to become friends with other players outside of the game world itself. I myself made a lot of friends through MMORPGs and other online games, some of which I still interact with on a daily basis.

4.6. Freeform

Freeform role playing game forms are well known in Australia, United Kingdom and USA[1] and can be viewed as an alternative form to Live Action Role Playing games, however it is considered an independent category among the player community. The difference between Freeform and Live Action forms is that Freeform put a bigger emphasis on character interaction within a smaller environment, typically set in a single physical location or several smaller locations with limited or no combat, as well as less emphasis on props and costumes. It consists of more players then typical Table-top and Pen-and-paper RPGs but less then Live Action RPGs. This form greatly relies on player communication and less or rule based action resolution to play the game.[1] This form still required more then one game master to control the flow of the game, and the game masters are are free to expand the game space to anywhere in the world if it's required for the progression of the game.[1]

4.7. Pervasive

Pervasive Role Playing Games are a form of role playing games that are typically digital, but their gameplay extends from the digital world to the real world, for an example, a players movement in the real world causes movement of their character in the game world. The first commercially available pervasive role playing game was released in 2001 by It's Alive Mobile Games AB! called Botfighters[15]. The game used the locations of the players mobile phone to represent their character in the real world. Players could see other players in the game world as bots, and could walk up to them to attack them. Defeating other players rewarded the winning player with rewards that could be used to upgrade their character. Pervasive RPGs are considered to be an extension to the Live Action RPGs, and they don't necessarily have to include a digital component which define what parts of the real world are used to represent the game world[1]. A special feature of this game type is that anything in the real world, even people not playing the game, are a part of the game.[1].

5. Methods and Techniques of Work

To create the game for this master's thesis, I used the RPG Maker MV tool. After comparing RPG Maker MV with other tools used for game design, I considered RPG Maker MV to be the most suitable tool for creating an RPG game I have envisioned. This tool offers a wide variety of assets with an option to import new assets by simply downloading them and importing them through the tools resource manager. Aside from having a lot of pre-created character designs to use, there is also an option to create your own characters through the client's character generation tool. The character generation tool is very rich with features, allowing customisation of the character's face, hair, clothes, etc. while also allowing some additional features, like adding wings, tails, and other accessories.

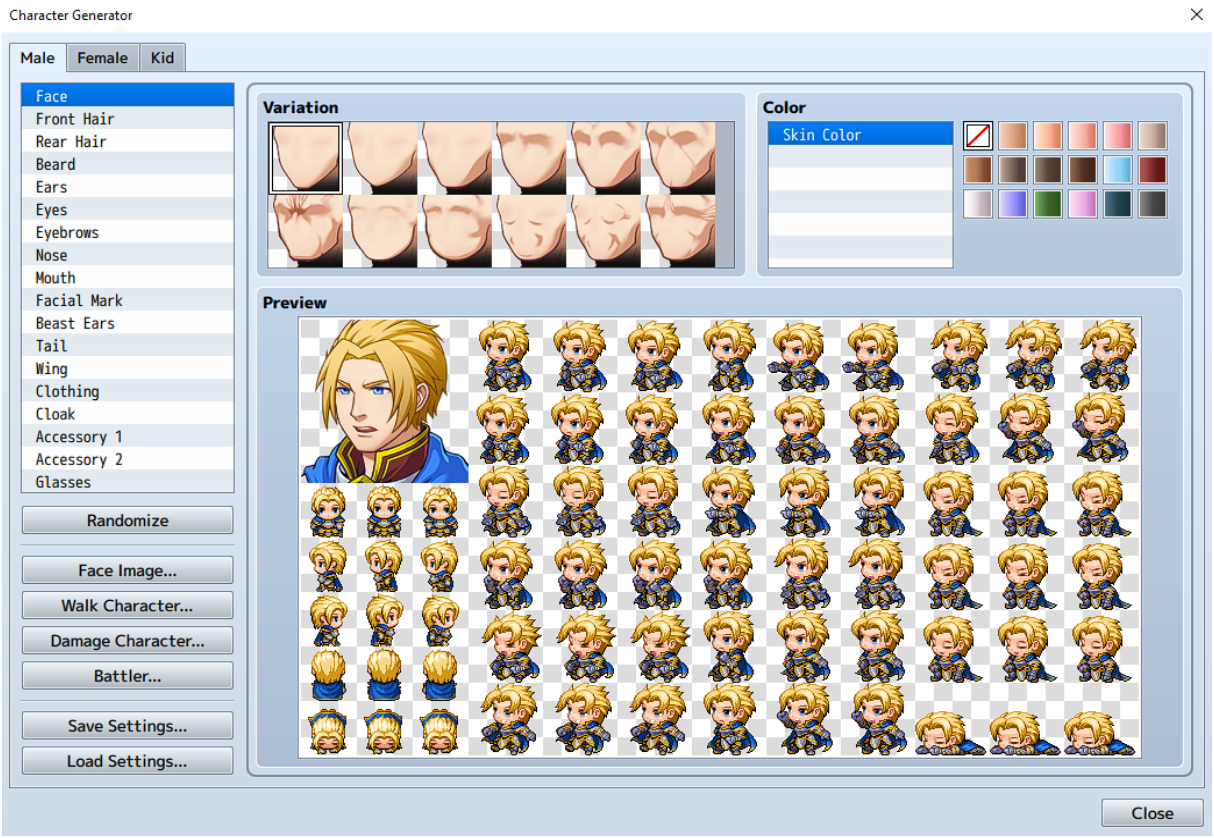


Figure 1: Character generation

The game is designed with the help of the tile pallet (Tileset) located on left side of the tool's main view. Adding a tile to the game is done by simply selecting the tile and drawing on the board. While the tool offers a limited amount of default tiles, they can also be downloaded from an external source and imported into the tool using the tools resource manager. The tools gives an option to create multiple tilesets, however, one map can only use 1 tileset. Below is an image from the first map of the game designed for this master's thesis:

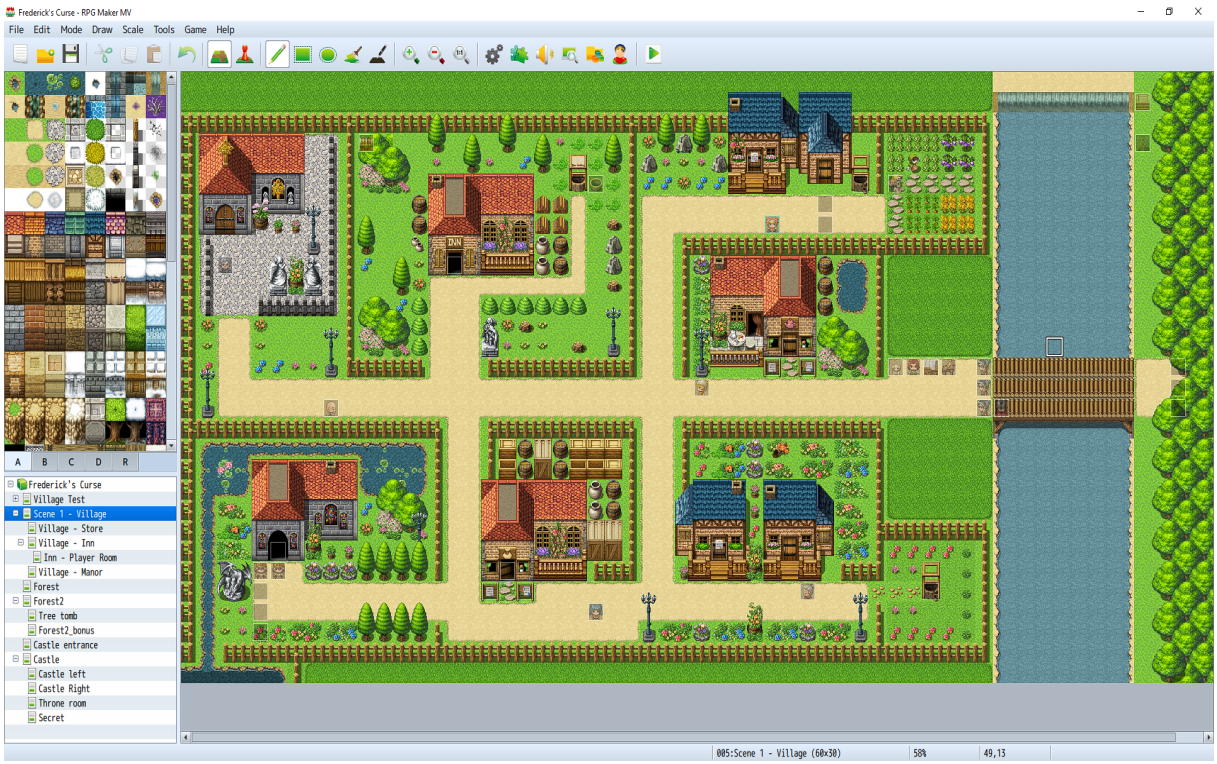


Figure 2: Village created with RPG Maker MV

RPG Maker also makes it very easy to add Events into the game. Within RPG maker MV, events are considered to be: Non-player characters (NPCs), objects that a player can interact with, enemies, and anything that is actively happening around the player character (such as transferring a character from one place to another, or from one map to another map). Events are a key part of an RPG game, because without them, the player would only be able to aimlessly walk around 1 map without anything to do. This was the most important factor for me when choosing a tool for creating a game, because the game I envisioned would need a lot of events, with a good amount of them being complex (having multiple choices, condition branches, quests, etc.) to create the adaptive experience for the game, such as helping one NPC in the game would unlock certain benefits for another NPC, however the player can still finish the game without helping the first NPC. An event is created by switching to the event editing mode and double clicking the tile on which we want to create an event. This opens the Event editor, in which I can define the contents of an event. Content of an event is created by double clicking on an empty line inside the contents table, or by right clicking an empty line and selecting "New". From there I could simply select exactly what I would need and it would display it in the Conditions table. Below is an image of the event editor.

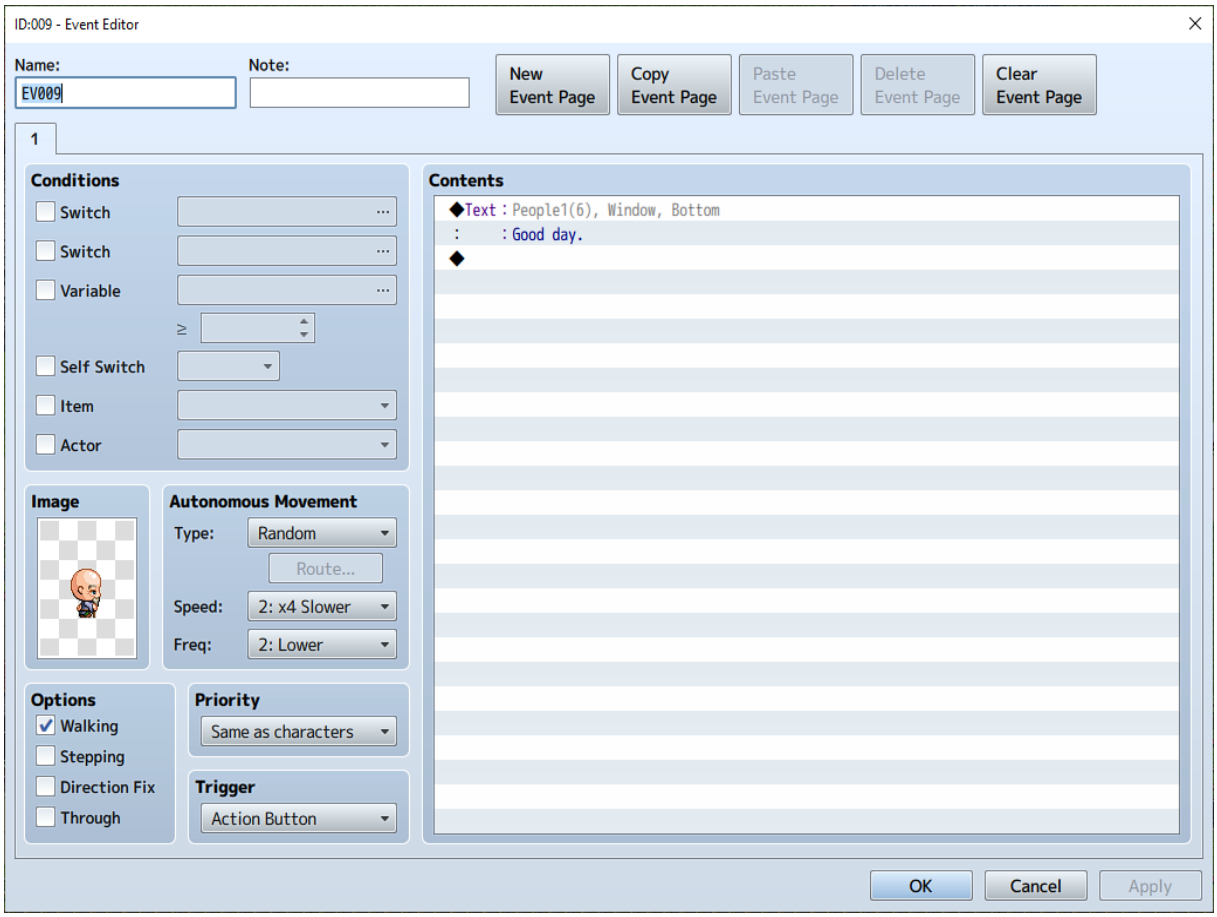


Figure 3: A simple event inside RPG Maker MV

RPG Maker MV also has a lot of predefined elements, called quick events, that are used in almost every RPG game of this type, such as character transfer, doors, treasures, Inns, and an option to quickly select the players starting position. These speed up the creation process of the game, because I didn't have to manually create such events every time I needed them. Previously created events can also be copied and edited, so most event don't have to be created from scratch, such as monster battles. All that is required to do is change the monsters sprite in the game world, and change the monster that the player encounters in that battle. Because I planned to have a good amount of battles in the game, this would also prove as a very useful feature for saving time.

Aside from RPG Maker MV, I have considered other tools for creating my game. When I first tried RPG Maker MV, I was a bit overwhelmed with the tool. Adding that to the tools pricey cost, it opted to try creating the game with Unity instead. Unity offered a free RPG kit which came with a few character models, sprites for the environment, and some predefined scripts that are commonly used in RPG games (such as roof fading away when entering a house). At first glance it seem a lot more user friendly then RPG Maker MV so I started with Unity. The problem was that outside of the RPG kit that unity offered, there was very little additional assets. Since unity is not very popular for creating RPGs, there was very little assets that could be downloaded or bought, and those weren't enough for the game I had envisioned. I went to revisit RPG maker more closely, because the name of the tool just seem like the right choice for me. After taking a detailed look at the tool, following some beginner guides, and trying out the free trial version, I decided to switch from Unity to RPG Maker MV. While the tool may look overwhelming at first, it is very easy to use once you get the hang of it, and in my opinion it was the best choice to help me realise my vision of the game.

6. Elaboration of the Topic

Before starting with this chapter, I would like to clarify some key terms that are going to be mentioned in this chapter to make it easier to follow.

- Switch - a named selection control mechanism that can only be turned ON or OFF. By default, all switches are turned OFF. A switch's state can be accessed anywhere in the game.
- Variable - variables inside RPG Maker MV can only have numerical values. They are used when more then 2 states provided by a switch are needed for an event. They can also be accessed anywhere in the game.
- Self Switch - This is the same as a switch, except it only affects the event that triggers the switch. Each event can have up to 4 separate self switches and they are named A, B, C, and D by default.
- Item - a database item that a player can have in their inventory. Items can be regular items (such as potions) or Key items (items that cannot be sold or used, unless a player is at a specific location).
- Actor - an actor represents the player character and NPC's that can join the player's party.

I have decided to name my game Frederick's Curse. In the story of my game, Frederick is the evil king who has gone mad with power, and is the final fight of the game. Upon starting the game, the player is presented with a Title screen. From there the player can start a New Game, Continue the game if they they have already played before, and customise the game options. The player navigates through the Title screen using the up and down arrow keys, and selects their choice by pressing enter, or by hovering with a mouse and left clicking their choice.

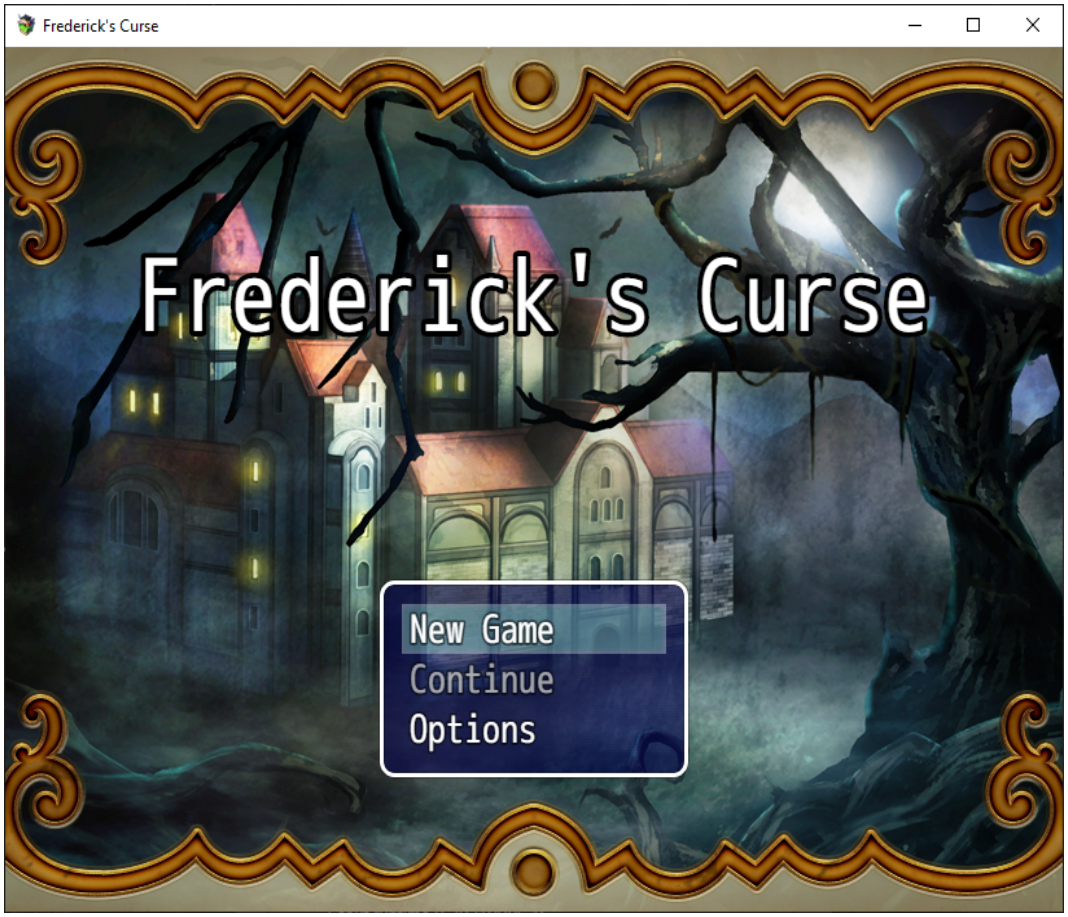


Figure 4: The game's Title Screen

When a new game is started, players will start in their room. The message window will pop up, explaining the games commands to the player.

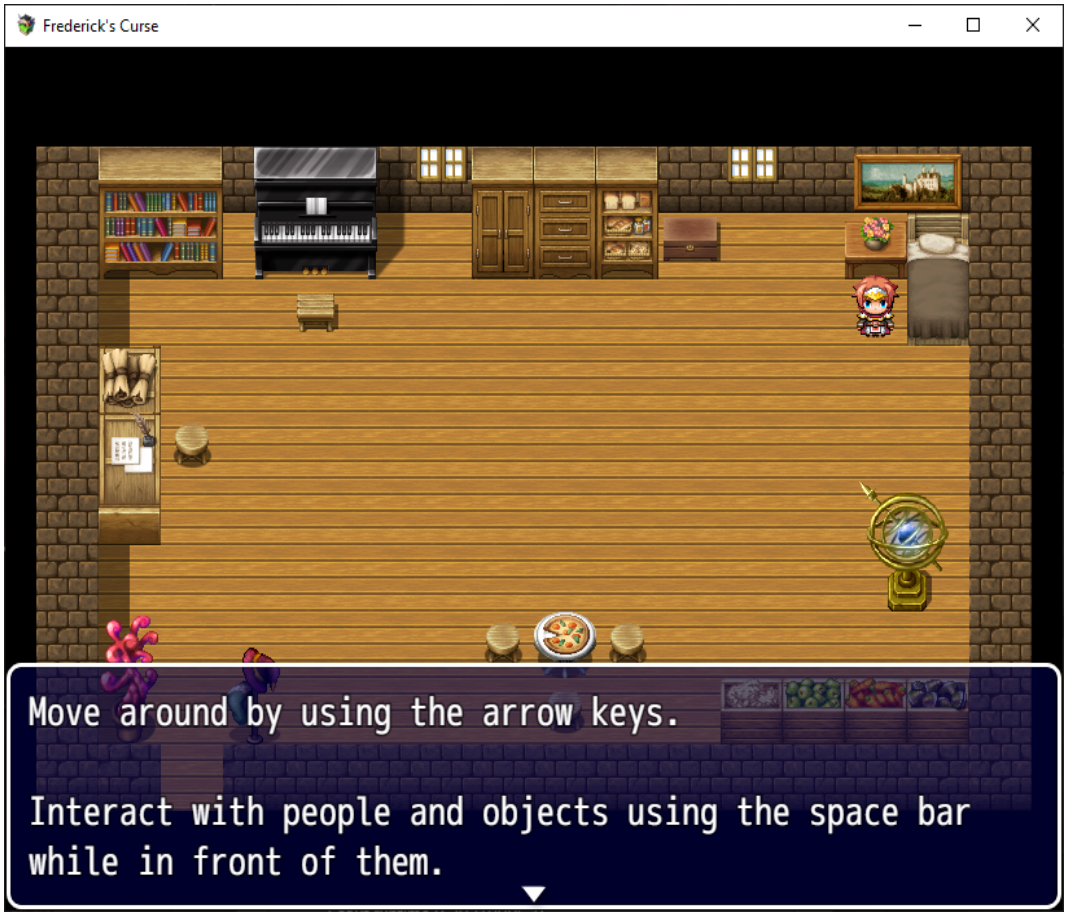


Figure 5: Game instructions upon starting a new game

Observant players will notice a chest inside the room. Interacting with it will inform them that the chest is locked and requires a key to be opened. By exploring the room, players can find the key to the chest and receive a magical staff and some gold. This is not necessary for the progression of the game, and is there to award players that explore the game.

Leaving the room in the bottom right corner will move the player from their room to the INN. If this is the first time a player has left the room, they will be informed that they can always come back to the room and interact with their bed to fully recover their health and mana, at the cost of 20G.



Figure 6: Leaving the room for the first time

Players can use Potions and Magical Water obtained from the shop or from defeating enemies to recover a small amount of health or mana from anywhere in the game world, however they can always walk back to the room should they run not have any.

To help set players on the right path, upon leaving the room and moving downwards, an Exclamation mark (!) will appear above one NPC inside the INN. This is the first NPC that a player has to interact with to begin the story. From this point on, the player should carefully read the dialog to know what their next course of action will be.

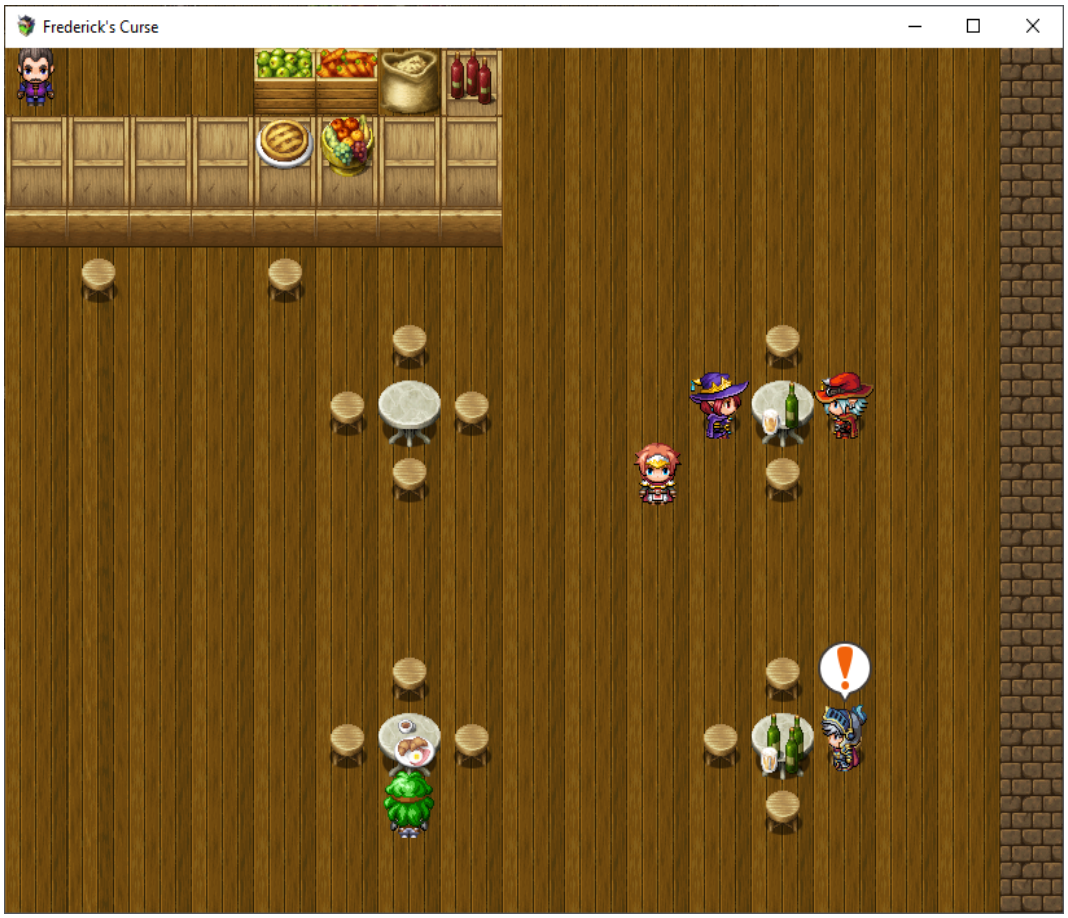


Figure 7: The first quest

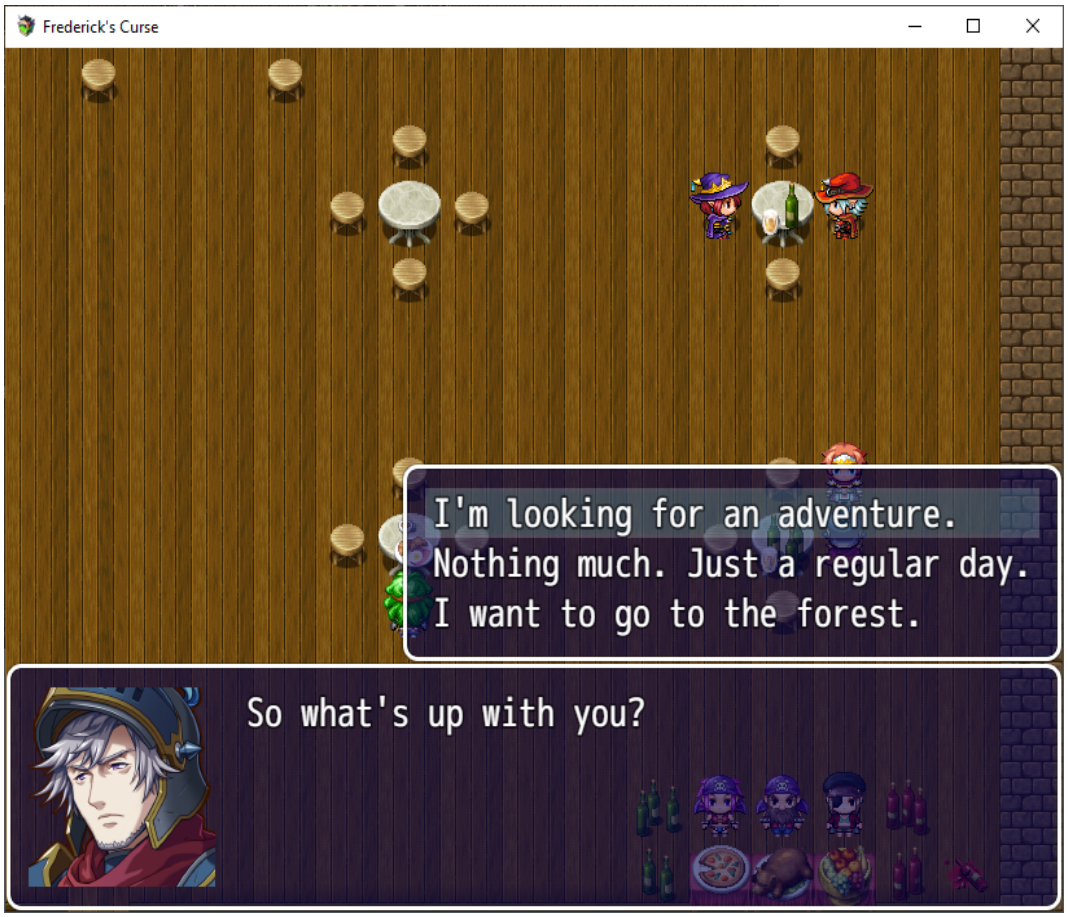


Figure 8: Dialog with multiple responses

Through the conversation with this NPC, the player will get their first hint of the game's story. To proceed from this point, the NPC instructs the player to buy them a Craft Beer from the INN's bartender in order for them to share the rest of the story with the player. Talking to the NPC again from this point will not repeat the entire conversation. If the player does not have an item called "Craft Beer" in their inventory, the NPC will respond with "How's that craft beer coming along?", however if the player does have it, he will instead ask if that Craft beer is for him, giving the player an option to give the Craft Beer to them of not.

This is handled by using a Self Switch and a Conditional Branch. Once the NPC sends you to get them a Craft beer, Self Switch A turns on. Then, I created a new event page that only triggers if Self Switch A is turned on. This event page contains a conditional branch "If : Party has Craft Beer". If that's true, the dialog continues from that branch. If it's false, the dialog continues from the Else branch.

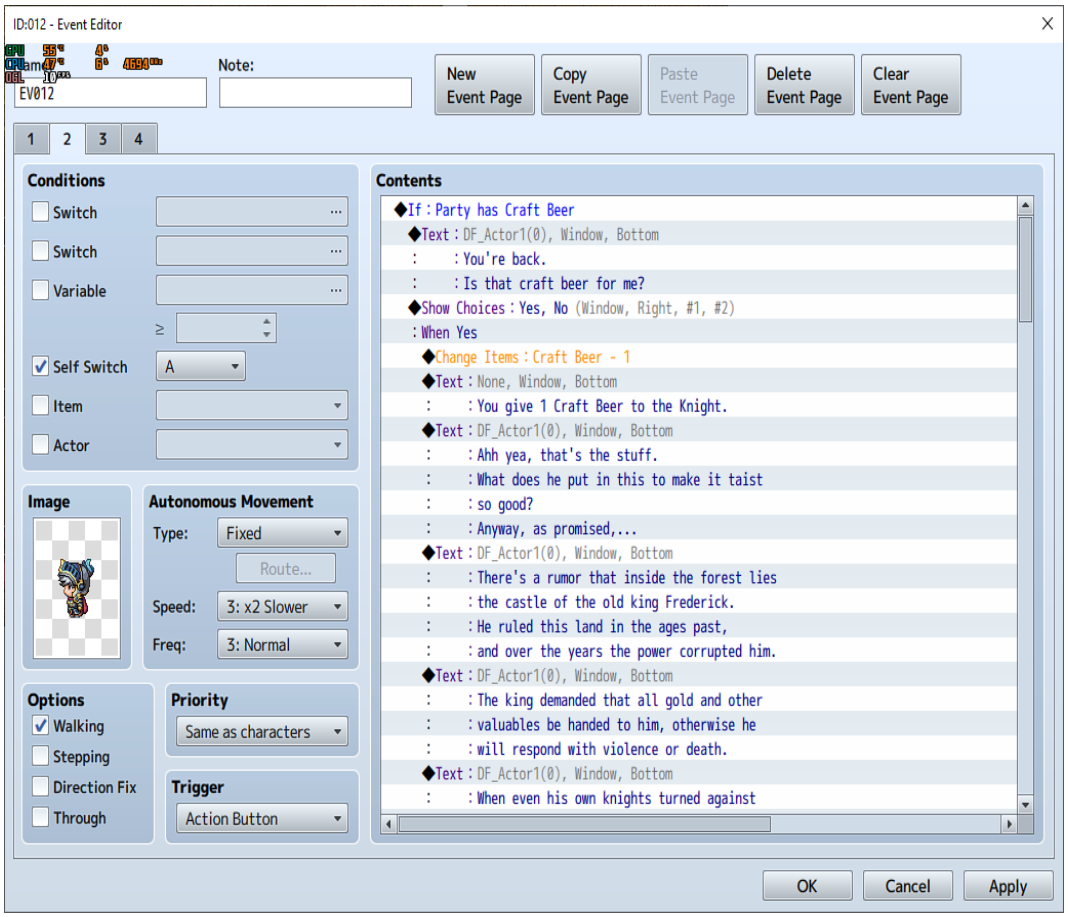


Figure 9: Conditional branch and a self switch

To acquire a Craft beer, the player has to walk up to the bartender NPC and purchase one from them. Interacting with the barkeeper NPC will open their shop and give the player an option to buy items from the NPC or allow the player to sell their items to the NPC, as well as display the amount of Gold that a player currently has. Selecting "Buy" will open a list of all items the NPC has for sale. From that shop menu, the player navigates to the "Craft Beer" item an purchases it by hitting the "Enter" key or left clicking the item.

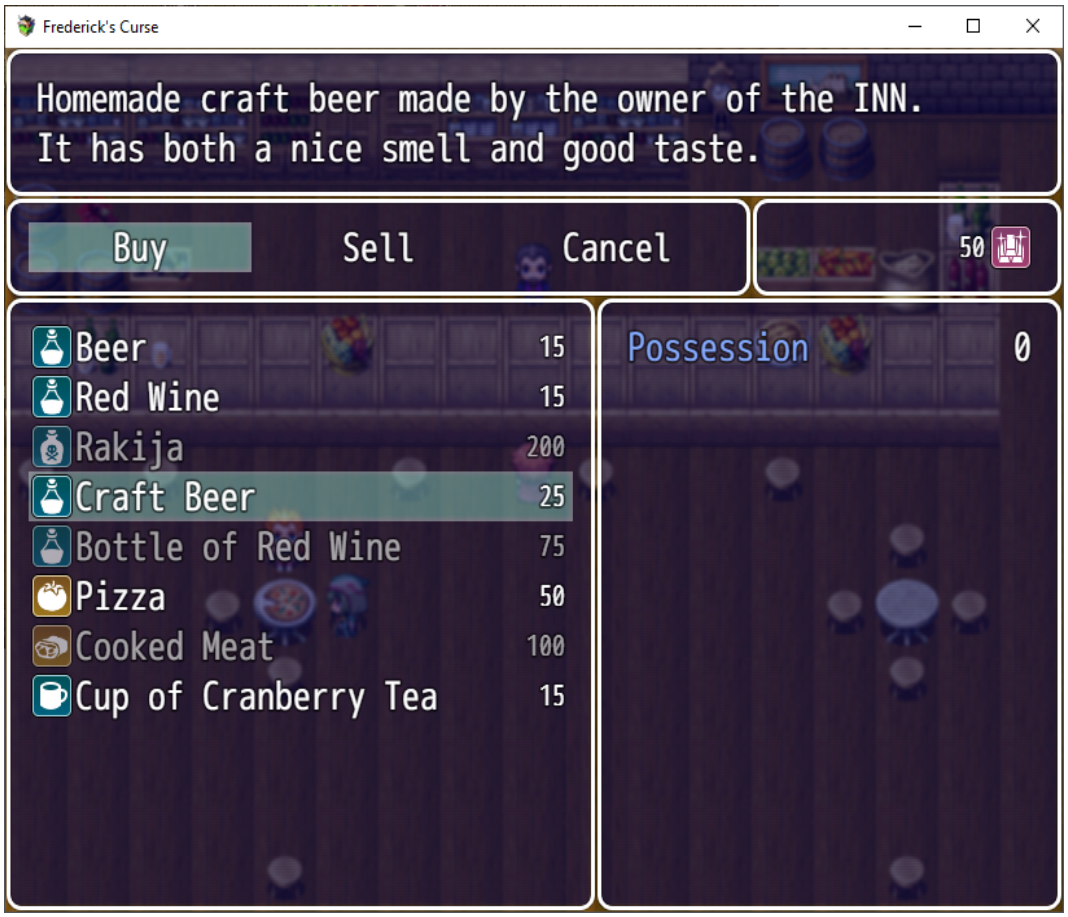


Figure 10: Shop

After bringing the Craft beer to the NPC, they will give the player some lore about the game world and direct the player to go to the forest to progress the game. Entering the forest requires the user to acquire a "Forest Pass" item from the village elders. The NPC will offer the player to grant them entrance to the village manor in exchange for 25G. If the player has 25G or more, they will pay the NPC 25G and they will join the player's party. This is indicated by the NPC following the player instead od sitting at the table and can also be seen by pressing the ESC key.

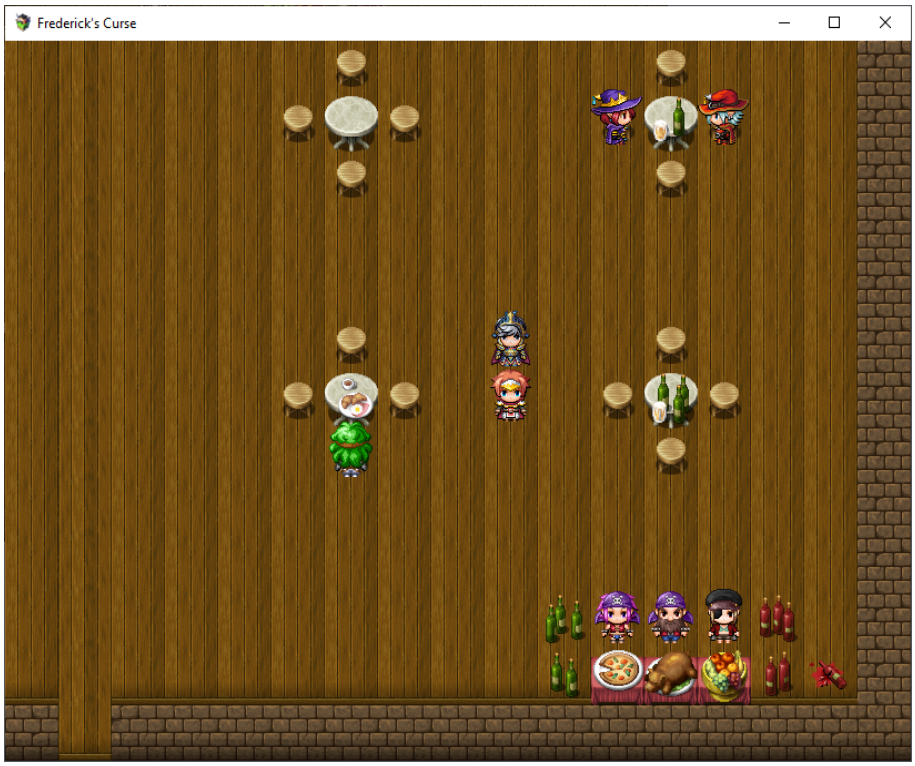


Figure 11: NPC joining the player's party 1



Figure 12: NPC joining the player's party 2

This NPC will remain in the player's party until they enter the village manor. If the NPC is not present in the party, the entrance to the manor will be blocked by another NPC. This interaction is also done using the conditional branch, except this time it check if the Actor "Garolt" (The name given to the knight NPC) is in the player's party.

To acquire an item called "Forest Pass", the player needs to speak to one of the Elders inside the village manor. Depending on the player's choice of words, the NPC will have them perform a task before giving them the item. This task can either include: purchasing a specific item from the store, defeating 3 Rat enemies, or recruiting another party member. After completing the required task, returning to the elder will reward the player with a Forest Pass item. Interacting with the guards at the entrance of the village will make them move away, and let the player pass.



Figure 13: Decision

Battles in the game are done using turn based combat, which means characters will take turns attacking one another. During the player's turn, they can choose one of the following actions:

- Attack - Strikes the target with the character's equipped weapon.
- Magic/special - Perform a magical or special attack. Magical attacks do more damage the higher the character's Magical Attack, while Special attacks do more damage the higher the character's attack is. These attacks usually cost Mana (MP) or Technique (TP) points, indicated next to the name.
- Guard - The character puts their guard up, causing them to gain a little TP and reducing damage taken until their next turn.
- Item - Use an item from the player's inventory as part of their action.
- Escape - Attempt to flee the battle.

A battle can start either by a random encounter, which happened every once in a while while walking through certain areas, or by being approached by an enemy NPC. After the battle end the player will receive Experience points (Exp) and Gold.

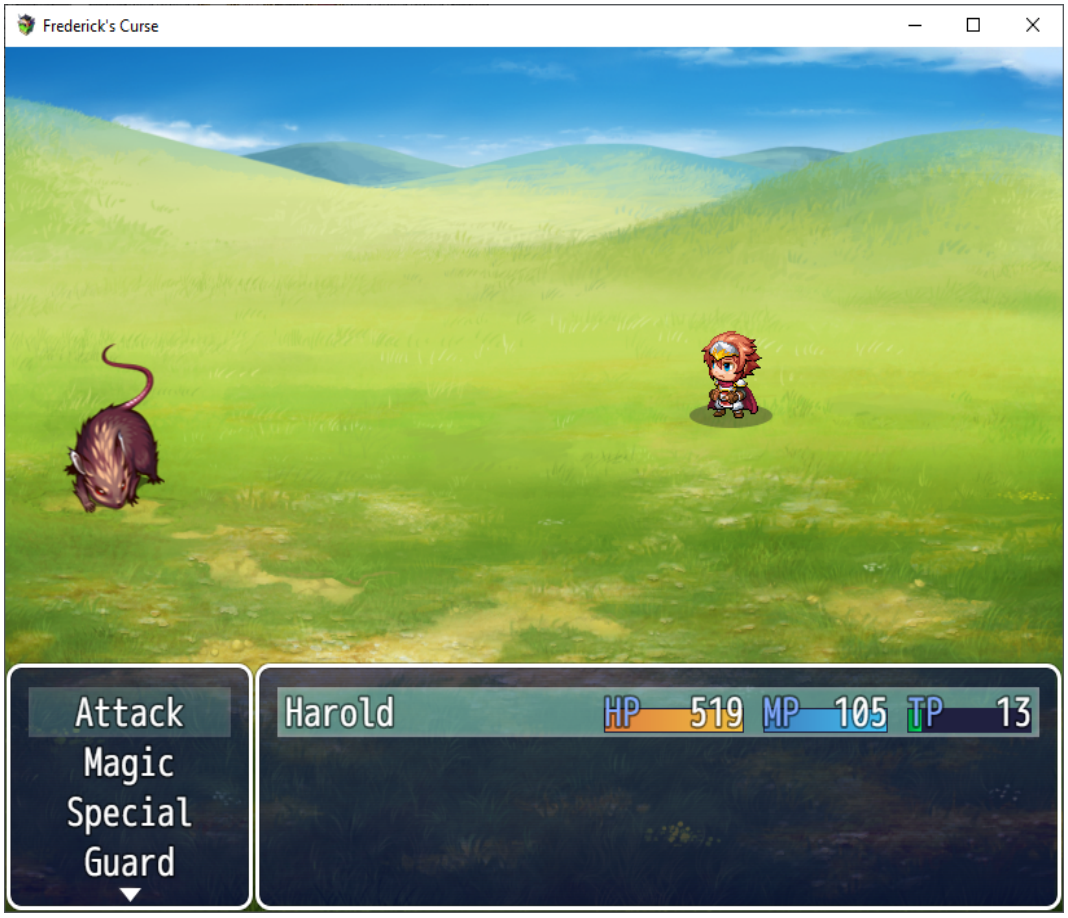


Figure 14: Battle

An optional NPC can be located in the top right corner of the village. This NPC will ask you to bring them a bucket of water because the rope of their water well's bucket broke. The player has several option to do this. They can walk to the INN, pick up a bucket of water and bring it back to the NPC. Doing so will award the player some consumable items that can be used to recover a player's health or mana. However, a player can also go to the shop, purchase 1 "Rope" item, and interact with the NPC's broken water well. This will cause the player to fix the water well, and acquire the bucket of water that way. Doing so will also make the NPC give you some gold and inform you that should you ever need a Shaman in your party, her daughter will assist you free of charge. If this quest is not completed, the daughter will request you to purchase a few items for her before she joins your party.

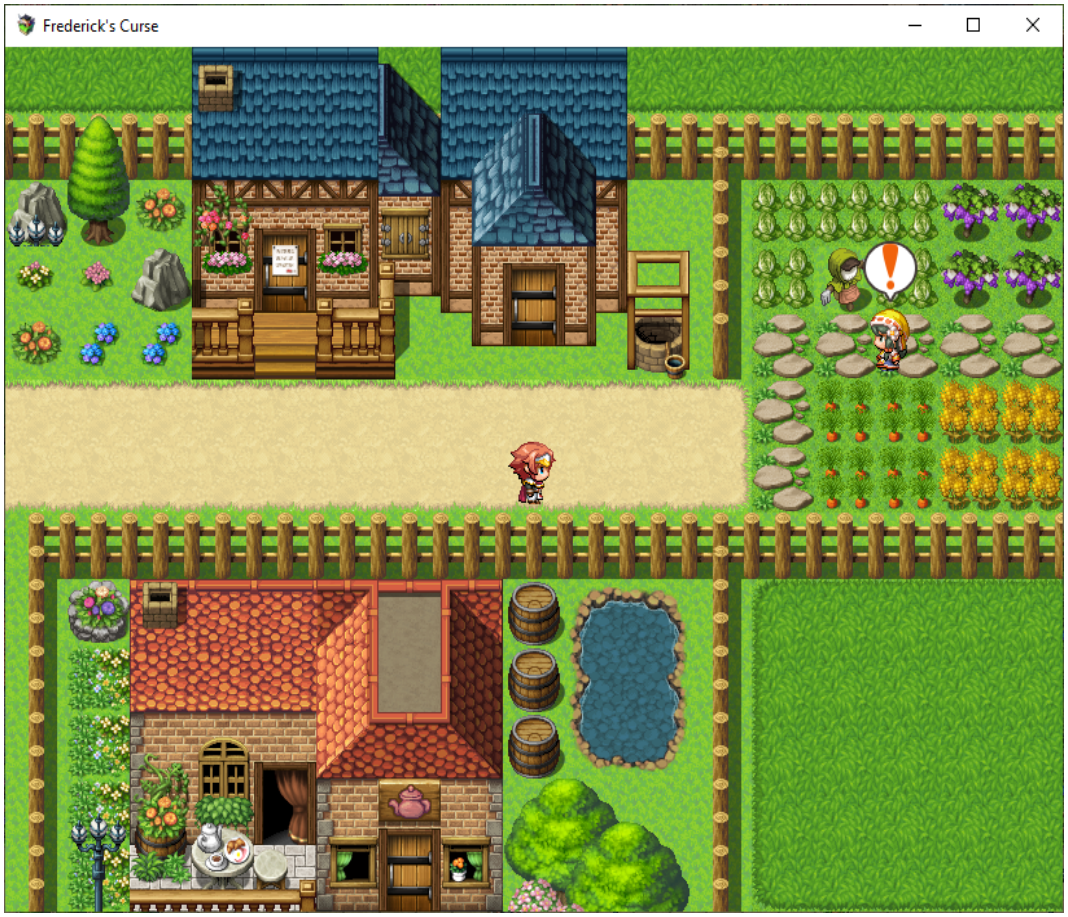


Figure 15: Optional NPC

Some events in the game require a certain Actor or Item to be present in the player's party or inventory. A player can encounter a small tree that can be cut down. If the Actor Frank is in party, they can cut down these trees. However, if that Actor is not present in the party, the player will instead have to use an item "Lumberjack's Axe" to cut down these trees, which is consumed ever time this action is performed. If neither are present, the player will not be able to pass.

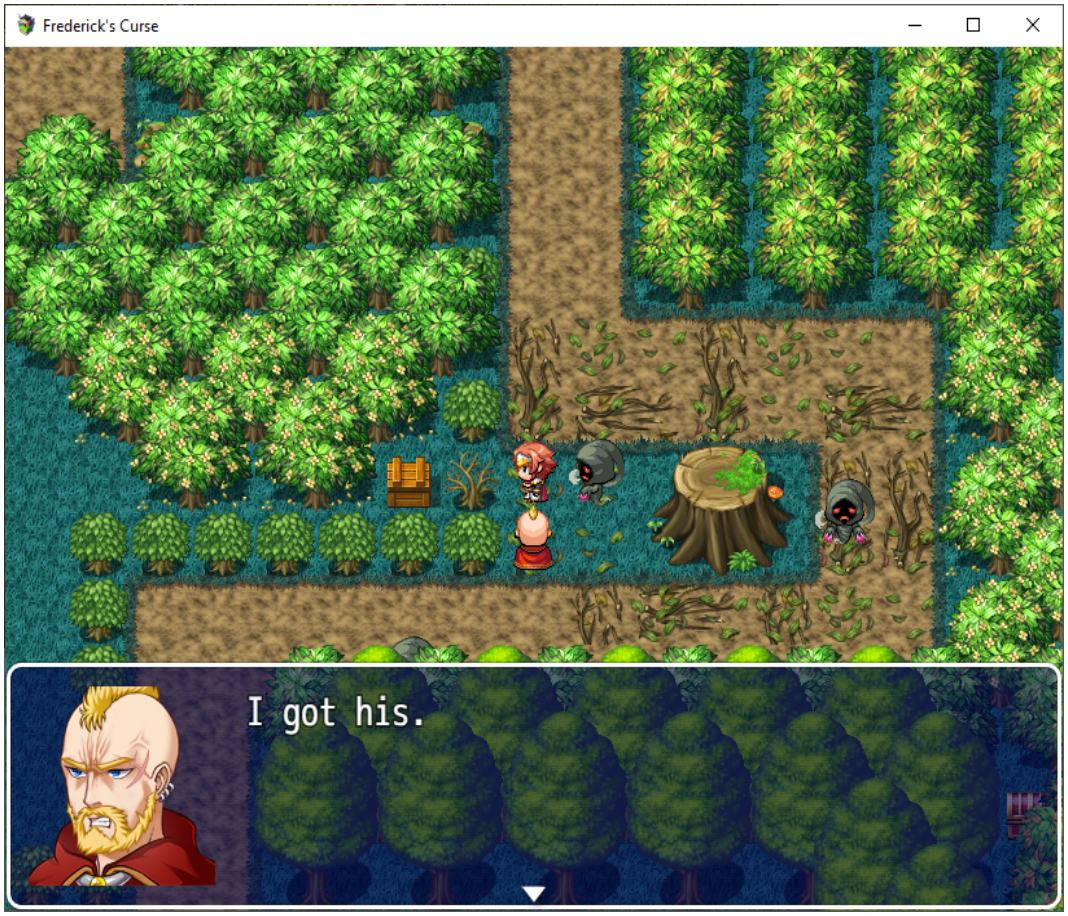


Figure 16: Small tree that can be cut down

Similarly, the player can also encounter crates. These crates can be opened by an Actor names Senna, or using a Crowbar (which is also consumed in the process).

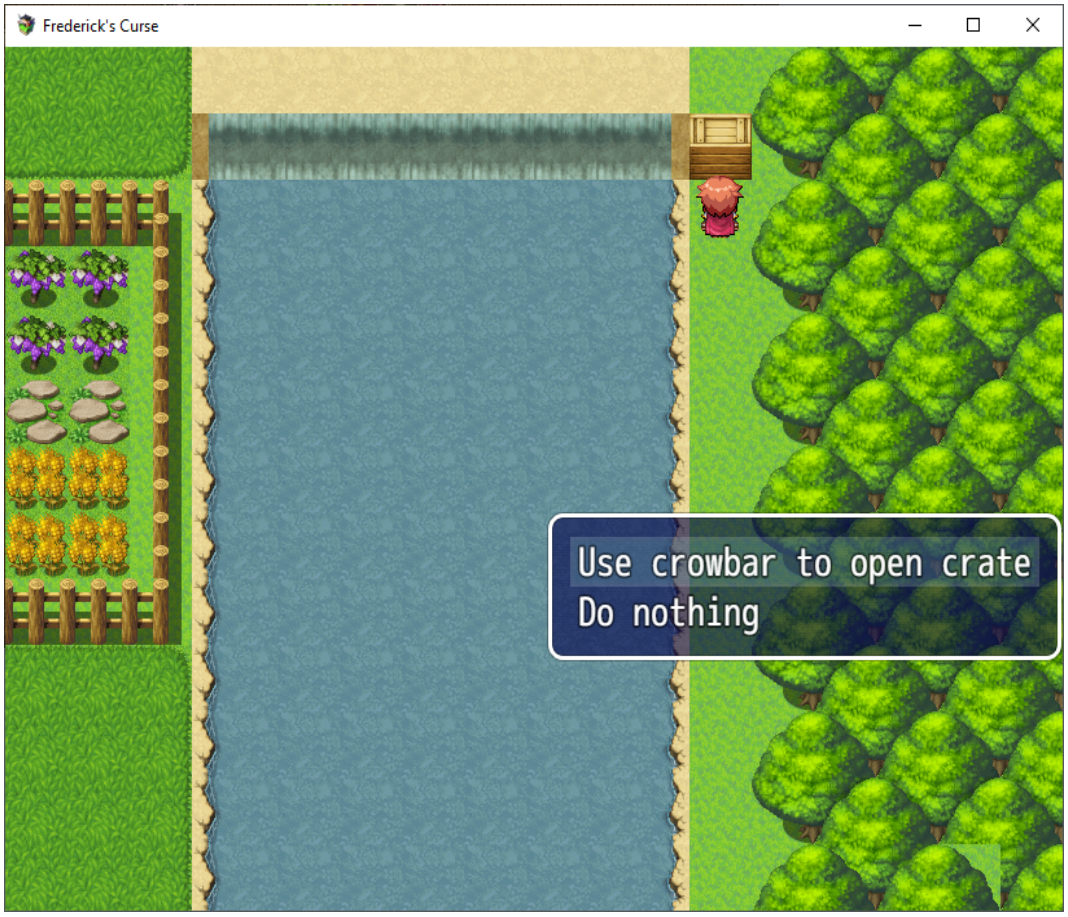


Figure 17: Crate that can be opened

Later in the game, a player will encounter and be able to battle 3 wolves. Defeating those 3 wolves, will cause 3 werewolves to spawn in the same map. After finding and defeating the 3 werewolves, Cerberus will spawn. This interaction is done with the combination of Battles and Variables. Battles can have up to 3 outcomes: Player win, Player lose, or Player escape. When the player wins a battle against a wolf, a variable called "Wolf king" increases by 1. When this variable becomes 3 this way, a dialog box displays that the wolf unleashes a loud howl. This means that the werewolves have spawned on the map. Werewolves have a similar interaction, except their action triggers when the variable reaches 6. When this happens, Cerberus spawns in the middle of the forest. Defeating Cerberus will allow the player to enter a previously blocked location.

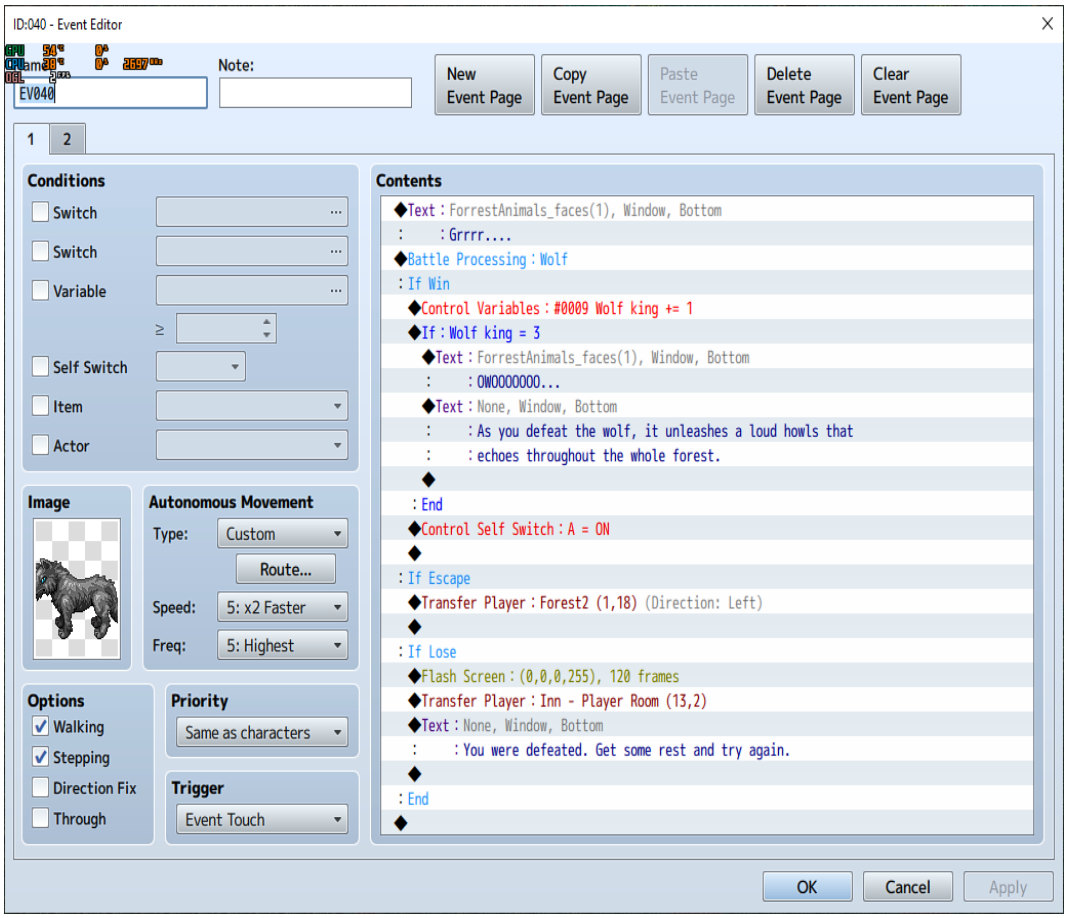


Figure 18: Variable event

7. Conclusion

From Role Playing Game definitions discussed in this thesis, it can be seen that a single definition that defines every single Role Playing Game is still up for debate. Traditional role playing games such as Pen-and-Paper and Table-top games follow noticeably different rules from their computer counterparts and large scale Role Playing Games such as Live Action Role playing games. What is certain about Role Playing games is that they involve a player assuming the role of a certain character (or sometimes characters) which they use to explore and interact with the game world. What makes computer Role Playing Games stand out from other genres is that they put a heavy focus on character development, either through developing a character on their personal level or their skills (making the character stronger through the course of the game). Role Playing Games almost always feature an open world for the character to explore, where the player has an option to explore the game world as they see fit, rather then having game levels, where player has to beat a level to advance to the next one. A character's power in Role Playing Games are almost always indicated by the character's level, which are advanced by receiving experience points by completing quests and battling enemies. The higher the character's level is, the higher their base stats become, and they can equip stronger weapons and armor. The main focus of a Role Playing Game should be the game's story, and how the player's character experiences it. Computer Role Playing Games usually take elements of other genres of games, such as Action games and Shooters to create a more immersive experience to the player. These elements of other game genres are seen as supporting factors to the game, while the core of the game still remains on the story and character development.

Artificial Intelligence methods proved very useful in creating a computer Role Playing Game. As was previously discussed, Single Player Role Playing Games are the only form of Role Playing Games that doesn't include multiple players playing the game together. Because of this, Single Player Role Playing Games rely heavily on Artificial Intelligence to create a "living" game world for the player to interact with and explore. Through my game, I set out to create multiple characters, with different personalities and interests, where a player would have to select the right choice of dialog to convince a that character to join their party, help them with their needs, etc. I have also created several items, weapons and armor that can be obtained by purchasing them from an NPC or by exploring the game world and acquiring them without spending gold. The basic idea of my game was to make it so the player's choices mattered in the game, and to reward exploring the game world a little. I believe that the game achieved those goals, as by observing my friends who helped me Beta test the game, I noticed that those who clicked through the story dialog with minimum to no reading got lost and didn't know what to do, while those who read every dialog and went to explore every corner of the game world not only enjoyed the game far more, but also managed to complete the game a lot easier then the rest.

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Appendices

1. Attachment 1 - Proof of Purchase

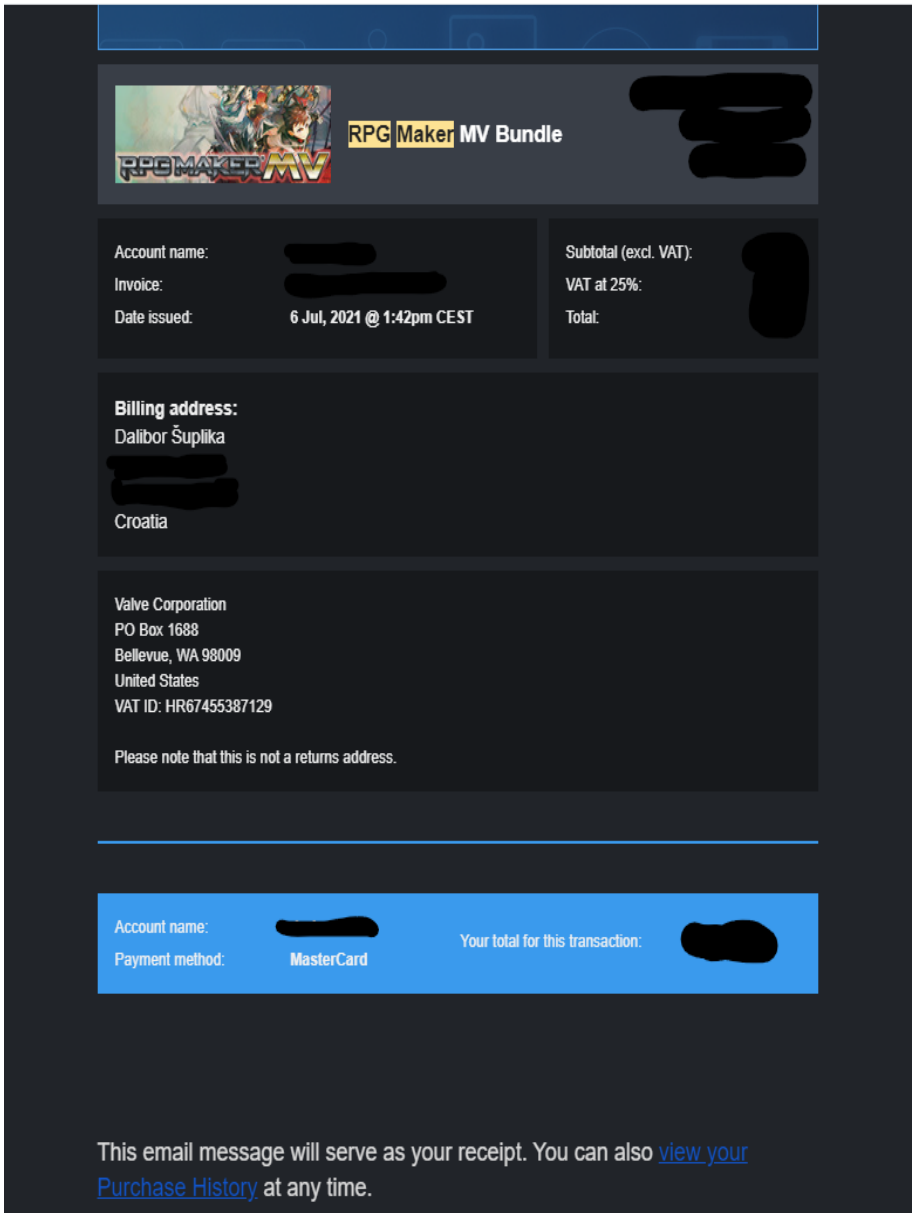


Figure 19: Proof of Purchase