The Magic Apprentice

1. Introduction

1.1. Purpose of the system

The purpose of the game is for the player to have fun.

1.2. Scope of the system

The system is a video game developed with Godot 4 that allows the user to control a player character in order to kill monsters in dungeons with magic and to improve their player characters strength through augments and unlocking skills.

1.3. Objectives and success criteria of the project

The goal of this project is the creation of a single player RPG game.

1.4. Definitions, acronyms, and abbreviations

Player Character (PC): This term refers to the character controlled by the player within the game. The player's decisions and actions dictate the character's behavior and progression.
Hit Points (HP): Represent the health or vitality of entities, such as player characters and enemies. Hit Points decrease when the entity takes damage. An entity is defeated or dies when its Hit Points reach zero.
Augment: A type of item that can be equipped by the player to gain additional statistics or effects. Augments are typically obtained by clearing dungeons.
Load-out: The combination of augments and magic skills a player currently equips. A player can equip up to five augments and three magic skills simultaneously.
Area of effect (AOE): Area in which a damaging skill effects enemies or the PC.
Dungeon: A dungeon is an area within the game where the player can control the Player Character (PC) and combat enemies to gain rewards. Dungeons are composed as a 2D-grid of multiple rooms.

1.5. References

We use Miro Board for story boards of the game.

An old version can be found on stormboard

2. Proposed system

2.1. Overview

The PC is a magician that explores dungeons. In these they fight slimes with up to 3 magic spells to get to the boss room, where they fight a boss.
There are 2 types of dungeons. Automatically generated dungeons and story dungeons that are hand crafted. Furthermore, the player can choose to curse a dungeon, which increases the difficulty by strengthening the

enemies or weakening the player. Cursed dungeons give better rewards. By defeating the boss, the player can unlock new magic skills of the 3 different magic types.

Instead of classical concepts like armor the player receives "Augments". Each Augment has between 1 and 3 effects. These effects can be simple stat increases or additional effects (like casting one Skill when another is cast or increasing the AOE). The player can wear up to a total of 5 augments. Additional augments can be stored in an inventory. Augment slots are unlocked by playing story dungeons.

Players can only change their load-out (active augments and spells) outside of dungeons in the home town. This is done since the difficulty of generated dungeons is determined by the amount of augments the player is currently using. The game is supposed to be finishable in under 2 hours. The idea is hence not to create a long game, but instead allow great replayability by having many different and interesting choices of playstyles and builds.

2.2. Functional requirements

2.2.1 Entities

There are two types of entities, the PC and enemies.

2.2.1.1 Entity properties

All entities have the following properties:

ID: EP1	**Entity property: Max HP**
Description	Every entity has a max HP floating point value that shows how much damage the entity can take in total before dying.
Acceptance Criterion	Has to be implemented
Notes	The max HP of every entity has to be greater than 0 and less than infinity.
ID: EP2	**Entity property: Current HP**
Description	Every entity has a current HP floating point value that shows how much damage the entity can still take before dying. If the current HP value is smaller or equal to zero, the entity dies.
Acceptance Criterion	Has to be implemented
Notes	The relation of current HP to max HP should be visible for the player for all entities on screen through healthbars. The current HP always has to be less or equal to the max HP. Contrary to the max HP it is allowed to be negative.
ID: EP3	**Entity property: Armor values**

ID: EP3	**Entity property: Armor values**
Description	Every entity has three armor floating point values for each of the three magic types in game. The armor type for a magic type determines how much the damage to the entity is reduced by an attack of that magic type (30 armor means 30% damage reduction). If an entity has an armor value above 100, part of the damage is reflected back to the attacker. Example: Entity has 120 armor, attack makes 100 damage, then 20 damage is reflected back to the attacker, if the attacker has an armor value of 50, the attacker takes 10 damage.
Acceptance Criterion	Damage of all types is applied correctly to entities depending on their armor values.
Notes	The damage calculation works like if armor <= 100: health = health - damage*(100-armor)/100 Only PC should be able to reach over 100 armor through additional stats, enemies need at least one armor value below 30 unless they are buffed. If both entities have more than 100 armor neither entity takes any damage.
ID: EP4	**Entity property: Damaging skills**
Description	Every entity has one or more damaging skills. Every skill has a magic type and a base damage floating point value. The base damage value can be modified under certain circumstances (curses for enemies, augments and buffing skill for the PC). A damaging skill only damages the opponent, that means the PC takes no damage from their own spells and enemy attacks only damage the PC.
Acceptance Criterion	Damage from different skills of all magic types is applied correctly to PC and enemies for armor values of 0.
Notes	The area in which a damaging skill applies damage to the opponent and the duration in which the opponent takes damage depends on the specific skill.
ID: EP5	**Entity property: Speed**
Description	Every entity has a speed floating point value that determines how quickly it can move across the game environment. This affects both the player character (PC) and enemies.
Acceptance Criterion	Speed should be accurately reflected in the movement rate of entities in the game.
Notes	Speed may be modified by certain augments or dungeon curses.
ID: EP6	**Entity property: Invincibility Time**
Description	After taking damage, an entity becomes invincible for a short duration during which it cannot take further damage. This is to prevent rapid successive damage from multiple sources.
Acceptance Criterion	Invincibility time is correctly applied after each instance of damage.

ID: EP6	Entity property: Invincibility Time
Notes	The duration of invincibility should be short and consistent across all entities unless modified by specific augments or dungeon curses. The invincibility time has to be between 0 and 10 seconds.

2.2.1.2 Magic types

There are three magic types in the game: Sun, Cosmic and Dark. Skills and enemies belonging to the different magic types are color coded to allow differentiation by the player. The colors are Sun: yellow - red, Cosmic: blue - white, Dark: black - purple. The magic types work like in Rock, paper, scissors such that they have one other magic type that they are strong against and one against which they are weak. Their effectivity against themselves is in between.
The magic types are:

- Sun: strong against Cosmic, weak against Dark
- Cosmic: strong against Dark, weak against Sun
- Dark: strong against Sun, weak against Cosmic

2.2.1.3 Player character (PC)

The PC is the figure the player controls while playing the game. The PC is a wizard and should therefore wear wizard-like clothing, e.g., a pointy hat, a long robe and a staff.

2.2.1.3.1 PC control

The PC is controled by the player via keyboard and mouse movements. A visualization of the state machine can be found here. The PC has five states which are described in the following.

The PC starts in the **Idle** state.

ID: EPC1	PC state: Idle
Description	If the player does not press the buttons relevant for movement, spellcasting or dashing, the PC remains idle and does not move. The idle animation specified in the sprite sheet is shown.
Acceptance Criterion	PC is in idle state if no input is given.
Notes	None
ID: EPC2	**PC state: Moving**
Description	If the player uses the `WASD` keys, the PC moves as long as the keys are pressed. The specific walking animation for each direction from the sprite sheet is shown.
Acceptance Criterion	PC walks correctly if `WASD` is given as input.

ID: EPC2	PC state: Moving
Notes	In order to get the direction of movement, the key `W` is mapped to the vector $(0, -1)$ (note that Godot uses inverted y-Axis), `A` to $(-1, 0)$, `S` to $(0, 1)$, `D` to $(1, 0)$. Then all vectors for which the buttons are pressed are added up and the result is then normalized to give the direction vector. The speed of movement has to be greater than 0 and less than the speed of light.

ID: EPC3	PC state: Dashing
Description	If the player presses the `spacebar` while inside **Idle** or **Moving** state, the PC moves with increased speed in the direction of the current movement for a predefined length. While dashing, the player cannot be hit.
Acceptance Criterion	PC dashes in the correct direction when `spacebar` is pressed.
Notes	The dashing speed has to be at least 20% greater then movement speed, but less than light speed.

ID: EPC4	PC state: SpellCasting
Description	If the player presses one of the spellcasting keys `1`, `2` or `3` while inside **Idle** or **Moving** state, the PC casts a spell/uses a PC skill and the spell casting animation from the sprite sheet is shown. All PC skills get the current position of the PC and the position of the mouse as values to be used.
Acceptance Criterion	PC is in SpellCasting state if input `1`, `2` or `3` is given.
Notes	Only one spell can be cast at a time. All skills use the same spell cast animation. Cast times should generally be short (less than 1 second). Slower cast times are achieved by playing the spell cast animation slower. Spells cannot be cast if they are on cooldown.

ID: EPC5	PC state: Death
Description	When the PC's health reaches 0 or less, they transition to a death state. The player is informed about the PC's death and can then choose to either retry the current dungeon where the PC died, or exit the dungeon and return to the main hub.
Acceptance Criterion	The PC must correctly transition to the death state when its health is depleted and the player can no longer control the PC's actions.
Notes	After the death animation of the PC, a death screen should be shown.

2.2.1.3.2 PC progression

While playing the game, the player can unlock new skills and is rewarded with augments. The player also unlocks additional augment slots to equip up to 5 augments.

2.2.1.3.2.1 PC skills

Every PC skill belongs to one magic type and does damage of that magic type. Each magic type has three different skills: a basic skill, a supportive skill and an offensive skill. Supportive skills deal either no damage or very little, providing instead buffs to to PC or debuffs to the enemies. Offensive skills on the other hand deal more damage and have little to no supportive effects.

The PC can have up to three different skills equipped.

Each skill has a damage, magic type, a duration for how long it lasts and a cooldown, during which they cannot be used.

ID: EPS1	**Skill: Basic Skills**
Description	Each magic type has a basic skill that consist of a colored circular projectile shot from PC in the direction of the mouse. If the projectile hits an enemy, the enemy is dealt the damage of the skill and the projectile despawns, spawning some collision particles. If the projectile hits a wall or structure it also despawns.
Acceptance Criterion	Works as described
Notes	The color of the projectile is the color of the magic type it belongs to.
ID: EPS2	**Skill: Sun Beam**
Description	The supportive skill of the sun magic type. The PC emits a ray of yellow ligth from the PC in the direction of the mouse. Enemies hit deal reduced damage and have reduced armor until they are killed.
Acceptance Criterion	Works as described
Notes	None
ID: EPS3	**Skill: Summon Sun**
Description	PC spawns a yellow circular object that looks like a sun at the mouse location that lasts for a few seconds. Enemies close to it take damage depending on how close they are to the center. The closer they are, the more damage they take. Enemies take damage at predefined intervals as long as they are inside the AOE.
Acceptance Criterion	Works as described
Notes	None
ID: EPS4	**Skill: Moon Light**
Description	A visualization of a light silver ray of moonlight is shown around the PC. The PC now has increased attack damage for all their equipped skills and increased armor values for all magic types for a few seconds.
Acceptance Criterion	Works as described
Notes	None

ID: EPS5	Skill: Star Rain
Description	Multiple blue circular projectiles spawn randomly around the PC and start moving towards the mouse position. On collision with enemy they apply their damage and despawn. On collision with a wall or structure they despawn.
Acceptance Criterion	Works as described
Notes	The amount of projectiles has to be between 2 and 1000.

ID: EPS6	Skill: Dark Energy Wave
Description	PC creates a black circular wave centered around the PC, moving away from them / increasing with predefined speed, that pushes all enemies away from the PC by a predefined distance. The wave pushes away all enemies in the same direction that the wave is moving at the collision point, i.e. along the normal of the circle, independently of the distance to the PC.
Acceptance Criterion	Works as described
Notes	None

ID: EPS7	Skill: Black Hole
Description	PC creates a round black circular shape at mouse position that pulls all enemies inside the AOE towards it using gravity, if the enemies hit the black circle they take damage.
Acceptance Criterion	Works as described
Notes	None

2.2.1.3.2.2 Augments

Instead of a traditional armor and weapon system, the game uses augments to enhance the PC by giving additional effects and stats. A maximum of 5 augment slots can be unlocked, with each augment being equipable to any unlocked slot. This feature will facilitate the player's ability to craft their own unique builds.

ID: EPA1	Augments: Equipping and Unequipping augments
Description	The player can equip augments to their unlocked augment slots. Every augment can only be equipped to one slot at a time. The augment effects are then applied to the PC. The player can also unequip augments, causing the effects to no longer apply to the PC.
Acceptance Criterion	Augments can be equipped and unequiped and the effects are applied to the PC correctly.
Notes	None

ID: EPA2	Augments: Unlocking augment slots

ID: EPA2	Augments: Unlocking augment slots
Description	When the player completes the intro dungeon, the first augment slot is unlocked. When the player clears each further story dungeon, one additional augment slot is unlocked. There are a total of 5 augment slots.
Acceptance Criterion	Augment slots are unlocked correctly.
Notes	None

ID: EPA3	Augments: Obtaining augments
Description	Upon clearing a dungeon, the player is rewarded with a random amount of random augments.
Acceptance Criterion	PC optains augemnts uppon clearing a dungepn
Notes	The player can optain between 1 and 3 augments. Depending on the difficulty of the dungeon, the chances for more augments are increased.

Each augment will have 1, 2 or 3 effects. Augments can the same effect several times in which case the effect will stack. The amount of effects determines the quality of the augment. The effects are decided randomly from the list of possible effects by the game when the augment is given to the PC. Some effects will have percentage values in which case effects of the same type will stack multiplicatively.

To allow build crafting for the player, it is possible to destroy one augment and to move one of its effects onto another augment, overwriting one of its previous effects. This is described in more detail in chapter 2.2.2.1.3 Fusing augments.

List of augment effects

The effects of the augments are the following:

- 10 additional armor of a type
- 5 additional armor of all types
- 10% more hp
- 10% extra damage for one skill (one for each damaging ability)
- 5% extra damage for one magic type
- 10% bigger radius for one skill (exists for “summon sun”, “black hole”)
- 10% more stars for “star rain”
- Upon casting spell x also cast spell y (specific spells will be determined during balancing)
- Plus 10 attack for all spells of one magic type (this way supportive spells can also deal damage)
- 50% longer duration for skills that remain on field (“summon sun” and/or “black hole”)
- Plus 20 attack for skill in slot 1/2/3

Values and effects might have to be changed, added or removed for good balancing later.

2.2.1.4 Enemies

Each Enemy only deals damage of one magic type. It will have a high armor against the magic type that its magic type is strong against and a low armor against the type that it is weak against. Its armor value against its own magic type is in between. The enemies are colored with the colors associated with their magic type so that the player can visually determine their magic type.

There are two types of enemies:

1. Slimes (small and big, melee and ranged)
2. Unicorn bosses

Enemies are controlled via their state machine. Every attack, be it ranged or melee, has a maximum distance to the PC at which it can be used. If the distance to the PC is greater than this maximum distance enemies will move towards the PC. Slimes will come in large groups.

2.2.1.4.1 Slimes

Each slime is associated with a specific magic type. They are visually represented by the color corresponding to their magic type. Slimes only inflict damage aligned with their magic type, and their armor is strong against the magic type that their magic type is strong against and weak against the magic type that their magic type is weak against. The armor against their own magic type is inbetween. Example: A Sun slime could have the following armor values: Sun armor: 30, Cosmic armor: 50, Dark armor: 10 (values might change). Every slime has a view range and a attack range. If the PC is outside the view range the slime will be idle as it has not seen the PC. Once the PC is inside the view range the slime moves towards them until they are in the attack range, which then allows the slime to attack the PC.

Slimes can have four possible states. The slime always starts in the **Idle** state.

ID: ES1	**Slime states: Idle**
Description	If the PC is outside of the view range of the slime, the slime is idle. It changes between two behaviours, first it remains in one position for a random time period of up to 5 seconds and afterwards it moves on a straight line into a random direction for a random time period of up to 5 seconds. This behaviour loops until the slime either dies (enters **Death** state) or gets close enough to the player that it changes to **Moving** or **Attacking** state. The idle animation and the moving animation used in this state are in the slimes sprite sheet and depend on the slimes magic type, attack range and size.
Acceptance Criterion	If the PC is outside of the view range of the slime, the slime behaves like described.
Notes	None
ID: ES2	**Slime states: Moving**

ID: ES2	Slime states: Moving
Description	If the PC is inside of the view range of the slime but outside of the attack range of the slime, the slime moves towards the PC until it is in attack range. If the PC is inside the attack range of the slime, the slime transitions to the **Attacking** state. If the PC moves out of the view range of the slime (e.g. by dashing), the slime returns to the **Idle** state. If the slimes health points reach zero, the slime enters the **Death** state. While in the Moving state, a moving animation is played. The moving animation used in this state is in the slimes sprite sheet and depends on the slimes magic type, attack range and size.
Acceptance Criterion	The slime moves towards the PC while the PC is in the slimes view range but not inside of its attack range.
Notes	None

ID: ES3	Slime states: Attacking
Description	If the PC is inside of the attack range of the slime, the slime attacks the PC. After the attack is completed, the slime returns to the **Moving** state. While in the Attacking state, an attacking animation is played. The attack animation used in this state is in the slimes sprite sheet and depends on the slimes magic type, attack range and size.
Acceptance Criterion	If the PC is inside the attack range of the slime, the slime attacks the PC.
Notes	None

ID: ES4	Slime states: Death
Description	When the slime's health reaches 0, it transitions to the death state. In this state, the slime stops all actions and does no longer interact with other game objects, and after a short delay during which the death animation is played, it disappears from the game world. The death animation used in this state is in the slimes sprite sheet and depend on the slimes magic type, attack range and size.
Acceptance Criterion	The slime must correctly transition to the death state when its health is depleted, and it should no longer be able to perform any actions or affect the game.
Notes	Ensure that the transition to the death state is smooth and that the slime's disappearance is visually clear to the player.

Slimes can differ in three attributes. Apart from the three magic types, there are large and small slimes and there are melee and ranged slimes, making a total of 4 different slime types for each magic type. Large slimes have more HP and higher attack values than small slimes. Large slimes are rarer than small slimes and only appear in small groups of up to 3 large slimes. They are often accompanied by several small slimes. Ranged slimes have a larger attack range and have a different color brightness than melee slimes. The armor values of all slimes of one magic type are the same.

ID: ES5	Slime types: Melee Slime

ID: ES5	**Slime types: Melee Slime**
Description	Melee slimes move towards the PC and once they are very close to the PC, they jump to the position of the PC for their attack. They deal damage to the PC if they collide with the PC during their attack. Melee slimes can be large or small. Melee slimes have a brighter color than ranged slimes.
Acceptance Criterion	Slimes exist that can attack and damage the player as described and are visually distinct from ranged slimes.
Notes	None
ID: ES6	**Slime types: Ranged Slime**
Description	Ranged slimes have a larger attack radius. When attacking, they shoot a small projectile from their position in the direction the PC is currently located. The projectile flies on a straight line until it hits either the PC or an object that has at least medium height (e.g. a wall, a stack of boxes, etc., objects that would not qualify are small things that lie on the ground) Ranged slimes can be large or small. Ranged slimes have a darker color than melee slimes.
Acceptance Criterion	Slimes exist that can attack and damage the player as described and are visually distinct from melee slimes.
Notes	None
ID: ES7	**Slime types: Small Slime**
Description	Small slimes are the default slime type. Depending on their type, they show the attributes described in the other requirements. Small slimes can be melee or ranged.
Acceptance Criterion	Small slimes can be created.
Notes	None
ID: ES8	**Slime types: Large Slime**
Description	Large slimes are larger than small slimes and have more HP and larger attack values than small slimes. Large slimes can be ranged or melee.
Acceptance Criterion	Large slimes can be created and they have more HP and larger attack values.
Notes	Large slimes should be rarer than small slimes and only appear in small groups of up to 3 large slimes. They should often accompanied by several small slimes.
ID: ES9	**Slime types: Sun, cosmic and dark Slime**

ID: ES9	Slime types: Sun, cosmic and dark Slime
Description	All slimes have one of the three magic types: sun, cosmic or dark. All attacks of a slime deal damage of the magic type the slime belongs to. The slimes magic type is indicated to the player by the color of the slime. Sun slimes are yellow to red, cosmic slimes are blue to white and dark slimes are purple to black. The magic type of a slime determines its armor values against the different magic types. All slimes of a magic type (melee and ranged, small and large) have the same armor values for all magic types unless the armor values are changed by a curse or a PC skill.
Acceptance Criterion	Slimes of all three magic types can be created and they only deal damage aligned with the magic type they belong to.
Notes	None

2.2.1.4.2 Bosses

The unicorn is the boss monster of the dungeons, once it is killed the dungeon is cleared. It looks like a unicorn but is colored according to its magic type.
Unicorns have no attack and view range since they can detect and attack the player from every position in the room. Unicorns have three different attacks. Unicorns have a melee attack radius. If the PC is inside of the melee attack radius, the unicorn uses the melee attack, otherwise it uses one of the ranged attacks at random. In between two attacks the unicorn remains idle for a short while to allow the player to attack the unicorn with their skills.
The unicorns are controlled by a state machine. The initial state of the state machine is the **Wait** state.

ID: EB1	Unicorn
Description	Unicorns are the boss monsters of the dungeons and are in the last room of the dungeon. There are three different types of unicorns, one for each of the three magic types. Unicorns have no view range or attack range. They can detect and attack the PC from any position when they are in the same room.
Acceptance Criterion	Has to be implemented
Notes	None

ID: EB2	Unicorn states: Wait

ID: EB2	**Unicorn states: Wait**
Description	The Wait state is the initial state of the unicorn. The unicorn remains in the wait state for a short while, for something between 1 and 5 seconds (has to be tested out to see what works well). While in the wait state, the unicorn moves towards the position of the player slowly (speed is greatly reduced). At the end of the wait state, the unicorn transitions to one of its attacks, depending on how far the PC is away from the unicorn. If the PC is inside of the melee attack range of the unicorn, the unicorn does a **Stomping attack**. If the PC is outside of the melee attack range of the unicorn, the unicorn either does a **Charge attack** or a **Shooting attack**. A random number is generated to determine which of the two ranged attacks is chosen. The walking animation used in this state is in the unicorn sprite sheet and depends on the unicorns magic type. The walking animation shown depends on the direction from the unicorn position to the PC position. There are eight walking animations: up, down, left, right and the four diagonal directions upleft, upright, downleft and downright. If the unicorn walks to the right, the animation right has to be played etc.
Acceptance Criterion	Unicorn correctly transitions to the wait state after every attack and remains in the wait state for the designed time duration. The correct walking animation is shown depending on the direction from the unicorn position to the PC position.
Notes	None
ID: EB3	**Unicorn states: Charge attack**
Description	The unicorn can perform a charged attack, if the PC is outside of the melee attack radius of the unicorn. The unicorn charges with a high speed from its original position in the direction of the PC. The charge ends a distance behind the player. The unicorn has a minimum charge distance that is only shortened if the unicorn charges against a wall. If the unicorn hits the PC, it deals a large amount of damage to the player. After the attack is completed, the unicorn returns to the **Wait** state. The charging animation used in this state is in the unicorn sprite sheet and depends on the unicorns magic type. The charging animation shown depends on the direction from the unicorn position to the PC position. There are eight charging animations: up, down, left, right and the four diagonal directions upleft, upright, downleft and downright. If the unicorn charges to the right, the animation right has to be played etc.
Acceptance Criterion	The unicorn charges correctly at the PC. The charging distance is always at least as long as the distance between the unicorn and the PC at the beginning of the charge. The correct charging animation is shown depending on the direction from the unicorn position to the PC position.
Notes	None
ID: EB4	**Unicorn states: Shooting attack**

ID: EB4	**Unicorn states: Shooting attack**
Description	The unicorn can shoot a set of projectiles at the PC, if the PC is outside of the melee radius of the unicorn. The projectiles fly away from the unicorn in a random direction in the half plane directed towards the player for a short distance. Afterwards they are accelerated in the direction of the PC position, that the PC has at the begin of the acceleration. The projectiles disappear if they either hit the PC or a wall or a tall object. The unicorn transitions to the **Wait** state, once its shooting animation is finished. This can be before the projectiles shot by the unicorn disappear. The shooting animation used in this state is in the unicorn sprite sheet and depends on the unicorns magic type. The shooting animation shown depends on the direction from the unicorn position to the PC position. There are eight shooting animations: up, down, left, right and the four diagonal directions upleft, upright, downleft and downright. If the unicorn shoots to the right, the animation right has to be played etc.
Acceptance Criterion	The projectiles show the described behaviour. The correct shooting animation is shown depending on the direction from the unicorn position to the PC position.
Notes	None
ID: EB5	**Unicorn states: Stomping attack**
Description	If the PC is inside of the melee attack range of the unicorn, the unicorn uses a stomping attack. The unicorn stomps on the ground in front of it, creating an AOE that deals damage to the PC if they are within it. The AOE has two zones, so that the the player receives more damage in a small radius around the unicorn and less damage if they are in a larger radius around the unicorn. The unicorn transitions to the **Wait** state, once its stomping animation is finished. The stomping animation used in this state is in the unicorn sprite sheet and depends on the unicorns magic type. The stomping animation shown depends on the direction from the unicorn position to the PC position. There are eight stomping animations: up, down, left, right and the four diagonal directions upleft, upright, downleft and downright. If the unicorn shoots to the right, the animation right has to be played etc.
Acceptance Criterion	The stomping attack applies damage as described. The correct stomping animation is shown depending on the direction from the unicorn position to the PC position.
Notes	None
ID: EB6	**Unicorn states: Death**
Description	When the unicorn's health reaches 0, it transitions to the death state. In this state, the unicorn stops all actions and animations, and after a short delay, it disappears from the game world. The death animation used in this state is in the unicorn sprite sheet and depends on the unicorns magic type.
Acceptance Criterion	The unicorn must correctly transition to the death state when its health is depleted, and it should no longer be able to perform any actions or affect the game.

ID: EB6	Unicorn states: Death
Notes	Ensure that the transition to the death state is smooth and that the unicorn's disappearance is visually clear to the player. Find out, whether death animations for several directions are necessary or if one animation looks good enough.

2.2.2 Areas

2.2.2.1 Main Hub

The first area type is the main hub which is a menu that allows the player to modify their load-out. In this area no PC exists that can be moved. Instead there is a point-and-click visualization of the magic school. Clicking on specific objects in the image opens the different menus needed to modify the load-out.

ID: AMH1	Main Hub
Description	The Main Hub is a point and click environment that allows the player to return back to the main menu and to access four sub menus: the augment inventory, the skill tree, the fuse augments menu and the dungeon selection menu. The graphic for the background and the five buttons is given in the assets folder.
Acceptance Criterion	The Main Hub menu exists and connections to the main menu and the four sub-menus via the five buttons work.
Notes	None

2.2.2.1.1 Skill tree

The skill tree is a menu where the player can unlock new skills and read the effects of the different skills. Each magic type has its own small skill tree. The base skill is the first skill of each skill tree. The supportive and offensive skills are the second layer of the skill trees. After the base skill is unlocked, the player can decide whether they want to unlock the supportive or offensive skill first.
For description of the skill see section 2.2.1.3.2.1 PC skills.

ID: AST1	Skill tree: Unlocking the first skill
Description	The player chooses a magic type in the beginning of the game which unlocks that magic types base skill.
Acceptance Criterion	The correct base skills are unlocked after the player selects their magic type.
Notes	None

ID: AST2	Skill tree: Unlocking criteria
Description	The base skill of each magic type has to be unlocked before other skills of that magic type can be unlocked.

ID: AST2	Skill tree: Unlocking criteria
Acceptance Criterion	Offensive and defensive skills of each magic type cannot be unlocked if the base skill is not unlocked. They can be unlocked if the player has the base skill unlocked.
Notes	The player chooses a magic type in the beginning of the game which unlocks that magic types base skill. Upon completing the intro dungeon the base skill of a second magic type is unlocked automatically.

ID: AST3	Skill tree: Unlocking skills
Description	The player can use one skill point to unlock one new skill. Skill points are magic type specific, e.g. a Sun skill point can only be used to unlock a Sun skill.
Acceptance Criterion	Skills are correctly unlocked by using skill points.
Notes	Skill points of a magic type are earned by clearing dungeons of that type. Both story and generated dungeons have a magic type.

ID: AST4	Skill tree: Skill descriptions
Description	All skills in the skill tree have a description. If the skills are not unlocked yet, the requirements for unlocking the skill are additionally described.
Acceptance Criterion	Descriptions are displayed correctly.
Notes	None

ID: AST5	Skill tree: Upgrading skills (Optional)
Description	If the player fulfills the cirterion for a skill upgrade, the skill is upgraded automatically.
Acceptance Criterion	Skills are upgraded correctly if the corresponding criterias are met.
Notes	This is a low priority requirement and should only be implemented if there is time. Planned unlocking criteria are clearing a dungeon with only one spell, which gives a version of the skill with better stats (more damage, buffs or debuffs). Additioanlly different criteria for each skill can give additional effects to the skills, e.g. Moon light gets an additional healing effect, slows or stuns for other spells. The properties and critera still need to be determined! Upgrades are hidden in the skill tree until they are unlocked by the player.

2.2.2.1.2 Equipping

The equipping menu allows the player to change the equipped augments and skills. In this menu, the skill slots with the currently equipped skills are displayed. Furthermore, the augment slot with the currently equipped augments and the inventory with all not equipped augments are displayed.

ID: AE1	Equipping: Equipping skills

ID: AE1	Equipping: Equipping skills
Description	If the player click on one of their skill slots, they can select which skill to equip to this skill slot from all skills they have unlocked. The player also has the chance to clear the second and the third skill slot. If the player selects a skill that is already equipped to a different skill slot, the slot the skill was previously assigned is cleared. For this reason the skill that is equipped in the first skill slot cannot be selected in the second or third skill slot.
Acceptance Criterion	Unlocked skills can be equipped.
Notes	The first skill slot cannot be cleared to prevent players from entering dungeons with no skills equipped.

ID: AE2	Equipping: Skill descriptions
Description	If the player hovers the mouse over a skill, the skill name and description is displayed.
Acceptance Criterion	Description is displayed correctly.
Notes	None

ID: AE3	Equipping: Equipping augments
Description	The player can drag and drop augments from their inventory to the unlocked augment slots. If the player drags an augment to an augment slot that is not empty, the previously equipped augment is returned to the inventory. The effects of the equipped augments are applied to the PC.
Acceptance Criterion	Augments can be correctly equipped to unlocked augment slots.
Notes	None

ID: AE4	Equipping: Augment descriptions
Description	If the player hovers the mouse over an augment, the augment effects are displayed. If an augment slot is not unlocked yet, the criteria for unlocking the skill slot is displayed.
Acceptance Criterion	Description is displayed correctly.
Notes	None

2.2.2.1.3 Fusing augments

The fusing augments menu allows the player to modify their augments. To fuse, the player has to choose two augments. The effect from one of the augment can be moved over to the second augment, which destoys the first augment. An effect from the second augment is overwritten with the new effect from the first augment. The player selects both the effect that is to be transferred and the effect that is overwritten.

ID: AFA1	Fusing: Fusing augments

ID: AFA1	Fusing: Fusing augments
Description	The player can select two augments to fuse them. For this they select an effect on the one augment that is transfered to the other augment and an effect on the other augment that is to be overwritten. The augment with the first process is destroyed in the process.
Acceptance Criterion	Augments can be fused correctly.
Notes	The number of effects that an augment has cannot be changed by fusing augments. An augment that is dropped with only one effect cannot gain a second effect through fusing.

2.2.2.1.4 Saving the game

From the main hub, the player can leave the game and save the current game state beforehand.

ID: AS1	Saving: Saving the game
Description	The player can save the current game state.
Acceptance Criterion	The current game state is saved.
Notes	None

2.2.2.1.5 Entering a dungeon

The entering a dungeon menu allows the player to select which dungeon to enter next. First, the player decides whether they want to enter a story dungeon or a generated dungeon. The layout and magic type of the story dungeons is always predefined depending on the magic type the player chose in the beginning. If the player chooses to enter a generated dungeon, they have to select the magic type of the dungeon. Furthermore, they can curse the dungeon to make it more difficult but to gain more rewards. The curses are shown in the menu before entering the dungeon and can be rerolled twice.

ID: AED1	Choosing a Dungeon
Description	The player can decide whether to enter a story dungeon or a generated dungeon. If the player chooses to enter a generated dungeon, they have to select the magic type of the dungeon. Furthermore, the player can curse the dungeon. The curses are shown in the menu before entering the dungeon and can be rerolled twice.
Acceptance Criterion	The dungeon type and all its modifications can be successfully determined.
Notes	The layout and magic type of the story dungeons is always predefined depending on the magic type the player chose when starting the game. Cursed dungeons are more difficult to clear but give better rewards.

ID: AED2	Entering a Dungeon
Description	The player can enter the dungeon they selected from the entering a dungeon menu.

ID: AED2	Entering a Dungeon
Acceptance Criterion	Player succefully enters the right dungeon.
Notes	None

2.2.2.2 Dungeons

Dungeons are the areas of the game where the player can control the PC and combat enemies to gain rewards. Dungeons are composed of a number of rooms with slimes and a boss room at the end of the dungeon that contains at least one unicorn. The rooms are connected through doors which only open after all enemies in the room are killed.
Every dungeon has a magic type that determines the magic type of the majority of slimes and the magic type of the unicorn boss at the end. Dungeons are not linear. Instead the player is forced to find the boss room. However, only the boss has to be killed in order to clear a dungeon, not every single room.
In the dungeons a camera is used to track the PC and enemy actions. The camera behaviour is different for different parts of the dungeon.

ID: D1	Camera Movement in Regular Rooms
Description	In regular dungeon rooms, the camera centers on the PC, smoothly tracking its movement to prevent sudden changes in the view field. Additionally, the camera is bounded by the room's walls, ensuring that everything in view is relevant to the player.
Acceptance Criterion	Camera works as described. Smooth movement is implemented using linear interpolation between the PC's and the camera's position. To prevent very slow camera movement, linear interpolation is only used when it would move the Camera more than 1px times the current delta.
Notes	None

ID: D2	Camera Movement in Boss Rooms
Description	In the boss room the camera is fixed and more zoomed out in order to always show the entire boss room at once.
Acceptance Criterion	Camera works as described.
Notes	None

ID: D3	Opening doors
Description	The player can open doors that leads to other rooms of the dungeon by killing all enemies in the room. If a room has several doors forwards, all doors are unlocked at once when the last enemy is killed.
Acceptance Criterion	Doors unlock when all enemies are dead and remain closed beforehand.
Notes	None

ID: D4	**Boss room door**
Description	The door to the boss room has to be visibly distinct from other, normal doors. There is only one door to the boss room.
Acceptance Criterion	Boss room door is visually distinct and there is only one inside the dungeon.
Notes	Since the player leaves the dungeon automatically after defeating the boss, and cannot leave the boss room once they entered it, they should know they are about to enter into the boss room.
ID: D5	**Clearing the dungeon**
Description	When the player has killed all bosses in the boss room, an information about the success and the gained rewards is displayed for the player. When the player closes the information, they exit the dungeon automatically.
Acceptance Criterion	Rewards are displayed correctly and player exits dungeon correctly.
Notes	None
ID: D6	**Pausing the dungeon**
Description	When the esc-key is pressed by the player, a menu is opened above the game layout and the game is paused. The pause menu overlays the current game screen, providing options for the player to resume the game, access the settings menu, or leave the dungeon early.
Acceptance Criterion	The game pauses and the pause menu is displayed correctly when the esc-key is pressed. The player can navigate the pause menu and select options without any issues.
Notes	From the pause menu, the player can go to the settings menu or leave the dungeon early. The game remains paused until the player chooses to resume or exit the dungeon.
ID: D7	**Leaving the dungeon early**
Description	The player can always leave the dungeon before clearing it. All rewards the player already has collected remain in the players inventory.
Acceptance Criterion	Player can leave the dungeon as described above.
Notes	None
ID: D8	**Dying in the dungeon**
Description	If the player dies in a dungeon, all rewards the player already earned remain in their inventory and the player is returned to the main hub.
Acceptance Criterion	On player death the player is returned to the main hub with all rewards they have earned.
Notes	Except for story dungeons, players cannot retry the same dungeon again. If the player enters a generated dungeon again, a new one is generated.

ID: D9	**Handcrafted Rooms**
Description	The rooms out of which the dungeon is created are handcrafted and not randomly generated. There should be at least 5 different rooms.
Acceptance Criterion	At least 5 different handcrafted rooms are available.
Notes	None
ID: D10	**Enemy Spawn Locations**
Description	The spawn locations for the enemies are determined by hand. However, not all possible spawn locations must spawn enemies. Since there are curses that spawn additional monsters in each room, not all spawn locations must spawn an enemy. Instead, whenever the room is first initialized, the game will determine how many enemies should be spawned and then randomly pick the locations.
Acceptance Criterion	Enemy spawn locations are determined as described.
Notes	None
ID: D11	**Room Instances**
Description	Each room is its own instance. The player can go into another room by walking through a door of the room. This will then load the next room instance. Direction is preserved, meaning if the player goes through the door on the left, the player will come out the door on the right in the next room, and vice versa for the other four directions.
Acceptance Criterion	Room instances and direction preservation work as described.
Notes	None
ID: D12	**First Time Room Entry**
Description	The first time the player enters a room, a set number of slimes are spawned. The type of slime is randomly selected from the available types, with slimes of the same magic type as the dungeon having increased probability. The player can only exit the room after killing all enemies within it.
Acceptance Criterion	Slimes spawn correctly on first entry and the player can only exit after killing all enemies.
Notes	None
ID: D13	**Returning to Cleared Rooms**
Description	The player can also return to a room they have already been to and cleared. In that case, no enemies are spawned and the player can immediately leave the room through any door.
Acceptance Criterion	Returning to cleared rooms works as described.

ID: D13	Returning to Cleared Rooms
Notes	None

2.2.2.2.1 Intro dungeon

The intro dungeon is a handcrafted dungeon and the first dungeon the player has to clear. It serves as a tutorial for the basic mechanics and the magic types in the game. Because of this the magic types of the slimes in the dungeon change based on which magic type the player has chosen when starting the game. The magic type of the intro dungeon is the type that the chosen magic type of the player is strong against, e.g., the player chose Sun, then the intro dungeon is of type Cosmic. When the player completes the intro dungeon, they receive a skill point of that magic type, in the example, a Cosmic skill point. This is teaching the player how to interact with the skill tree after clearing the intro dungeon.

ID: DI1	Adapting the Intro Dungeon
Description	The magic types of the enemies inside the intro dungeon will be adapted according to the magic type the player has chosen.
Acceptance Criterion	Intro dungeon is adapted correctly.
Notes	The first enemies will have the type that the magic type is strong against. For example if the player chose Sun as their magic type, most the dungeons enemies will be of type Cosmic. Other enemies will teach the player about the weaknesses of their chosen magic type.

ID: DI2	Layout of the Intro Dungeon
Description	The intro dungeon consists of 4 rooms in a linear way. The first room contains only small melee slimes. The second room contains only small ranged slimes. The third room has both small melee and small ranged slimes. The fourth room is the boss room and contains one large melee slime.
Acceptance Criterion	The intro dungeon is implemented as described.
Notes	Slimes have to correspond to different magic types to teach about strengths and weaknesses. The layout might have to be adapted according to player feedback later.

2.2.2.2.2 Story dungeon

There are five story dungeons. The bosses of the story dungeons are unicorns. The magic type of the story dungeons depends on the magic type the player chose at the start of the game. The unicorns have the same magic type as the dungeon type.

ID: DS1	Layout of Story Dungeons

ID: DS1	Layout of Story Dungeons
Description	Each Story dungeon has a fixed layout that is handcrafted. The bosses of the story dungeons are unicorns. Each story dungeon also has an magic type. At least 50% of all slimes are of this magic type and the boss is also of this magic type. This magic type is determined by the starting magic type the player chose at the start of the game. The first story dungeon will be the same magic type as the intro dungeon. For the other story dungeons the magic type is the magic type that is weak against the magic type of the previous story dungeon. The fourth story dungeon has two bosses and the fifth and last dungeon has three bosses, one of each magic type.
Acceptance Criterion	
Notes	For example if the player chose Sun as starting magic type, then intro dungeon and the first story dungeon will be of type Cosmic. The second story dungeon will then be of type Dark, the third will be Sun, the fourth Cosmic and the fifth Dark.

2.2.2.2.3 Generated dungeons

The player can enter additional generated dungeons for additional rewards to level up their character.
Before entering the generated dungeon, the player can choose which magic type the dungeon should have. This choice determines the magic type of the final boss and guarantees that at least 50% of all slimes in the dungeon are of this magic type.

2.2.2.2.3.1 Generation

The dungeon layout is created using the possible rooms when the player first enteres the dungeon.
The layout is generated in a grid like pattern, where each room is one cell.
There should be at least 2 room between the entrance of the dungeon and the boss room.
Furthermore, there should not be more then 10 rooms in total.

ID: DGG1	Generating a Generated Dungeons
Description	When a player enters a generated dungeon, a new dungeon is generated.
Acceptance Criterion	The dungeon is generated with a layout that meets the specified criteria, including the number of rooms, grid pattern, and room selection.
Notes	There is no option to return to a previously generated dungeon if the player failed to clear the dungeon successfully.

ID: DGG2	Layout of Generated Dungeons

ID: DGG2	Layout of Generated Dungeons
Description	If the player decides to enter a generated dungeon, a dungeon is generated. Every generated dungeon has between 5 and 10 rooms. These rooms are generated in a grid like pattern, where each room is one cell. There should be at least 2 rooms between the entrance of the dungeon and the boss room. The rooms themselves are not randomly generated but randomly selected from a list of designed rooms.
Acceptance Criterion	Dungeons can be generated correctly according to the criteria.
Notes	None

ID: DGG3	Difficulty Scaling of Generated Dungeons
Description	When a player generates a generated dungeon, the amount of augment effects the player has equipped when generating the dungeon changes the difficutly of the dungeon. The more augment effects are applied to the PC, the more slimes spawn in each room and the stronger the slimes are (more HP and more damage).
Acceptance Criterion	Dungeon difficulty is adapted to augment effect amount correctly.
Notes	This allows for the player to lower the difficulty of the dungeons if the dungeons are otherwise too difficult. Exact numbers have to be determinied during developent to ensure good balancing.

2.2.2.2.3.2 Rewards

Clearing dungeons gives rewards to the players.

ID: DGR1	Skill Point Reward
Description	Killing the boss of a generated dungeon, and thus clearing the dungeon, rewards one skill point of the type of the dungeon.
Acceptance Criterion	Skill point is rewarded correctly when killing the boss.
Notes	None

ID: DGR2	Augment Reward
Description	Killing the boss of a generated dungeon, and thus clearing the dungeon, the player is rewarded with one random augment guaranteed. There is a chance for a second augment. The quality of the augment is influenced by the difficulty of the dungeon. If the dungeon was cursed the player is rewarded with two augments guaranteed, with a chance for an additional third augment.
Acceptance Criterion	Arguments are given to the player correctly upon clearing a dungeon.

ID: DGR2	Augment Reward
Notes	Drop rates might have to be adjusted later.

2.2.2.2.3.3 Curses

Dungeons can be cursed before starting the dungeon. The dungeon will then be harder by strengthening enemies or weakening the player.
Upon dying the player has the choice to either retry the previously generated dungeon or to create a new one.
If the player decides to leave the dungeon, they cannot try the same dungeon again. Instead, a new one will be generated.

ID: DGC1	Curse Selection
Description	When the player curses a dungeon, a set of curses is drawn randomly from a list of curses. The player can view the current set of curses. The player can reroll the curses twice to obtain a new sets of curses. If the player fails to clear a dungeon, the curses are not changed.
Acceptance Criterion	Curses are drawn and can be rerolled correctly.
Notes	Upon rerolling the player cannot return to the previous set of curses.
ID: DGC2	**Regaining rerolls**
Description	When the player clears any generated dungeon, the number of rerolls is updated to two again. If the player fails to clear a cursed dungeon and dies, one reroll is restored to the player.
Acceptance Criterion	Rerolls are restored correctly.
Notes	None
ID: DGC3	**Generating a cursed dungeon**
Description	When the player enters a cursed dungeon, a new dungeon is generated. The curses applied to the dungeon are the last drawn set of curses.
Acceptance Criterion	Cursed dungeons are generated with the correct curses.
Notes	If the player fails to clear a dungeon, the curses are not changed for the next dungeon unless the player rerolls them, but a new dungeon with different rooms and spawn points is generated.

Possible Curses

ID: CURSE1	Skill 3 Disabled
Description	The player cannot use skill 3 during the dungeon run.

ID: CURSE1	**Skill 3 Disabled**
Acceptance Criterion	Skill 3 is disabled for the player.
Notes	None

ID: CURSE2	**Skill 1 Only**
Description	The player can only use skill 1 during the dungeon run.
Acceptance Criterion	Only skill 1 is available for the player.
Notes	None

ID: CURSE3	**Increased Damage Taken**
Description	The player takes 25 % more damage from all sources.
Acceptance Criterion	Damage taken by the player is increased by 25 %.
Notes	None

ID: CURSE4	**Increased Monster HP/Damage**
Description	Monsters have 30 % more HP and deal 10% more damage.
Acceptance Criterion	Monster HP and damage are increased by the specified percentages.
Notes	The exact percentage increase needs to be determined.

ID: CURSE5	**Increased Monster Count**
Description	33 % more monsters spawn in the dungeon.
Acceptance Criterion	The number of monsters is increased by 33 %.
Notes	None

ID: CURSE6	**Two Bosses**
Description	The dungeon contains 2 bosses in the final room.
Acceptance Criterion	Two bosses are present in the final room of the dungeon.
Notes	None

2.2.2.2.4 Tile-Based System and Collision Detection

The game utilizes a tile-based system for both the macro-scale dungeon layouts connecting the different rooms, as well as for the in-room environment. Each room in the dungeon corresponds to a tile in a grid, ensuring structured navigation and interaction within the environment. This system facilitates the procedural generation of dungeons and supports a variety of room configurations.

2.2.2.2.4.1 Macro-scale dungeon layouts

ID: DGL1	**Dungeon Layout**

ID: DGL1	Dungeon Layout
Description	Dungeons are composed of 5 to 10 rooms (with the exception of the intro dungeon, which is shorter). They have one entry room, one boss room, and normal rooms. The entry room has to be on one side of the macro-scale layout of the dungeon and there have to be at least 2 rooms between the entry room and the boss room. The rooms in the dungeon correspond to tiles in a grid, wherein all neighboring tiles have doors to connect the rooms. The only exception to this is the boss room. Even if the boss room has several neighboring tiles, the door to the boss room is only in one normal room. All rooms are similar enough in size that the tiles that represent rooms can be quadratic, with four possible neighboring tiles.
Acceptance Criterion	Dungeons are generated with the correct layout and room connections.
Notes	None

2.2.2.2.4.2 In-room environment

ID: DGE1	In-room Environment
Description	The in-room environment consists of a set of predefined rooms, including tiles, enemy spawn points, entry point (one per dungeon), and exit points. The tilemap consists of three layers: Background (non-interactable background tiles), Middleground (walls, doors, and other obstacles), and Foreground (decorational or special interactable tiles). Entities such as the player, enemies, and augments are visually placed between the middleground and the foreground layer, however, they are not treated as tiles.
Acceptance Criterion	Rooms have the correct environment layers and entity placements.
Notes	None

2.2.2.2.4.3 Collision Detection

ID: CDC1	Collision Detection
Description	Collision detection ensures that players and enemies interact with the environment and each other in a predictable manner. The game engine checks for collisions between entities (player, enemies) and environmental obstacles (walls, doors) to determine valid movements and interactions. This system is crucial for implementing gameplay mechanics such as combat, movement restrictions, and accessing different areas within the dungeons.
Acceptance Criterion	Collision detection works correctly for all entities and environmental obstacles.
Notes	None

2.2.2.2.4.3.1 Player-Enemy Collisions

ID: CDC2	Player-Enemy Collisions
Description	The player and enemies normaly cannot pass through each other. Their collision is handled by the game engine. If the player dashes, they are able to go through enemies.
Acceptance Criterion	Player-enemy collisions are processed by the engine if the player is not dashing. If the player is dashing, no collisions happen.
Notes	None

2.2.2.2.4.3.2 Player-Wall and Enemy-Wall Collisions

ID: CDC3	Player-Wall and Enemy-Wall Collisions
Description	The player and enemies cannot pass through walls.
Acceptance Criterion	Player and enemies are correctly blocked by walls.
Notes	None

2.2.2.2.4.3.3 Enemy-Enemy Collisions

ID: CDC4	Enemy-Enemy Collisions
Description	Enemies cannot pass through each other. Their collision is handled by the game engine.
Acceptance Criterion	Enemies cannot overlap.
Notes	None

2.2.3 Main menu and Tutorials

2.2.3.1 Main menu

If the player opens the game, the main menu is the first interface the player can interact with. The player has several options for interacting with the main menu.

ID: MM1	Main menu: New Game
Description	The player can start a new game from the main menu. When a new game is started, the player first has to decide with which magic type they want to start playing the game.
Acceptance Criterion	Starts a new game with the correct magic type.
Notes	None

ID: MM2	Main menu: Continue
Description	The player can continue playing the game from a previously saved game state.

ID: MM2	Main menu: Continue
Acceptance Criterion	Loading saved game states works.
Notes	None

ID: MM3	Main menu: Settings
Description	The player can change the settings such as music and sound volume, setting the resolution or toggling to fullscreen mode. The settings menu can be accessed through a sub-menu that appears when the player presses the esc-key from the main hub and from inside dungeons as well.
Acceptance Criterion	Works as described.
Notes	None

ID: MM4	Main menu: Exit
Description	The player can exit the game. In the standalone version of the game, the game closes itself.
Acceptance Criterion	Exit closes the game.
Notes	None

2.2.3.2 Tutorials

Tutorials are a set of explanatory texts that describe the features of the game. Tutorials exist for player movement (walking, dashing, spell casting), enemies (magic types and enemy types), the skill tree and the fusing of augments for example.

ID: T1	Tutorials
Description	When a player encounters a new game mechanic for the first time, a text is displayed for the player that explains the mechanic.
Acceptance Criterion	Tutorials are displayed at the correct times.
Notes	When possible, the tutorial is interactive.

2.3. Nonfunctional requirements

Coding Style: Adhere to the Godot C# style guide and use a component-based architecture for improved maintainability, code reuse, and easier future expansion.

2.3.1. User interface and human factors

Outside the dungeons, the user interface will be fully controllable via mouse and keyboard for menu navigation, spell/augment selection, skill point allocation, and dungeon selection.

Furthermore, every menu has to be selectable with no more than 3 clicks.
Each action, like selecting a dungeon or merging two augments, has to be doable with less then 10 clicks.

2.3.2. Documentation

Every non-trivial function within the codebase will have clear comments explaining its purpose, parameters, and return values.

We will use the Doxygen in order to automatically generate the documentation.

A comprehensive user manual will be developed alongside the game to aid players.

2.3.3. Hardware considerations

The game is intended for personal computers that meet the recommended system requirements to run the Godot 4 game engine effectively.

- **CPU**: x86_64 CPU with SSE4.2 instructions, with 4 physical cores or more
- **GPU**: Dedicated graphics with full OpenGL 4.6 support or full Vulkan 1.2 support
- **RAM**: 8GB
- **OS**: Windows 10 or later

2.3.4. Performance characteristics

The game should maintain an average frame rate of at least 55 FPS at 1080p resolution with no more than 10% dips below 60 FPS during gameplay.

2.3.5. Error handling and extreme conditions

All methods that can potentially encounter errors (e.g., missing file, invalid user input) will be explicitly marked with error handling code.

Errors will be communicated to the player through clear on-screen messages. Additionally, a log file will record all encountered errors for debugging purposes.

2.3.6. Quality issues

The development process will involve thorough quality checks, including functionality testing, bug fixing, and performance optimization to ensure a polished gaming experience.

2.3.7. System modifications

For the standalone version no additional software installations will be required beyond the game itself.

2.3.8. Physical environment

The game will run on a personal computer with the minimum system requirements described above.

2.3.9. Security issues

Due to its single-player nature, the game will not implement any online features or user accounts, eliminating security concerns related to player data.

The game will be restricted to reading and writing data within its designated folder, ensuring no security risks to the player's computer.

2.3.10. Resource issues

The game's memory usage and disk space requirements will be optimized to ensure smooth performance on a wide range of PC hardware. Specific limitations will be determined during development based on testing.

2.4. Pseudo requirements

The game should minimize visual clutter. There is no need for unneccessary visual effects if they do not add much to the enjoyment of the player.

The game should also not contain large empty spaces devoid of any form of player interaction.

2.5. System models

2.5.1. Scenarios

1. **Scenario** The player starts a new game. They are then asked to choose an magic type with which they want to start.
2. **Scenario** The PC enters a room in a dungeon. Close enemies then target the PC, forcing them to figth their way through.

2.5.2. Use case model

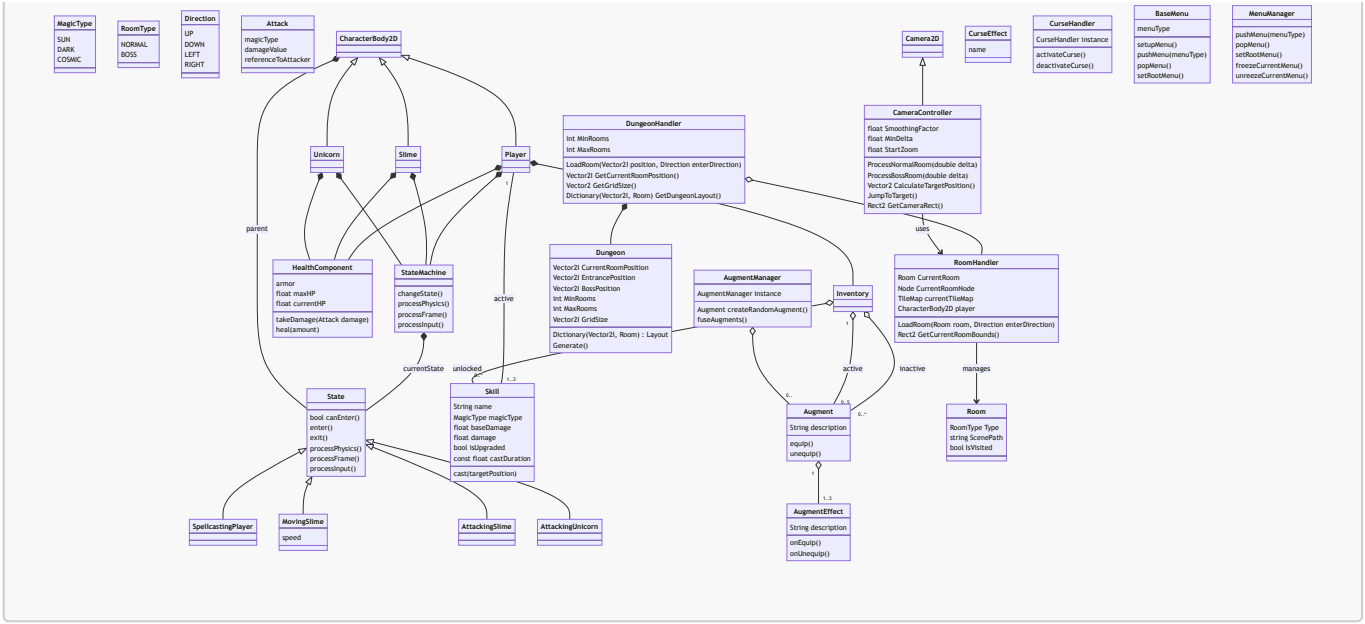
- **Use case:** Player unlocks a new skill
    - **Precondition:** The PC has a skill point to spend in an magic type and an unlearned skill in that magic type
    - **Steps:**
        1. The player selects the skils menu
        2. The player selects the skill they want to unlock
        3. The player clicks unlock
    - **Postcondition:** The PC has now learned the skill and can select it

2.5.3. Object model

2.5.3.1. Data dictionary

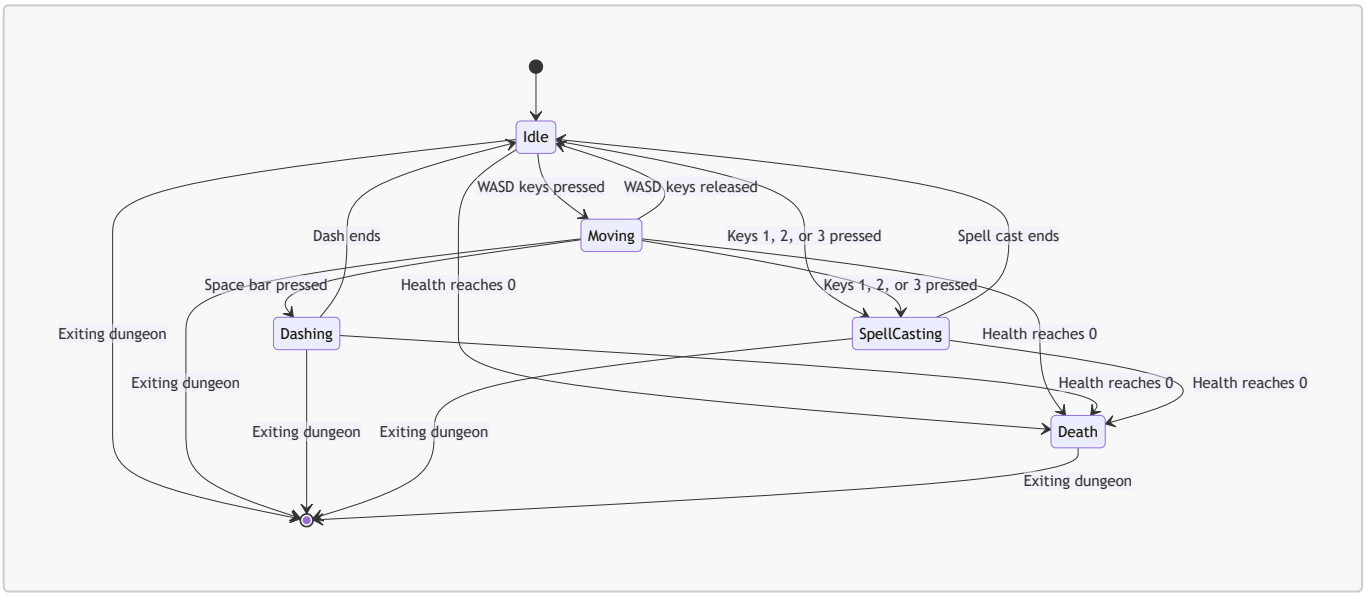
2.5.3.2. Class diagrams

Class diagram without all details

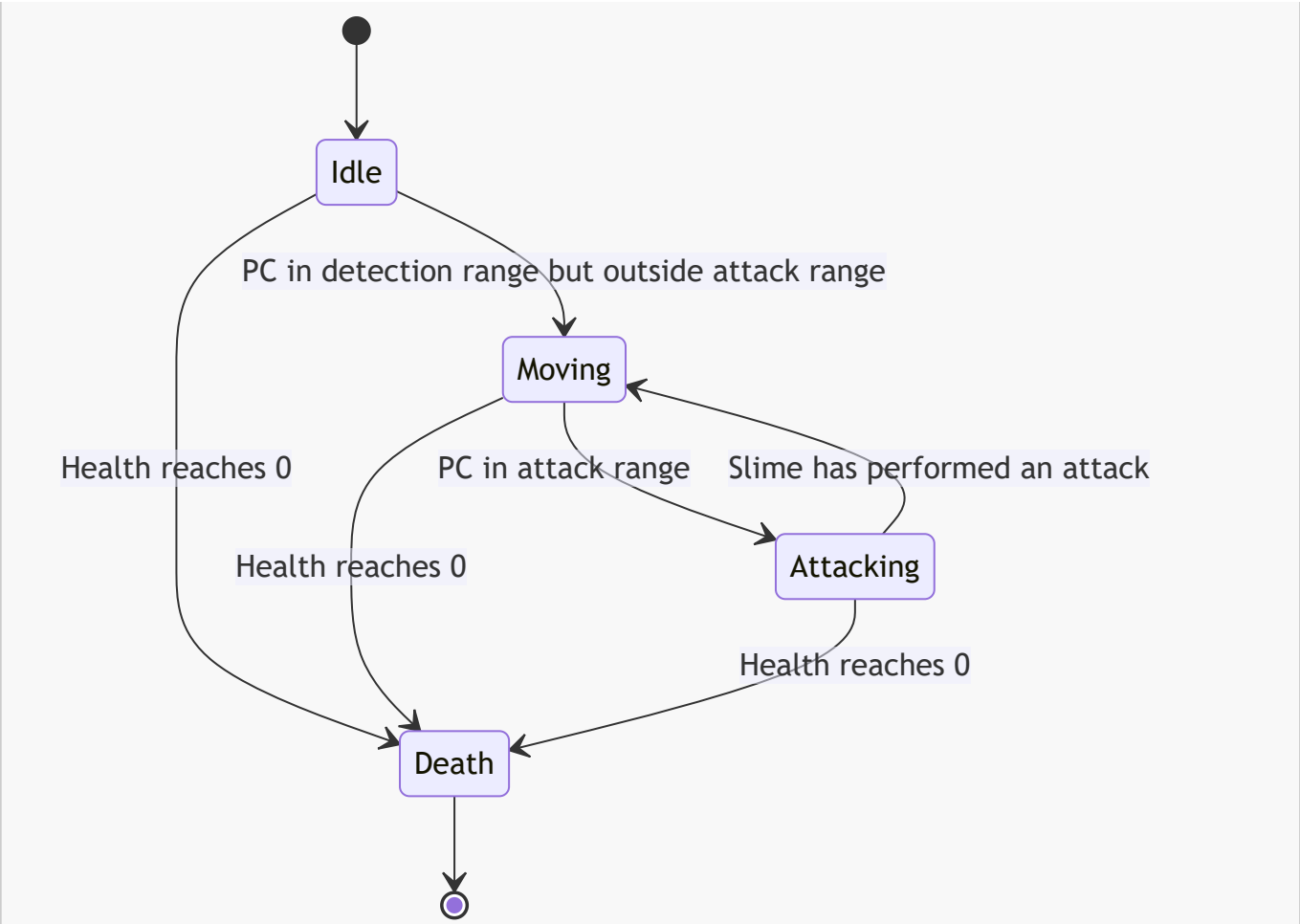


2.5.3.3. State machines

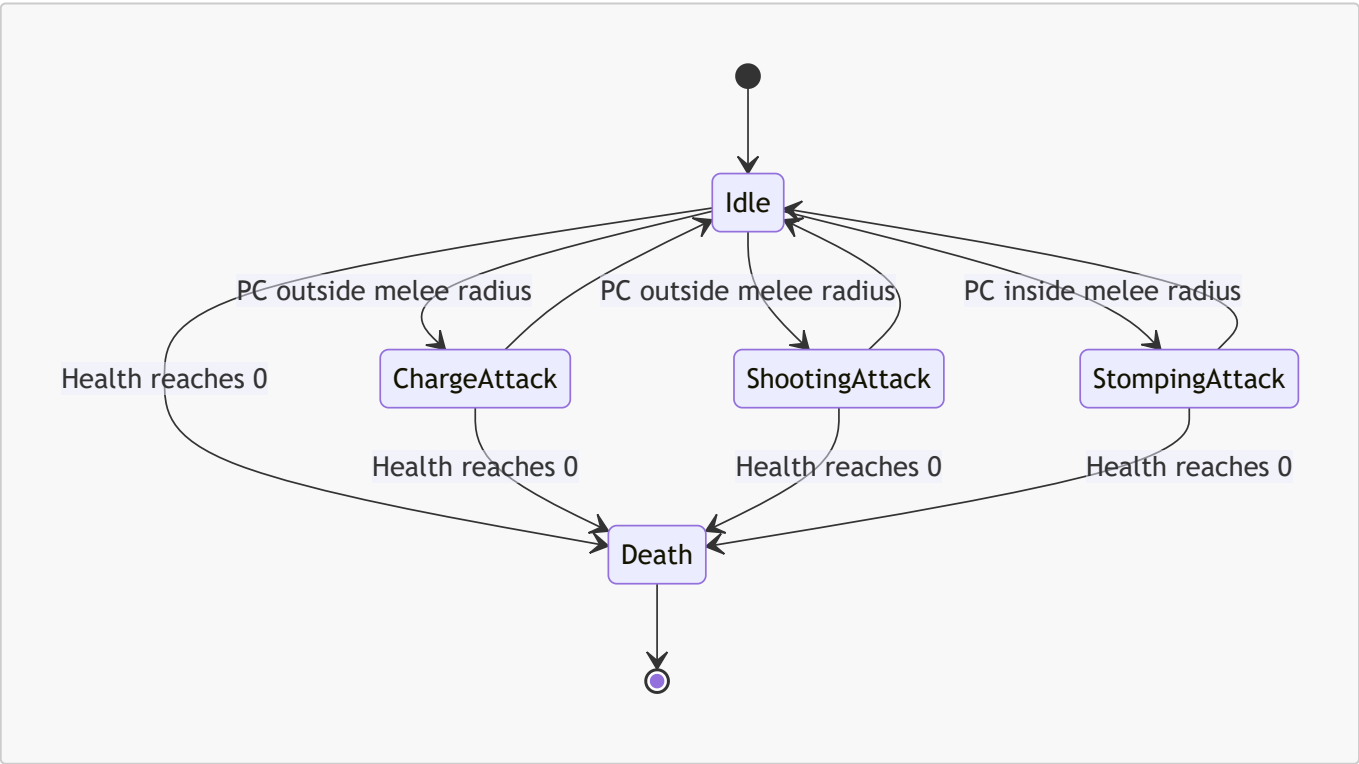
- **Player character state machine**



- **Slime state machine**



- **Unicorn state machine**



2.5.4. Dynamic models

2.5.5. User-interface -- navigational paths and screen mock-ups

3. Glossary