



**VILNIUS UNIVERSITY
FACULTY OF MATHEMATICS AND INFORMATICS
INSTITUTE OF COMPUTER SCIENCE
INFORMATION TECHNOLOGIES STUDY PROGRAM**

Problem-based Project

**Tower Defense.
2D game with strategy and AI features.**

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1 Purpose of the system

1.1 Theme

- The video game is a top-down 2D Tower Defense game. The theme of our game is magic. The enemies of the player are fantasy monsters, whereas the towers are magical wizards. The Video game consists of many waves, the player loses the game if the monsters reach the end of the level, as one monster damages a specified amount of Health Points and if it reaches 0 the game ends. The enemies and wizards all have special abilities that either help the player or do not.

1.2 Users

- Player - user that plays the game, but has less functionality than a Developer/Play Tester, for example, not being able to use the "Debug" feature.
- Developer/Play Tester - user that takes part in the development or testing of the application, the user has access to tools not designed for regular players.

1.3 Location

- All the code and documentation will be available on our GitLab repository. After the main release, the game will be uploaded on itch.io.

1.4 Responsibilities

- Provide the user with an endless game mode, which creates stronger enemies for each consisting wave.
- Provide the user with a randomly generated map that has obvious areas of where a tower could and could not be placed.
- Allow the user to place various towers, that have different abilities.
- The user must also fight various enemies with different levels, and abilities.

1.5 Need

- This video game is made for people to use, when on short breaks before doing something, for example, being on a train or before class.

2 High-level overview of the system

The video game consists of two systems that contain:

- The video game program - the video game itself where players will be able to play and interact.
- The Database - a relational database that stores player data, which contains the player's progression, and various stats, for example, how many enemies the user has killed or what tower the user frequently used.

3 Functional Requirements

3.1 High Priority

- Have manually made waves of enemies, consisting of 50 waves.
- Have placeable towers and a shooting system.
- Have playable, but randomly generated maps.

3.2 Medium Priority

- Having upgrades for towers that increase their stats and give them the ability to create status effects for enemies.
- A user leveling system that unlocks new towers.
- Towers can use abilities like attack speed boost, Area Of Effect in a zone, damage boost and etc.

3.3 Low Priority

- Have online multiplayer available, that pins the players against each other, one player places the towers and the other chooses what enemies spawn or a player co-op where they both face the monster waves.
- Have an AI director, that spawns in waves, instead of hard-coded ones.
- Better graphics for the game (better models, menu screens, textures).

4 Non-Functional requirements

4.1 Compatibility

- The game must be able to run on the majority of Windows 10-11 devices.
- Implement Unicode compatibility in every step of the system: users must be able to type, submit and see non-Latin characters.

4.2 Reliability

- The game should not have any issues or bugs that prevent the player from a non-frustrating experience.

4.3 Performance

- The game should work well on a computer that can run Windows 10 or Windows 11 reliably. Multiplayer should work even with a bad internet connection with a decent lag-compensation system.

5 Versions

Version 0.1

- Enemies spawn and go forward.
- There is a basic sound for shooting.
- The player is able to place a tower, towers can shoot at enemies.

Version 0.3

- Added different towers and enemies, enemies can damage the player.
- Towers can be upgraded, giving them extra stats.
- The upgrades can give status effects, like bleeding or slowness.

Version 0.5

- Added waves to the game, consisting of 10 waves.
- Added the ability of random path generation, along with the AI director being able to choose the theme of the maps.

Version 0.7

- Game menus like the main menu and pause menu, and also a game HUD.
- Enemies and towers can have special abilities.
- Background music while the game program is turned on.

Version 1.0

- Working menu and game GUI.
- Finished wave amount consisting of 50 waves, with winning and losing conditions.
- Game with different towers, enemies, upgrades, maps.