Elemental Tower Defense

Problem Statement

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1 EXECUTIVE SUMMARY

The purpose of this document is to outline the problem that this project will solve. This document, coupled with the other documents described in **2 Introduction** construct the documents that describe this project. In addition, this document contains a High Level Problem Summary, a Problem Statement, and information about Key Stakeholders that this project will affect.

The Tower Defense game genre is one of the most popular game genres for independent game developers. A "Tower Defense" game is a game where enemies travel through a defined path in a level. The player places "towers" alongside the path. The towers have unique abilities – some may fire bullets at the enemies in the nearby path, some may generate funds, some may slow enemies. The goal of these towers is to kill all of the enemies before they reach the end of the path. Consider the rough picture below:
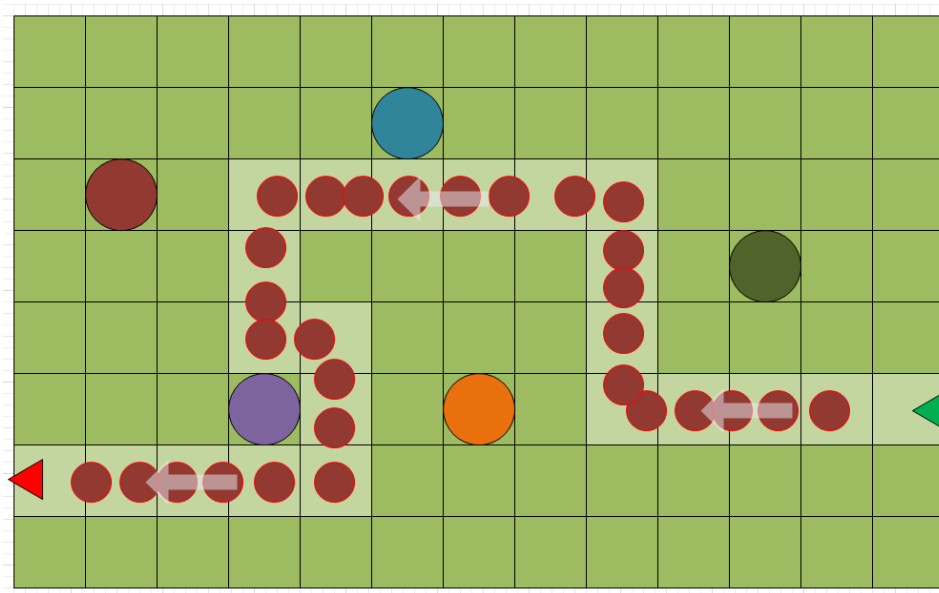
2 INTRODUCTION

This document is the first document describing the Elemental Tower Defense game system. In addition to this document, we will also provide class diagrams, a development timeline, coding standards documents, intermediate memos, a final project report and presentation. While the goal of this problem statement is to outline broadly the goals and scope of this project. This document lays out the features and form of the project and will be more specifically defined and refined in the subsequent documents.

3 HIGH LEVEL PROBLEM SUMMARY

3.1 ELEVATOR STATEMENT

The primary purpose of this project is to use Test Driven development to create a Tower Defense [1] game in Java using a combination of black and white box testing. Furthermore, the game will support Internationalization and Localization in three languages (English, Spanish, and Turkish).

3.2 PRIMARY SUCCESS CRITERIA

The Tower Defense game must be simple and elegant to use. "Flashy" animations are not necessary for our final product; the goal of the process is to use Test Driven development, not create a revolutionary new Tower defense game. That being said, the Game created using Test Driven development must have all of the features outlined in **3.3 Scope**.

3.3 SCOPE

3.3.1 WITHIN SCOPE

1. Multiple types of towers
2. Multiple types of enemies
3. Basic animation
4. Audio playback
5. Random map generator
6. 3 languages (English, Spanish, Turkish)
7. Upgradable and sellable towers
8. Save/load features

3.3.2 OUTSIDE SCOPE

1. Complex animation
2. More than 3 languages
3. Predefined increasing difficulty
4. Online capability
5. Multiplayer functionality

4 DETAILED PROBLEM STATEMENT

4.1 FUNCTION

1. Multiple types of unique enemies, in which all have different speeds, armor values, and health.
    a. There will be multiple waves of enemies. The player will be battling endless waves of enemies.
2. Ability to choose from several different towers based on elements. Towers of different elements can inflict different damages on enemies. For example, an "Ice Tower" inflicts a different amount of damage than a "Fire Tower".
3. Towers will be upgradable, in the sense that every upgrade will enhance their attributes. The towers can be upgraded infinitely, but their power will experience diminishing returns as the levels go higher.
4. Basic animation of towers and enemies, as well as audio playback when an enemy is hit by the towers and/or is destroyed.
5. Every map will be generated using a random map generator. The random map generator will make sure that there is always a starting, an end point, and that these two points are somehow connected to each other.
6. The player will be able to save and load the current state of the game.
7. Since the game will be internationalized and localized, players from different nationalities will be able to play the game, even if they are not familiar with English.

4.2 FORM

4.2.1 AVAILABILITY

- The game should not be crashing randomly. To avoid this, all the functions of the game have to be rigorously tested.
- Since the game is a single player game, it will be running locally. Therefore, it will be available regardless of internet connection availability.

4.2.2 USABILITY

- The player will have to strategize his or her gameplay every time a new game is started because every new level will be randomly generated.
- The interface will be easy to understand and use. There will be as many descriptions of towers and enemies as possible.

4.2.3 PERFORMANCE

- The game will have its own library that refreshes the current frame at a constant number of frames per second.

4.2.4 SECURITY

- No security issues because:
  - The game does not contain any confidential information.
  - There is no online interaction.

4.2.5 MAINTAINABILITY

- The game will be customizable in the sense that levels will be randomized. Therefore, the player will need to change his or her strategy (as in the placement of towers) every time a new game is started.
- The game will not be modifiable, in the sense that the player will have to play with the built in graphics, enemies, towers, and game modes.
- The game will be maintained with rigorous testing, so that the game is bug-free as much as possible.
- The game can be upgraded by adding new game modes, enemies, and towers.

4.2.6 TESTABILITY

- The game will be developed using the test-driven development approach.
- There are several elements that need testing before the game can be released. The main elements that need testing are gameplay, behavior of the GUI, and audio playback testing.
- Objects and the interactions between objects needed to be rigorously tested as they will be the most important elements of the game. These tests include, but are not limited to testing if:
  - Enemies are removed from the frame when they have no health left.
  - Bullet animations from towers are removed when they hit an enemy or miss and leave the frame.
  - The GUI is organized correctly (buttons and the gameplay frame are at the right locations).
  - The Random Map Generator generates maps with valid paths.
  - Towers cannot be placed on enemy path.
  - Audio playback occurs at the correct times (i.e. when the bullet hits an enemy).

4.3 ECONOMY

4.3.1 MARKETABILITY

Tower defense games appeal to people of all audiences, both those who are looking to challenge themselves and those who are just looking to have a good time. People will flock to a new twist on an old game, allowing them to work with something familiar while still enjoying the thrills of a new game. The fact that it is implemented in different languages will also invite people of different nationalities to play the game. Even those who have never seen a tower defense game before will be able to understand the instructions and play the game. All of this leads to a high level of marketability and acceptance.

4.4 TIME

4.4.1 HISTORICAL

Games have been a primary way for people to entertain themselves for as long as they have been around, and simple games have captured the attention of many people, despite their lack of flashy graphics and unique or exciting gameplay. Tower Defense games are a simple type of game, employing moving enemies following a predefined, randomly generated path towards the player's home base. The object of the game is to destroy these enemies before they reach your base by placing defense mechanisms known as towers near the path of the enemies, which would then, in turn, attack the enemies and kill them before they could reach their destination. Tower Defense games have been become a simple way for people to enjoy themselves, while not requiring intense coding or hard to understand instructions / gameplay. Because of this, Tower Defense games naturally lend themselves to the Test Driven Development methodology.

4.4.2 CURRENT

Tower Defense Games have come a long way from the simplicity that existed when they were first created. Players expect a sort of RPG style to the game, where money is earned for defeating enemies and each tower can be upgraded. As such, for our product to be accepted, it needs to go beyond just a simple, one level implementation with 5 different towers. Instead, it must be an all-inclusive game, grasping the attention of anyone who plays it. In this aspect, tower defense games must include ways of tracking information, interesting sound clips, and reliability while it is being played.

4.4.3 FUTURE

In the future, we hope that our game will be greatly accepted as the best Tower Defense game **ever**. We plan to capture the attention of audiences using interesting plot, easy to understand instructions and gameplay, and amazingly beautiful graphics. We understand this may not be completely possible, but we will strive to achieve whatever we can. Tower Defense games will never become just a thing of the past, as they continue to advance in their capabilities, there will always be gamers returning to the elegant simplicity that comes from these types of games.

5 KEY STAKEHOLDERS

Name	Role
Sriram Mohan	Project Advisor
Steven Moyes	Project Team
Matthew Mercer	Project Team
Arda Tugay	Project Team
John Doe	End User (US)
José Doe	End User (ES)
Jale Doe	End User (TR)

6 GLOSSARY

Term	Definition
Tower	A structure designed to attack and/or hinder enemies
Currency	Virtual points used to purchase and upgrade towers
Enemy	A non-player entity which attempts to reach the player's base. Has speed, armor, and health attributes
Buffalo	Any of several large wild oxen of the family Bovidae
Pastry	A sweet baked food made of dough, especially the shortened paste used for pie crust and the like.