Final Project: Tower Defense Game

Table of Contents:

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Game Introduction:

In this game, the players try to defend the castle from the enemies by building defensive canon towers. There are 25 waves of attacks, and the damage and hit point of enemies increase thorough waves. There are 3 roads and 8 places for players to build towers (see Figure 1). A player can press number 1 to 8 to select a place/tower, and the info of that place/tower will be shown on the upper right, including the location (1 to 8), cost, level, and type (Cannon if there is a tower or None if its empty) of the tower. After being built, towers fire cannon balls at the enemies if they are close enough. Players need to spend money to build/upgrade towers, and both the cost and the damage of a tower increases as the level of the tower increases. The amount of money will be shown on the upper left along with the wave count. Different amount of enemies (maximum of 15 enemies in a wave) will come out from different roads in different waves. The hit point of a soldier is shown above its head, and the soldier dies if its hit point is smaller or equals to 0. If all of the enemies die, the game continues automatically to the next wave. Enemies walk toward the castle and if a soldier gets near the castle, it starts attacking, causing the health of the player to decrease. The health of the player is shown on the left, and a player loses if his/her health is smaller or equals to 0. Players can pause the game by pressing

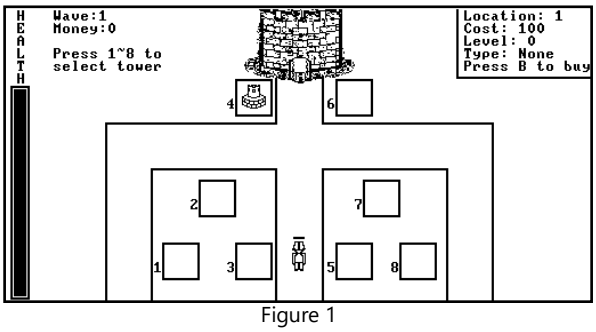

Figure 1

P, and get back into the game by pressing P again. After the game ends (either the player dies or finishes the 25 waves), the screen shows the score of that game and goes back to main menu (the highest score is shown on the upper left of the main menu).

Game Instructions and Screenshots/Demo:

In main menu: (see Figure 2)
- -Press enter to start
- -Press Q to quit

In game: (see Figure 1, 3 & 4)
- -Press 1~8 to select place/tower
- -Press B to build/upgrade towers (Shows "Not enough money" below money if the player does not have enough money)
- -Press P to pause/continue

Game ending:
- -Screen shows player's score and goes back to main menu

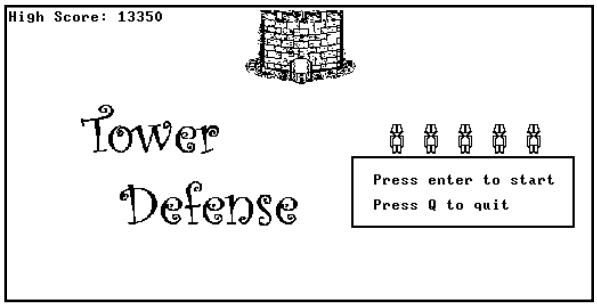

Figure 2: Main Menu with high score shown

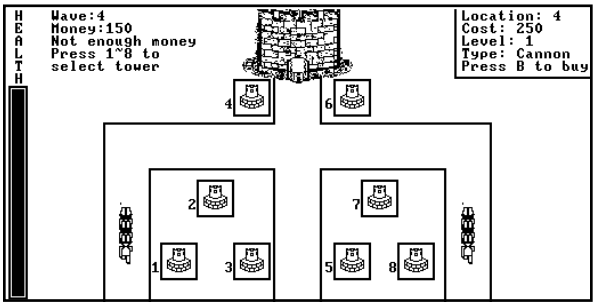

Figure 3: Attempt to upgrade without enough money

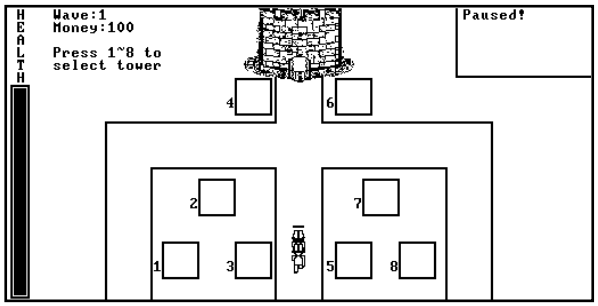

Figure 4: Game paused

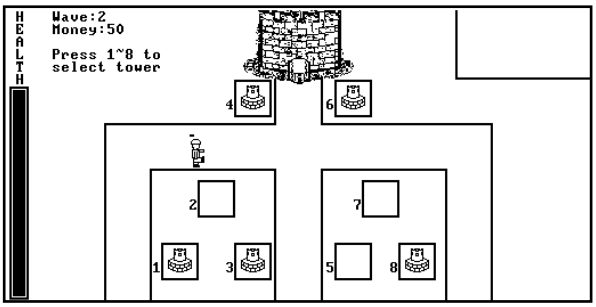

Figure 5: Soldier marching

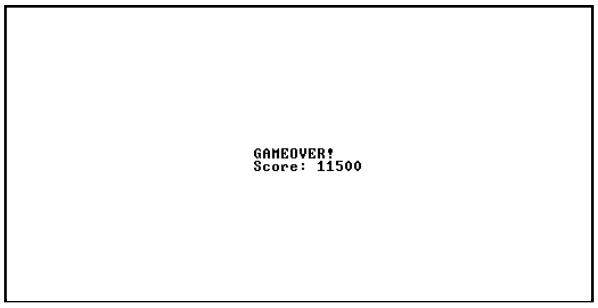

Figure 6: Game over message

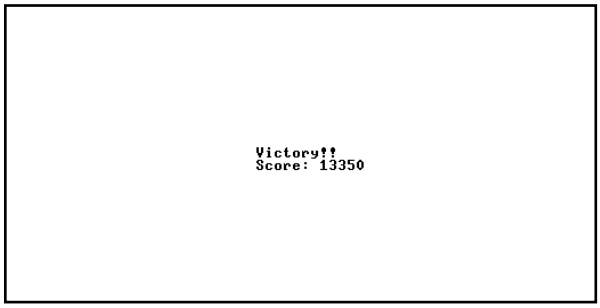

Figure 7: Victory message

Short History of My Small Game:

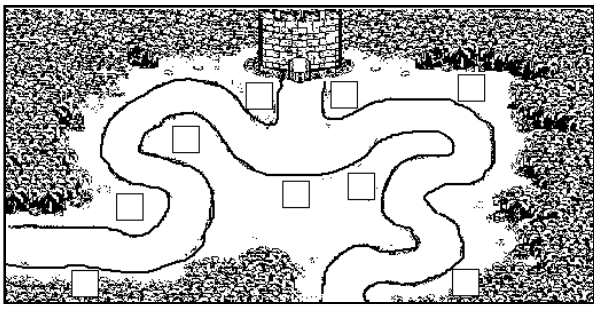

Figure 8: Original Map

The roads in the game were not designed to be straight lines at first, and there was a forest around the map when I first drew it (see Figure 8). However, since the forest and curvy roads have no obvious pattern to draw, it would use up too much ROM space to draw it in game, so I modified the map to the one you see today.

When I first started writing the game, I thought the most difficult part of the project is writing the program. After I finally finished the game and tried to play it, I found out that the most difficult part is actually trying to balance the game (see Figure 9 and 10). From the health of players, the cost of towers, and the length of roads to the hit point and damage of enemies, it really takes a bunch of work to make the game both winnable and intriguing at the same time.

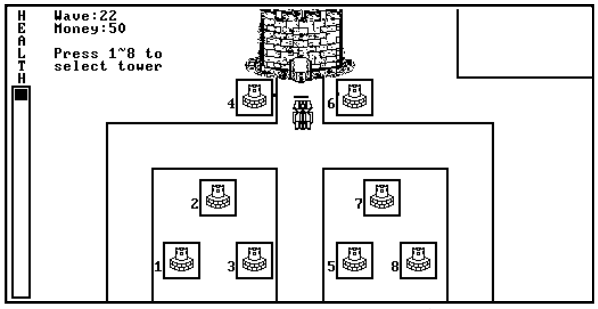

Figure 9: Me getting to wave 22 and found out that it is impossible to win

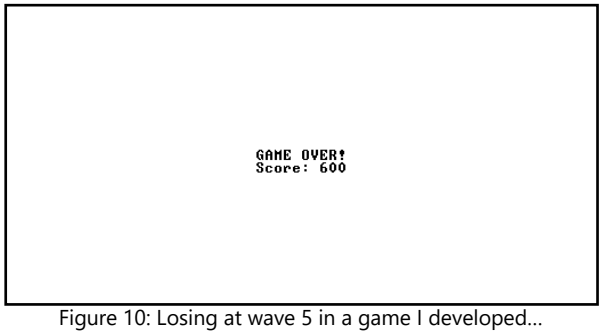

Figure 10: Losing at wave 5 in a game I developed...

Another interesting part of the project was translating bitmap images into Jack language. It took quite some time to understand the header format of bitmap. I used C for reading and translating the file (see Figure 11).

Figure 11: Converting bitmap to jack code

VM Files Download and Game Demo Link:

Google drive

Here is the .zip file which contains the executable VM file of my game. After downloading it, you can play the game by unzipping and loading it into the VM Emulator.

YouTube

Here is a gameplay demo uploaded onto YouTube.