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FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

LCOM 2018/2019 Project Report: “Star Fighter 2D”

2MIEIC01 Group 9

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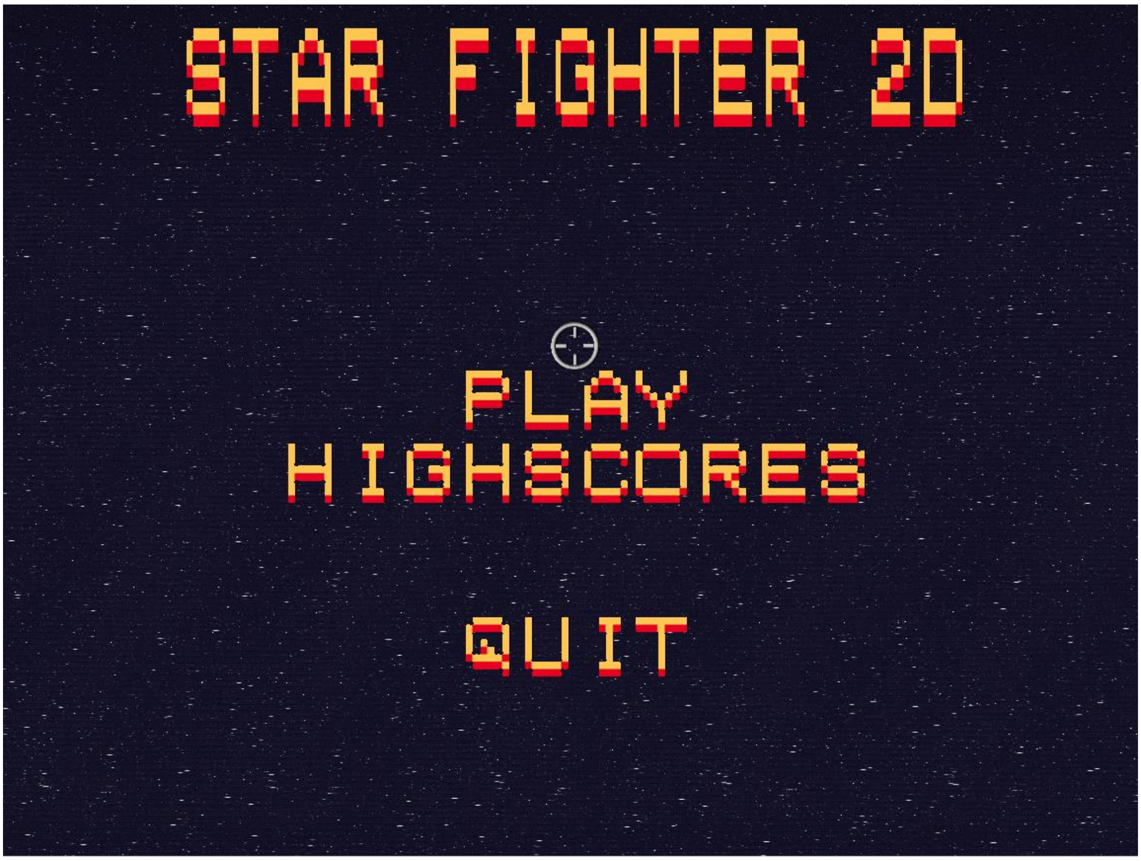
1. Introduction

1.1 Abstract

In the scope of the class “Laboratório de Computadores” (LCOM), students were asked to develop a project in which the studied computer peripherals would be applied. As stated in the original Project Proposal and Specification, this group set on to create a two-dimensional, “side-scrolling”, arcade, shooter game. The game would be set in outer space, where the player, controlling a spaceship would have to evade undestroyable obstacles and enemy fire, whilst simmultaneously destroying enemy ships to increase its score. After careful consideration however, the pair decided to take a different approach than usual, combining aspects from classic games such as “Space Invaders” and “Asteroids”. The final product features side-scrolling asteroids as obstacles and enemies that spawn on the top side of the screen and fire at the player. The player can move in all directions, including diagonally, and can fire back at the enemies to destroy them. The objective of the game is to survive for as long as one can.

1.2 User Instructions

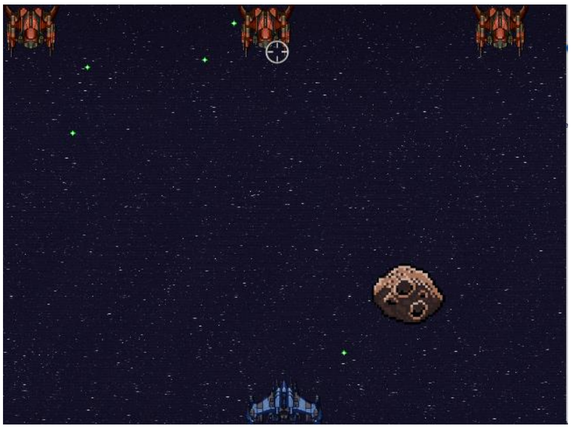
Main Menu:



Uppon starting the program, “Main Menu” will appear on screen. This screen has three buttons.

- Pressing the “PLAY” button will lead to the “Game” screen;
- Pressing the “HIGHSCORES” button will lead to the “High Scores” screen;
- Pressing the “QUIT” button will exit the game.

Playing the Game:

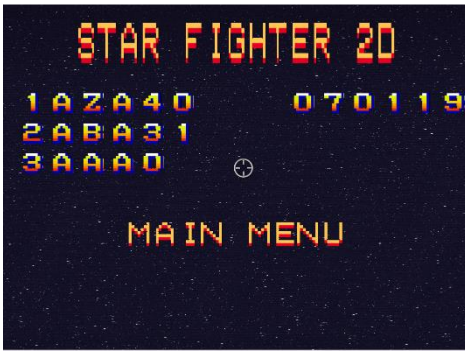


The player controls the blue spaceship, it can move in all directions and diagonally if pressing a combination of one of the vertical movement and horizontal movement keys. The player can use the mouse to aim the ship’s laser and fire it by pressing the left mouse button. The ship can fire one bullet per second. The bullets can destroy enemies but not obstacles.

The Game consists of four phases, as the player progresses through the game these change cyclically.

Highscores Menu:

Displays the top 3 scores along with the names chosen at the end of the game, and the Date of when the High Score was set.



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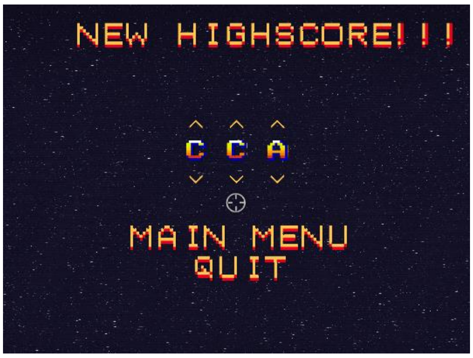
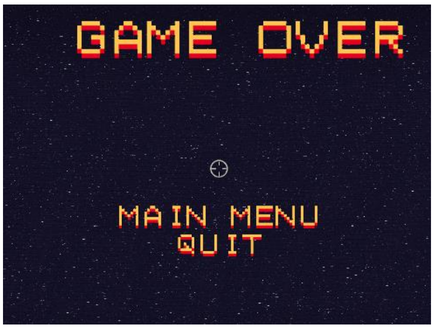
1AZA40      070119
2ABA31
3AAA0
```



Game Over:



When the player dies, if the score is higher than one on the Highscores array, the game goes to the “New HighScore” screen, else the game goes to the “Game Over” screen where he can exit or go back to the main menu.

Quit:

Exits the game.

2. Project Status

Device	**What For**	**Interruptions**
Timer	Refreshes the screen and adds to the score.	**YES**
KBD	Moves the player.	**YES**
MOUSE	Fires laser to the position of the mouse and is used to interact with the menus.	**YES**
VIDEO CARD	Displays menus and all the images.	**NO**
RTC	Used to save the date on highscores.	**YES**

Mouse:

In this project the mouse is used to interact with the menus. In the main menu it is used to left click on PLAY, HIGHSCORES or QUIT, in the game over menu it is used to left click on QUIT or MAIN MENU and in the highscores menu it is used to left click on MAIN MENU. Another use of the mouse is when you play the game in which left clicking results in firing a laser.

Keybord:

The keybord is used to play the game, more specifically it is used to control the ship and move it away from the obstacles. The keys used are W to go up, A to go left, S to go down and D to go right.

Graphic Card:

The graphic card is used to display on screen the game. The graphics mode used was 0x14C. We also used double buffer in order to eliminate flickering and make the game run more smoothly.

RTC:

The real time clock is used to display on the highscores menu the date of when the best scores where registered.

3. Code Structure

Proj:

Main file of the project that has a loop that depending on the state is gonna call the functions needed to run the game. It also controls the phases of the game. When quit is pressed the loop ends.

Weight: 1% Contribuitions:Carlos(50%), Pedro(50%)

Game:

This file is responsible for all the menus in the game and handles the interrupts of the mouse, keyboard, timer and rtc.

Weight: 14% Contribuitions:Carlos(50%), Pedro(50%)

GameState:

Almost all the mechanics of the game are in this file. It handles the generation of the asteroids, enemies and lasers and their movement. It also contains the functions that check if the lasers hit the enemies, asteroids or the player, removing them if they did. In the case of the player and the enemies it also reduces the hp with every collision of the laser or asteroid. When the hp is depleted it removes them from the game.

Weight: 5% Contribuitions:Carlos(50%), Pedro(50%)

Entity:

This file loads the xpm of all the entities and initializes the struct that saves the position, the type of entity and for the lasers keeps the angle. It also has the functions that control the position of the entities, check the collisions and if the entity is offscreen.

Weight: 10% Contribuitions:Carlos(50%), Pedro(50%)

Enemy:

The objective of this file is to create a new enemy ship using a struct that saves the damage it does, the hp and the fire rate. It also saves the entity of the enemy.

Weight: 5% Contribuitions:Carlos(50%), Pedro(50%)

Player:

This file defines the struct of the player which contains the hp, damage it does, if it is invunerable, the entity of the player and a struct that tells in which directions the player is moving. The functions initialize the player struct, move the player and check if the player is alive.

Weight: 5% Contribuitions:Carlos(50%), Pedro(50%)

Laser:

This file initializes the struct Laser that saves the entity, damage, angle and if it is a friendly laser or an enemy laser. It also has the functions that remove and add the lasers.

Weight: 2% Contribuitions:Carlos(50%), Pedro(50%)

Score:

This file is in charge of the highscores. It reads and saves in the file highscores.txt the scores and the name of the player so it can be displayed in the highscores menu.

Weight: 3% Contribuitions:Carlos(50%), Pedro(50%)

Mouse:

This file handles the interrupts of the mouse.

Weight: 12.5% Contribuitions:Carlos(50%), Pedro(50%)

Kbd:

This file handles the interrupts of the keyboard.

Weight: 12.5% Contribuitions:Carlos(50%), Pedro(50%)

Timer:

This file handles the interrupts of the timer.

Weight: 3% Contribuitions:Carlos(50%), Pedro(50%)

Rtc:

This file handles the interrupts of the real time clock.

Weight: 2% Contribuitions:Carlos(50%), Pedro(50%)

Video:

This file is responsible for drawing everything to the vram so it can be displayed in the screen.

Weight: 12.5% Contribuitions:Carlos(50%), Pedro(50%)

4. Implementation Details:

The project was implemented with a state machine with 6 states: MENU, HIGHSCORES, PLAYING, GAMEOVER, NEWHIGHSCORE, EXIT.

The first state is the menu where you can play, access the highscores and exit the game by left clicking on the words.

In the highscores menu the best 3 scores, the names and the dates are displayed.

When you are playing there are 4 phases. The first phase starts with 3 enemy1 that have 20hp and fire lasers randomly at every second. The player can be controlled with the wasd keys and left click to fire a laser that goes to the position of the mouse. The player has 100hp and loses hp when it is hit with a laser or there is a collision with an asteroid and does damage to the enemies by hiting them with a laser. After 6 kills the phase changes and now there is a random change of spawning either enemy1 or enemy2 which has 50hp and fires to the front, right or left. Another 6 kills and the phase is now phase 3 which is the same as phase 2 but asteroids now spawn randomly from the left or right up to 3 every time. Last phase spawns the boss that has 200hp and shoots a laser directly at the player, one a little to the right and another to the left at the same time. After the boss is defeated the game goes back to phase3.

When the player is defeated they are directed to the game over screen or to the new highscore screen if their score is in the top 3. In the new highscore screen they can select 3 letters as the name, go to the menu and exit the game. In the game over screen they can go to the main menu or exit.

5. Conclusions