Hand Controlled Fruit Ninja (advanced project)

Created by
Leonardo Filippeschi (950609-0233) &
Alexandru Stoica (950813-4856)

For the Datorteknik Expo on 2020-03-02

Objective and Requirements

The purpose of this project is to develop a replica of the famous game "Fruit Ninja" on the ChipKit Uno32. The game follows the same concept as the original one: fruits are being placed on the screen from the right side, with the sole purpose of being cut by the player. However, bombs are randomly inserted to create obstacles in trying to cut the fruits. The more fruits a player cuts, the more points are gained. If a bomb is cut or a fruit is missed, life value will be decreased. When the player has lost three lives, then the game will stop and display Game Over.

The game fulfils the following requirements:

- The game is running on the ChipKit OLED display;
- The user can control the movement of the cursor(sword) with the buttons on the ChipKit board;
- The main way of controlling the movement is done with an external accelerometer, which communicates with the ChipKit through the I2C protocol;
- The game as a built-in difficulty adjustment based on the score
- The game is displaying the highest score registered

Solution

We have developed the project on the ChipKIT Uno32 along with the Basic I/O Shield and an accelerometer.

The display on the Basic I/O shield is used to show and to be able to play the game. We have taken advantage of the power offered by interrupts triggered by the built-in timer to update the screen and to control the speed of the game.

The movement on the playing field can be done with the use of the four push buttons to move the cursor position both on the X- and Y-axis. After being able to perform this, it has been made possible with the accelerometer using the I^2C protocol to gain a more fun and realistic movement of the cursor. By using the data from the accelerometer sensor we defined how to move the cursor on the screen.

Verification

The program has been verified by performing extensive testing. The development of the game was gradual and we tested it at every milestone. For example after adding the fruits and the cursor, we tested with only two buttons the position of the cursor and if we were able to slice any fruits.
For each new feature added, we defined the different test scenarios and what should be the expected outcome. When a test failed, we were able to narrow the problem down and focus on how to fix it before advancing to the next point on our plan. where we systematically define different test scenarios. In particular, we have done the following check: the movement around the corner cases, such as when the cursor hits the walls; more buttons pressed at once, which is the direction; when we accelerate the sensor in unexpected behavior, to be able to check its sensitivity.

Contributions

The project has been run under an intensive period, with both members working relatively equal towards completing it with distinction. Both of us have met daily and collaborated during the entire project. The game logic and the main game engine have been designed, discussed and coded together. The implementation of the accelerometer and the EEPROM has been done by Leonardo, whereas the graphics of the game have been developed by Alex.

Reflections

Overall, we are more than delighted with the result of our project. The game has turned out to be quite realistic, especially because of the accelerometer feature. This makes the game much more engaging and challenging.

This part of the course has been a pivotal moment for us, as we have been able to go beyond our limits and create something from scratch. Due to the time constraints, we were not able to complement the game experience with sounds (eg. when cutting a fruit, or mimicking an explosion) or use an external display to enlarge the playing field. But this project has sparked our interest in such endevours. and we will definitely come with a Version 2.0.