ECE 385

Fall 2020

Final Project Proposal

Super Mario

Zhicong Fan/Xin Jin
AB2/Online
Yucheng Liang

Idea and Overview:

In the final project, we are going to make a classical Nintendo game: Super Mario. In this game, a four directional, two-dimensional adventure game, in which keyboard and VGA are supported. Also, you can play this game with your friends.

How to play this game?

When the game starts, there will be a start menu which could be used to choose single player or multiplayer. After choosing the mode, players will have up to 300 seconds to go through the game and fight クッパ(Bowser). Players would have 3 tries in one game, if players die 3 times, they lose the game. In the game, there will be a trigger such that if Mario gets in touch with this trigger, the bridge that Bowser is on will be broken so that Bowser will fall into lava. If multiplayer mode is selected, only one player could reach the end. Yes, it would turn into a competing game instead of a cooperating game.

Relevant Hardware:

Implementation of System Verilog with components such as the System Bus, RAM, Video Display, Keyboard, and Emulated Disk Drives.
Walls and Barriers, Movement logic, Game board and object coloring, and Timer.

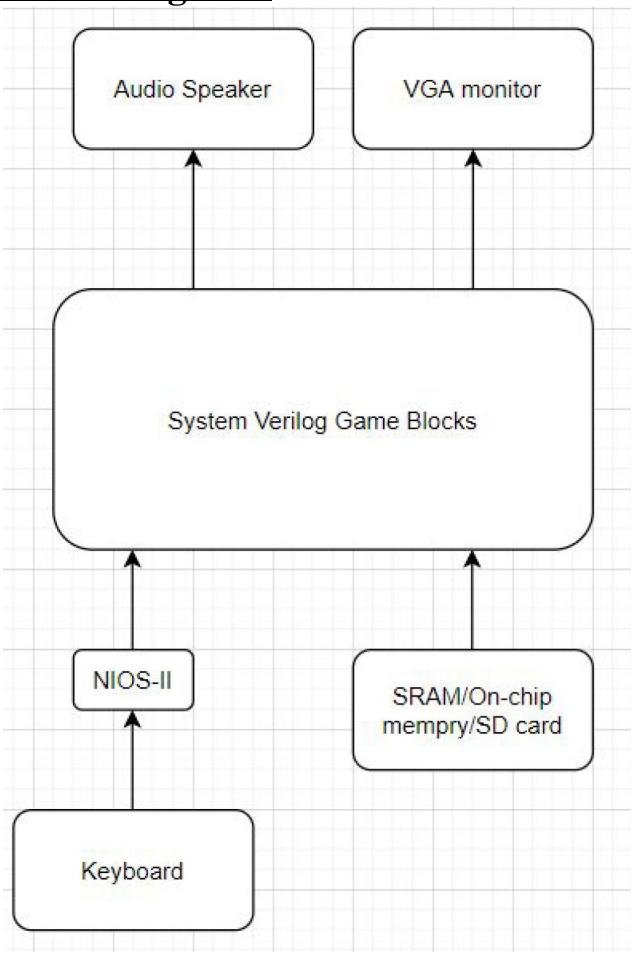
Software Components:

Software Components (Code written in C)
Score and lives calculation, Random Object Placement, Keyboard Input Processing.

External Resources:

385 IO shield for USB keyboard input.

Block Diagram:



List of Features:

Basic Functionalities:

1. A single user will be able to use a keyboard to control the movement of Mario. Mario is only allowed to move left and right, or jump. The movement will be blocked by the walls, tubes, and bricks. Mario will need to jump over walls and tubes in order to proceed. Mario can also jump onto the brick. Mario will lose one life if he jumps down the cliff.
2. Two users mode allows two users to control two different Mario brothers. The rules and challenges are the same for each player.
3. Mario can gain coins when he hits them. Some coins are hidden in the surprise blocks, which can be identified by a question mark. Mario will get those coins when he jumps and hits the surprise blocks. Some of the surprise blocks contain the magic props. Mario can gain those magic props when he jumps and hits the surprise block. The effect of the magic props will be explained in additional features.
4. When Mario hits the Little Goomba, Mario will lose one life. Mario can choose to jump over Goomba to avoid it or jump onto it to kill it.
5. When Mario hits the Koopa Troopa, Mario will lose one life. Mario can choose to jump over Goomba to avoid it or jump onto it to kill it. When Mario kills Koopa Troopa, the shell of Koopa Troopa will eject to the counter direction of Mario, which can kill other Little Goomba or Koopa Troopa on the way.
6. Pirana Plants will come out of the tubes. Mario should avoid being bitten by the Pirana Plants by jumping over it. If the tube is too high and there is Pirana Plants coming out of it, Mario will not able to jump over it directly and should wait until the Pirana Plants hide into the tube. Mario will lose one life if he is bitten by the Pirana Plants.
7. At the end of the game, Bowser will be the final boss, who will aim Mario and spit fire. Bowser will move within a small range, and Bowser is also able to jump. Mario will lose one life if he hits the Browser or burns by the fire.

Additional Functionalities:

1. There will be two counters for the total number of coins earned and total number of points gained by each player. Mario can gain 100 points by killing either a Little Goomba or a Koopa Troopa.
2. The special props are Magic Mushroom, Fire Flower, and 1-up-Mushroom. Magic Mushroom will double the size of Mario. Fire Flower allows Mario to eject fire, and 1-up-Mushroom will increment the number of lives by one.
3. There will be a special tube for Mario to enter (Mario cannot enter normal tubes). When Mario enters the special tube, he will be transmitted to the underground world where he can gain special gifts (props and coins) and may also encounter Little Goomba and Koopa Troopa. When Mario leaves the tube, he will enter the final boss Bowser directly.
4. There may be background music for the game. When Mario gets killed or trigger some events, there will also be special sound effects.

Expected Difficulty and Justification:

We expect a 7/10 difficulty score for basic features and if we finished all extra features, we would expect 9-9.5/10 difficulty.

Justification for a 7/10 difficulty score:
In lab 8, it took us a great time to connect the NIOS II processor with the keyboard interrupt and this time, things are more complicated than before. And there are many features either in the map or in the characters we described above. Also, for Bowser, we implemented AI for it, so that it would attack where the players are. Therefore, we pretty much deserve a 7/10 for the amount of work needed to achieve this level.

Justification for a 8.5-9 difficulty score:
Since we have never learned how to swap the character in the middle of the game, nor how to connect FPGA with the speaker to make sound. Therefore, making these functionalities would surely take us a great amount of time. Also, the different animations when different props are used

are very difficult to sketch. Therefore, we deserve 9 points if we implement all the extra features.