

## **Project Milestones**

What is the title of your project? Switch memory game

Provide a one-paragraph description of your project:

For our project, we would like to implement a game where a random sequence is displayed to the user and the user must remember and reinput the same sequence. The sequence will be generated using a random number generator that could be a counter that is connected to the 50MHz clock onboard. It will then be displayed to the player through the LED lights by turning them on and off according to the sequence. The user will then input a sequence which will be compared to the original sequence. If after the user has inputted a sequence of length equal to the stored sequence but not matching the stored sequence, the sequence will display again, perhaps up to some number of times equal to the lives that the game has. We may try to incorporate some difficulty setting into the game as well.

What will you accomplish for the first milestone?

We will complete the random sequence generator as well as the storage mechanisms for both the random sequence as well as the user inputted sequence. That means that by the first milestone we should be able to generate a sequence of flashing LED lights to our liking and specification. We should be able to modify the rate at which the LEDs flash, as well as the length of the sequence that is displayed.

What will you accomplish for the second milestone?

We will complete the comparison mechanism between the user input and the random sequence. The game should be functional but not complete at this stage. This means that at this point the game should have some way to signal to the user that the correct sequence has been inputted.

What will you accomplish for the third milestone?

We will add some form of graphics display or perhaps audio feedback to the game, to indicate when a new game is starting and when one has been won.

## Project Motivations

How does this project relate to material covered in CSC258?

The random number generator might be difficult to implement, as hardware is generally deterministic, and generating randomness from hardware may be difficult. Having a sequence of numbers being displayed would need a shifter of some sort and displaying them at a fixed interval would require a synchronous counter. After that, checking that the player then inputs the correct sequence would need some sort of FSM to be able to determine that a mistake was not made by the player. This might be the most difficult part, as since the sequence is random, the FSM will need to adapt to that and we anticipate this will be a challenging part of the project. The third part will be relevant too as we will work some form of graphical or audio feedback into the game.

What's cool about this project (to CSC258 students and non-CSC258 students)?

The fact that you can get a deterministic system to generate pseudo-random output and tailor it's behavior to some input that a human is providing is quite cool, and to students who are taking a hardware course, they can appreciate the fact that a whole lot is going on in the background in order to just simulate such a simple game, and recognize that even though it is a simulation by Verilog, there could be a hardware implementation that does this simply through the physical properties of semiconductors.

Why does the idea of working on this appeal to you personally?

I think that being able to work with hardware itself and not having a layer of software that has abstracted the hardware is very interesting. For example, the game that we intend to build could very easily be implemented in a programming language such as python. But years of work have gone into the development of python to make it easy and simple to use for everyone. What we are doing here is working with the hardware itself, and it's quite amazing what humans have accomplished.

~~Because of~~ Thanks to COVID-19, this project can fuck off

