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SE 101 Project Proposal
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The project that we would like to create is a game of "Simon". This game involves four coloured buttons that light up in a specific pattern, and the user presses the buttons in the exact order that they were lit up. When the user enters the correct sequence, the buttons will light up again, and the sequence will be one light longer than the last. This repeats until the user enters the wrong sequence, at which point, the game is over. Our project will be a version of this game, and we will use four buttons with lights in the same way as the classic version. We will also incorporate a user interface on a laptop, where the user can enter their name, and there will be a database with scores.

"Simon" will have a few major software components. The most significant will be developing an algorithm to randomly generate a sequence, and continue extending the sequence as necessary. Additionally, we will need to construct an easy-to-use interface on the laptop that allows the user to start and end the game, as well as view scores. Lastly, we require a system to communicate between the laptop and the physical game, for the purpose of information transfer.

To create the game, we will require a series of prototypes. The first prototype will involve manipulating the lights on the hardware to light up in a particular pattern, for a specified duration. This will be an experimental, vertical prototype, with the main goal of understanding how to switch each light on and off appropriately. From there, we will explore the functionality of the buttons, focusing on accurately retrieving information from this hardware to the computer program. This will likely be an evolutionary prototype because the same system for obtaining input from the buttons will be used in the actual game, and the primary purpose of this step is the integration of the hardware with the software. Another prototype that we will need is a vertical prototype of the main algorithm we will use for the game, which generates a random sequence and extends the sequence when required. This prototype will be a computer simulation, and will be evolutionary as we will then implement the same algorithm into the hardware.

The hardware we currently intend on using for the project is an Arduino UNO R3, accompanied by external sensors (buttons) and LED light bulbs. We will also require a laptop for the GUI and to store the database. Additionally, we may require USB cables to connect the game to the laptop.

The first challenge we are anticipating is integrating the software and hardware components so that they can communicate. We are unfamiliar with how to use Arduinos, and simply learning how they work will likely be the greatest challenge we face. Another challenge we are anticipating is sending information between the user interface on the laptop and the Arduino itself. This will either occur through Bluetooth or through wires to physically connect the two together.