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**Project Details**

In the game Labyrinth, a player tries to guide a marble through a maze by tilting the board (as you tilt the board towards one side, the marble will roll in that direction). The maze also includes many holes that the player must avoid, and requires precise motor skills to control the movement of the marble. Our project idea is to automate this process; a camera will be viewing the entire board from overhead, and will direct the video to a computer to track the position and velocity of the marble. This information will be fed to an Arduino, which will roll the marble from start to finish using servo motors.

**Software Components**

- OpenCV will be used for tracking the movement of the marble
    - Transfer information from camera to computer to arduino
- Set up connection between servo motors and arduino
- The project will most likely be coded in C++ or Python

**Prototype Plan**

We intend to create an experimental vertical prototype. Much of what is required to make this project can be explored in great depth. By pursuing an experimental vertical prototyping plan, we will be able to explore each specific component in depth so that we are able to understand each individual component of our project (e.g. learning how to use OpenCV first, and all its capabilities). After exploring and understanding each individual component of the project, we will be able to better achieve the objectives of this project.

Before trying to piece everything together, we hope to achieve the following milestones first:

- Properly attaching motors so that a human is able to tilt the board using a keyboard/controller
- Learn OpenCV and have a computer be able to track the marble on a wooden surface
    - Then, make it so that the marble can be tracked in real time
- Finally, automate and write algorithms to move the marble to the end without human input

**Hardware needed**

- An Arduino UNO that controls the motors
- 1080p camera (preferably small)
- 2 Servo Motors

**Anticipated Challenges**

- Integrating all the hardware and software together will be difficult.
    - Getting data from the camera fed to the PC and getting data from the PC fed to the arduino will be challenging
- Tracking an object will always be a challenge
- We are not sure what algorithm we should use for actually moving the ball from start to finish. A fully automated system may prove to be difficult; hardcoding specific points on the board that the marble needs to go to may be more realistic.