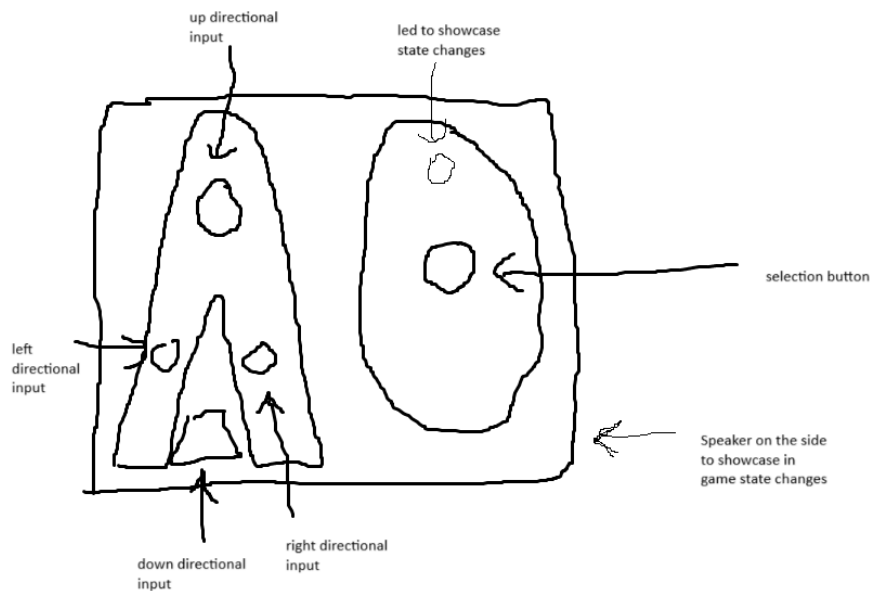


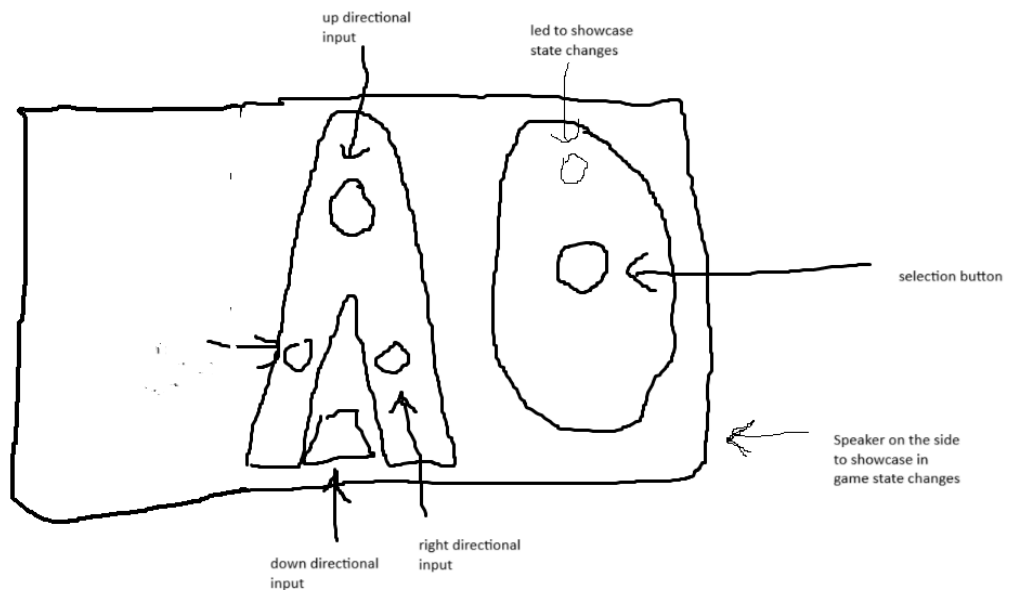
# Controller Explanation File

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## Brainstorming

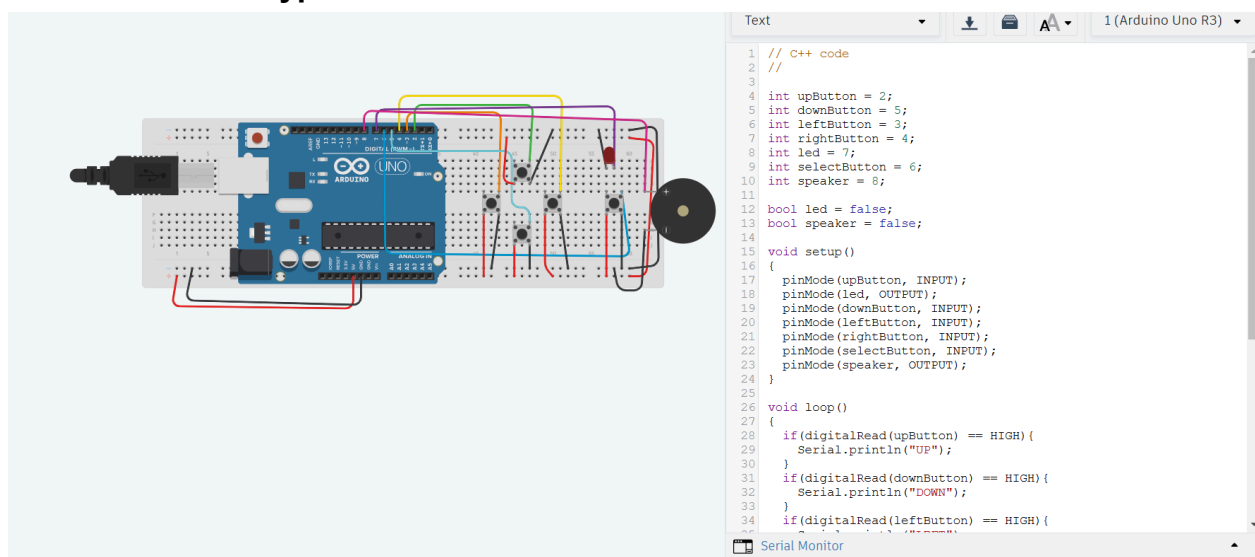


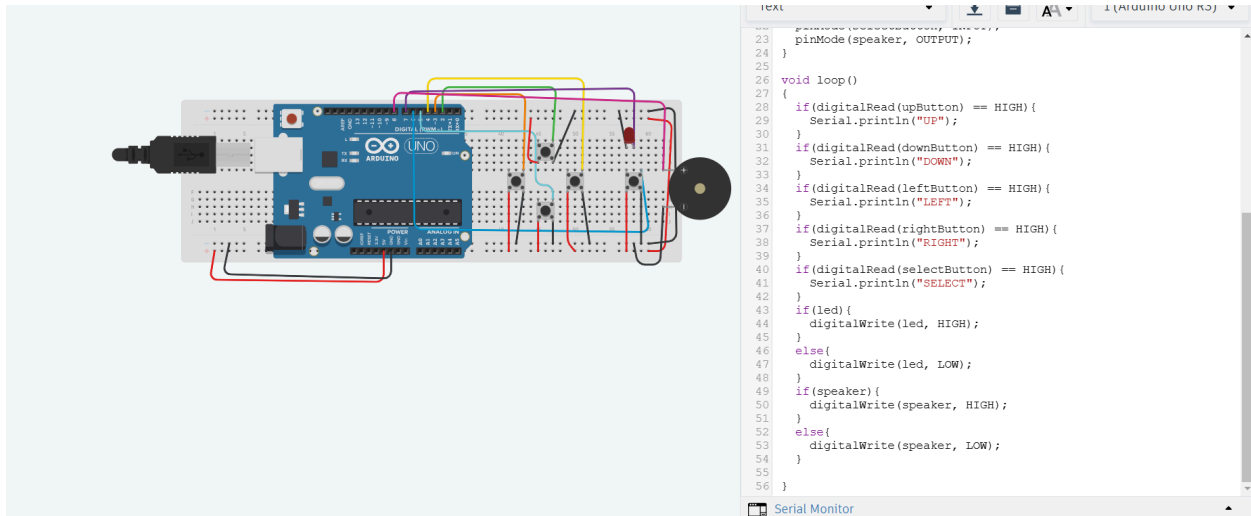
The first step I took was the brainstorming phase. I created a sketch of what the controller should look like. The shape of the controller are the letters A and O, with a base to hold everything together, these are my initials. The A has the directional input buttons attached to it. The top of the A is the up movement button, bottom is the down movement input, and then the left and right side have the left and right movement inputs. The middle of the O has a basic selection button that corresponds with selections in game. At the top of the O is an LED/actuator to showcase different state changes in the game. At the side of the controller on the bottom right side is a speaker that provides auditory information/feedback to the player.



After creating the electronics prototype I realized that the controller needed to be modified. I've added extra space to the left of the controller so that the arduino could fit without needing to be either below or above the components. The layout of the controller was made the way it was to be ergonomic for the players using it and

## Electronics Prototype





The electronics prototype recreates the layout proposed in the brainstorming sketches but with the components and wiring involved. Each component (buttons, led, speaker) are connected to their own digital pin on the arduino controller and the code I've written implements their functionality. When the buttons are pressed, it prints out either "UP", "DOWN", "LEFT", "RIGHT", or "SELECT" depending on the button. This was done so that, if integrated into unity, all the programmers have to do is look for those messages and design it so that when those messages are received, the corresponding in game action takes place. The led and speaker get enabled when the bools of led and speaker are set to true. This was done so that they can be controlled to turn on and off whenever necessary. For example, if something happens in game and the led needs to turn on for it, all that would need to be done is setting that bool value to true. Same with the speaker.

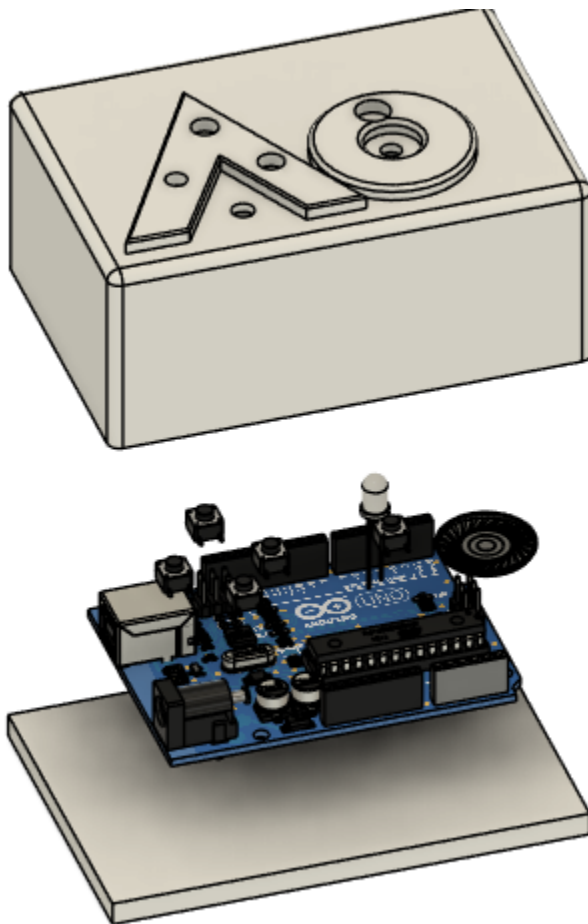
## Cad Prototype + Further Iteration

**Note:** all components aside from the speaker were collected from previous assignments so I do not have the source anymore, however they were all grabbed from grabcad.

**Speaker:** <https://grabcad.com/library/speaker-20mm-1>

After designing the controller I realized that the left side of the controller is far too long to comfortably hold. The new design has the arduino sitting underneath the breadboard. An issue with this design is that it may be too tall now. However, it's length proportions make up for this by being shorter. This controller is designed to simulate the feeling of being a rat, imagine how a rat/other rodent holds things. Back bent over, clutching the objects by the side. The design now functions more like the first iteration in the

brainstorming process. The electronics prototype is functionally the same, however instead of being beside the components, the arduino is now underneath everything. Also, since the entire left side of the breadboard isn't being used and is in the way, that part is going to be cut off.



This is the finished assembly of the controller built in fusion 360. The controller has a short and stocky design. It not only simulates the rat-like behavior as described above but it also gives the player a unique gaming experience. Although player's probably will not be able to play for long periods of time, the sheer enjoyment they will have by playing with this controller will get them to return for more play sessions later on. The issue of too much screen time is solved by forcing players to either take consistent breaks or they will start getting uncomfortable.

Aside from the physical health benefits received from playing with this controller, the small size makes it perfect for transportation.

To make this design, I first reconstructed the electronics prototype using the components collected from grabcad, then creating the lid. I created the lid first so that I

could measure out the distance between each part and accurately place the holes that the parts feed through. The lid consists of an extrusion of the letters A and O as well as a flat top that these extrusions sit on. Holes were placed that went from the top of the lid to the interior for the buttons/led. Then the lid comes down on the sides to contain the height of the components, breadboard, and arduino. Once finished with the lid, I took measurements of the length and width then began to construct the base. After this part is when I realized that the controller's left side was far too long. It would make the controller awkward to hold and just made it look strange. So I redesigned the sketch and electronics prototype to consider the arduino going below the breadboard rather than beside. Once I got a product that I was happy with, I modified the component construction and dimensions of the lid and base to the new specifications.

To further explain the controller:

Directional Input:

- D-Pad on "A" Extrusion
- The buttons represent a directional pad

Visual Cues:

- LED
- LED gets turned on and off via in game events

Auditory cues:

- Speaker
- Speaker outputs sound via in game events

Continuous Input:

- Selection Button
- Continuous input of select button is used by player and game for use in game events