### Abstract

The Compass Game is a device designed to help Kindergarteners learn how to read compass directions. The base has four LEDs with symbols for each direction on them to indicate which direction to find. There are also two LEDs to indicate if the provided answer is correct or incorrect. Next to the LEDs is a button that stops the game. The highlight of the game is the select dial and the compass face. This is where the gamer chooses his or her answer to the question by turning the dial. The game is designed to track how long it takes the gamer to get the correct answer. The controller is an Arduino that is connected to MATLAB to display gamer stats. And the end of the game, MATLAB displays the average time the gamer took to get the correct answer and his or her success rate per question.

### Methods and Materials

The game’s housing, the gearbox for the dial, the dial, the spring, and compass face were all designed by me from scratch in Autodesk Fusion 360. I printed all the non-electronic parts in the IDEA Lab and wrote all the code in MATLAB. Special thanks to Professor Tolga who made this project possible and helped develop it, Cedric Bleimling the Manager of the IDEA Lab, and Trevor Neal who helped me print the parts. The non electronic parts were all finished in ENGR 125 this past winter. You can see the PCB wiring on the right as well as the implementations.

### Conclusions

This was a really fun project. It is pretty and functional. I learned so much about designing and prototyping. One design defect is that the dial only goes in one direction. This affects the game’s times to get each answer. That is something that could be improved in future versions. All in all it was a lot of work but rewarding. Thank You!

### Code

The code of this project was the hardest part. At the start of the game, after a brief animation, the gamer receives a random direction from the LEDs as a question. They can then try to find the correct direction using the bronze dial on the compass top. The game is coded to prevent the same question from being asked twice in a row, and it keeps asking the question until the gamer gets it right. If the gamer keeps the dial on the wrong answer for more than 3 seconds, the answer is logged as incorrect. And if the gamer stays on the correct answer for more than 3 seconds, the answer is logged as correct and a green light turns on. Then it selects a new random question and goes on. While the gamer is playing, the Arduino times how long it takes to get the correct answer. When the gamer is finished they can press the white button to stop the game. In MATLAB the program finishes by displaying the gamer’s stats in the form of average time to get each answer, and percent correct.

The main code with comments is displayed to the left. I wrote three functions to do the job which are on the right. There is also a section of the main code on the right (in yellow) that is minimized on the left.

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