EECS 2032 Project: LED Ultrasonic Sensor

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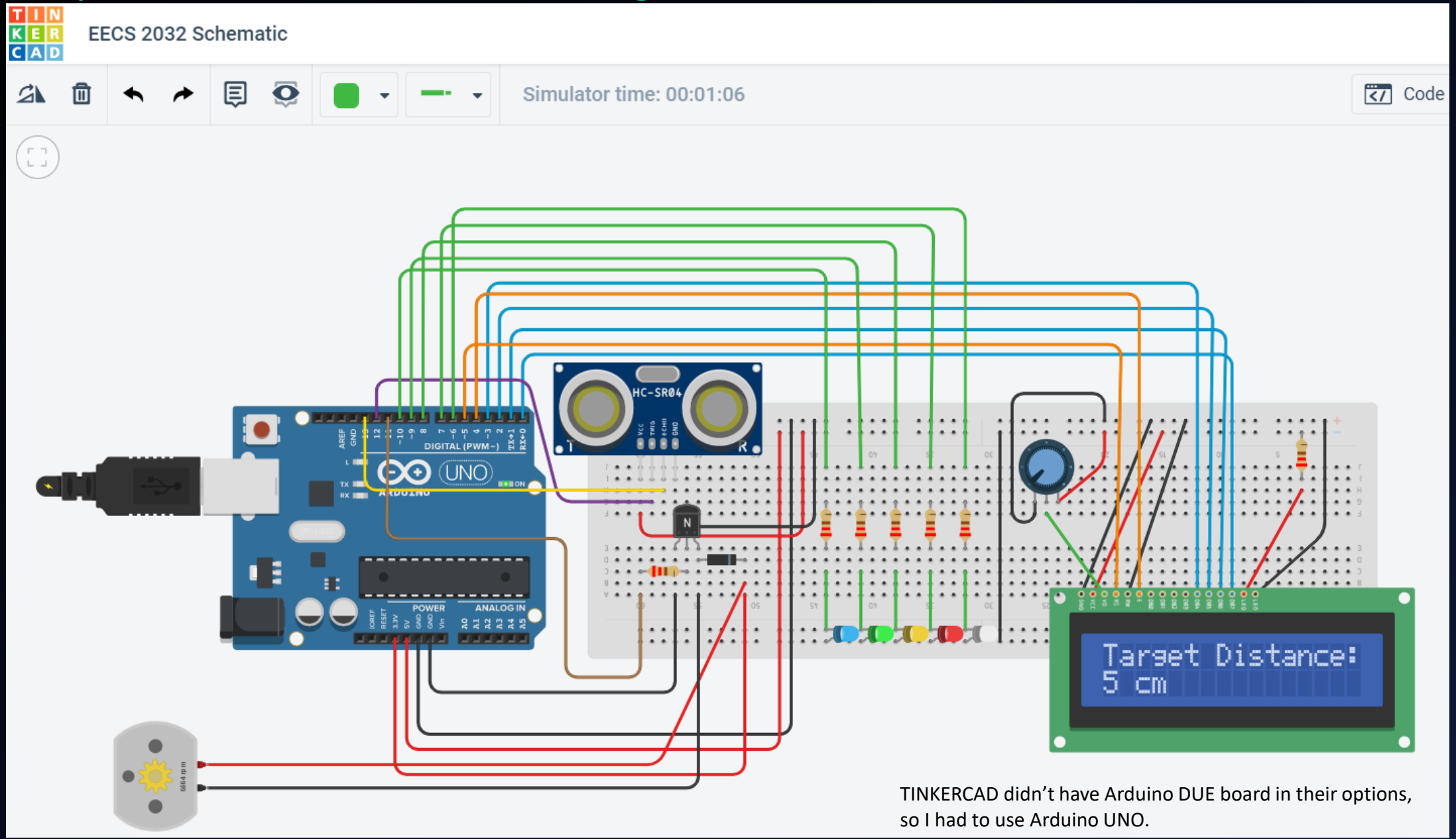
What is my project?

- My project consist of an Ultrasonic sensor that will display the distance of the object from the sensor.
- I installed 5 LEDs on to the breadboard that will light up depending on how close the object is towards the Ultrasonic sensor.
- I also installed a DC motor that acts as a fan, which will turn on if the object comes within 15 cm of the sensor’s range

My Schematic made through TINKERCAD



TINKERCAD didn't have Arduino DUE board in their options, so I had to use Arduino UNO.

Motivation of selecting the Project

- My motivation for making this project was to create sensors that would detect objects and measure the distance on how far the object is without using a ruler. I also want my device to be hands free, such as turning a fan on when there's a presence of an object in front of the sensor. For example, sliding doors in malls or a smart light bulb. The 5 LEDs I place on the device were inspire by an EMF reader that measures electromagnetic fields.

Hardware Part of the Project

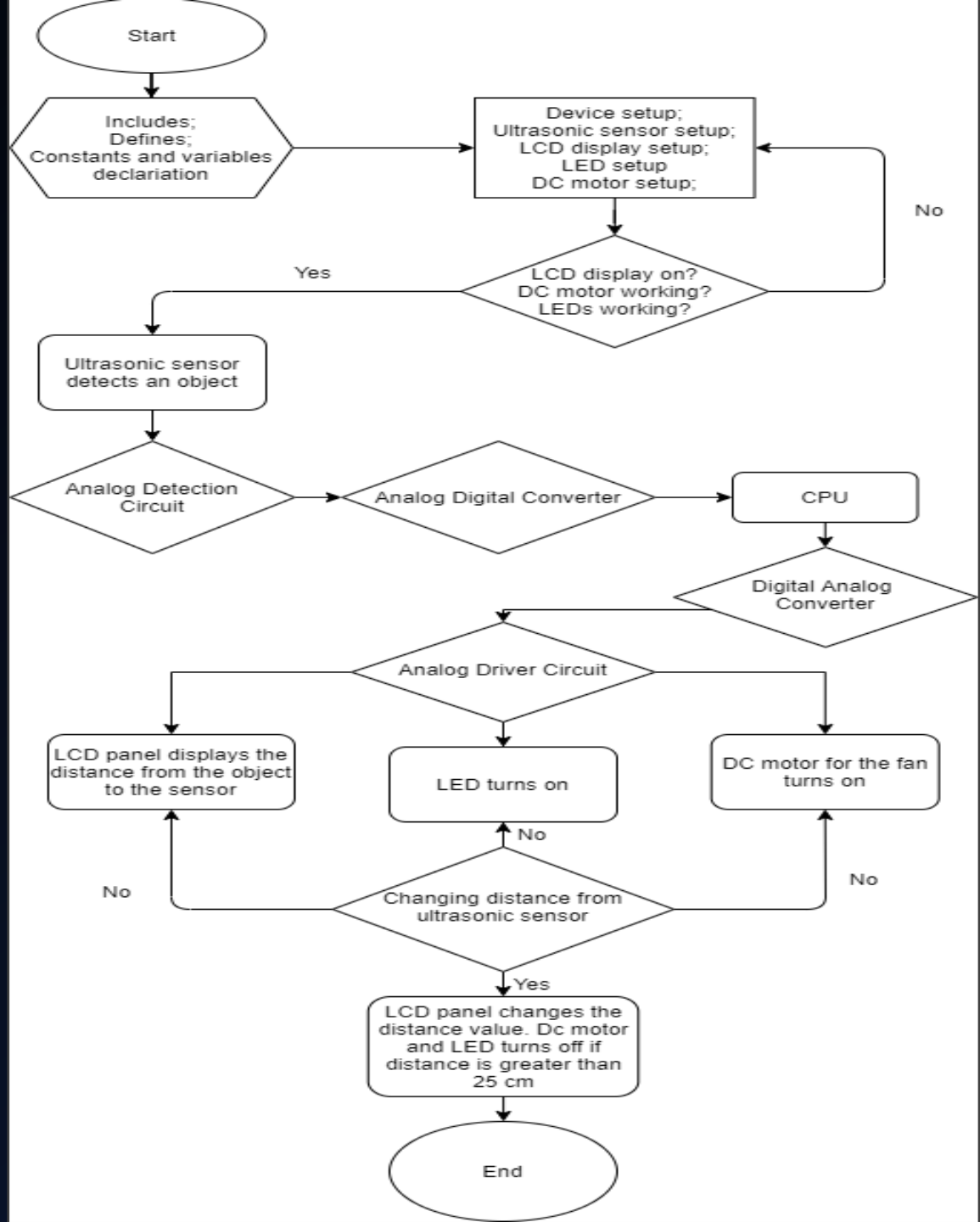
- For the Hardware I used Arduino DUE, an LCD display, a HC-SR04 Ultrasonic sensor, a DC motor, 5 LEDs, 7 Resistors, a Potentiometer, a NPN Transistor, a Diode, and a bunch of Jump wires.
- I had to use an NPN Transistor and a Diode because you can not connect the DC motor to the Arduino board directly or it will harm the board itself.
- The potentiometer was need so that I can control the brightness of the LCD display.
- Resistors were needed so not too much current goes into the LCD and LEDs.
- LEDs will light up more base on how close the object is.

Software Part of the Project

- Include the LiquidCrystal library.
- Create an LCD object and made other variables for the ultrasonic sensor, DC motor, and distance.
- Setup the LCD display, HC-SR04 Ultrasonic Sensor, DC motor, and all the LEDs from pin 6 to pin 10.
- Write a pulse to the HC-SR04 Trigger Pin and measure the duration of response from the HC-SR04 Echo Pin.
- Determine the distance from the duration using the speed of sound which is 343 m/s.
- Print the distance of the object from the sensor on the LCD display.

DIAGRAM OF HOW THE SOFTWARE WOULD WORK

- For the DC motor, I coded that it will only turn on when the object is 15 cm or less from the sensor.
- For the LEDs, I coded when each of them turn on depending on the distance of the object from sensor.



Practical Issues

- **Hardware**: The wiring for the LCD display was probably the hardest part of the project since there were many wires to account for in the project. I solve this issue by organizing the wires neatly and highlight how they will look on TINKERCAD. Another problem was sharing the 5v with the LCD display and DC motor because the display would glitch out whenever I shared the 5v between them. My solution was using 3.3v for the DC motor.
- **Software:** The coding for the HC-SR04 Ultrasonic sensor and LCD was probably the hardest part of the project as I didn't know how the sensor and LCD worked. So, I looked up for some online help which I will reference at the end of the presentation.

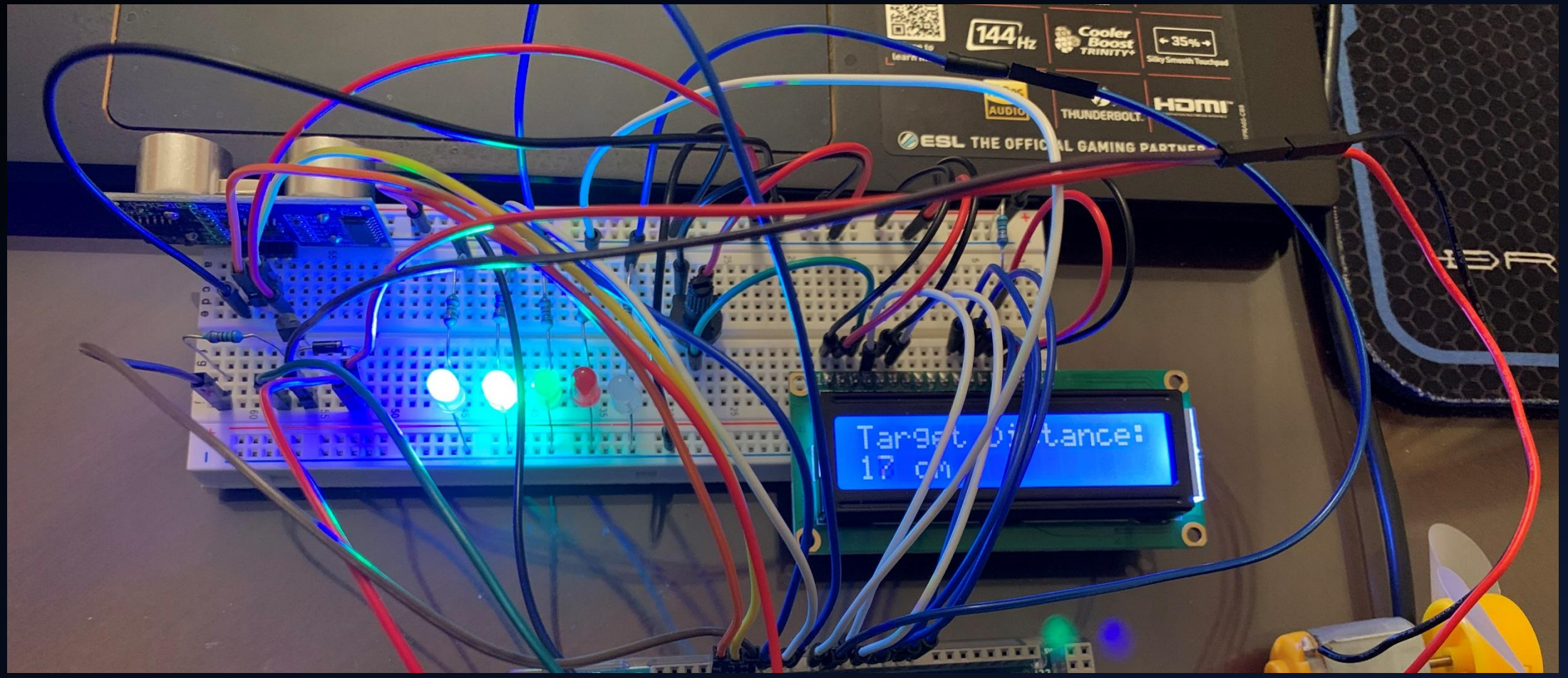
Design Tricks or Interesting Aspect of Project

- An interesting aspect of the project was learning how the LCD display and HC-SR04 Ultrasonic sensor works.
- Some Design Tricks I was able to make was using both the 5v and 3.3v pins.
- By spending more time with the LEDs and DC motors I was able to code when they will turn on or off base on the distance of the object.
- I was able to make use of all the pins on the Arduino DUE and bread board.

HOW CAN THIS PROJECT HELP ME IN DEVELOPING MY FUTURE JOB?

- This project helped me gain valuable experience which will help me in my future endeavors.
- Many of the skills associated with this project such as brainstorming, rapid prototyping, design, and electronics were improved through the many smaller tasks I have completed.
- It teaches me the basics of project and time management.
- I learn a lot more on how each sensors works and how other parts of the devices are needed for the project.
- These skill will help in pursing my future career in Computer Engineering.

Picture of my Project



References:

- https://lastminuteengineers.com/arduino-sr04-ultrasonic-sensor-tutorial/

Thank you for Listening to my Presentation