CVEN 6301: Sensors for Civil Engineers

Assignment 2
Due Date: 07/13/2023 (In class)

Assessment Goals:

1. Use LCD and Ultrasonic distance sensors
2. Use I2C and SPI communication protocols
3. Identify the logic behind sensors used in transportation engineering
4. Practice the use of User Defined Functions in Arduino
5. Gain familiarity with Binary numbers (Bits) and digital signals

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Problem 1: Write a function to convert an integer between 0 – 255 into a 8 bit binary digit and pass the binary digit to a shift register connected to 8 LEDs. The LEDs should highlight the 8 bits. Send the least significant bit first.

1. You need to have an input from the user (an integer between 0 – 255) in decimal (base 10) format.

2. You need to convert to binary (using a function) and then pass this to a shift register one bit at a time.

Problem 2: Create a setup using Arduino that uses an LCD (I2C preferred) to display the speed of an incoming vehicle. The speed should be displayed when the vehicle is within a certain distance of the LCD display (so the vehicle driver can observe). The LCD should also print a message – "Slow Down" if the vehicle is speeding or "What is wrong with you" when the vehicle is too slow (below a lower threshold). You can select any suitable upper threshold (speed limit) and lower threshold (minimum safe driving speed) to make this work. **Note: When using an Ultrasonic Sensor, you need to correct the velocity of the sound as a function of temperature. Use a temperature sensor to measure temperature and** Write a function to obtain the speed of sound as a function of temperature. (state your assumptions)

Deliverables:

1. You can demonstrate problem 1 on TinkerCAD

2. You should demonstrate problem 2 via physical setup (No simulation necessary)

Work individually on these Assignment