MICROPROCESSOR AND EMBEDDED SYSTEM LAB

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*Report should be handwritten and PDF in format.
*Topics to be covered: Title >> Objectives >> Theory & Methodology >> Apparatus >> Results & Simulations >> Discussion & Conclusion >> Reference.
*Submit the report before the next lab class in the provided link (check portal notice).
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SUBMITTED BY	
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LAB NO: 07
TITLE: Interfacing the Arduino with an external sensor using serial communication protocol for implementing an obstacle detection system.

SECTION: G	SEMESTER: SPRING 2023-24
GROUP NUMBER: 03	DATE OF SUBMISSION: 03-04-2024

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SUBMITTED TO:

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DEPARTMENT OF EEE, FACULTY OF ENGINEERING

Title : Interfacing the Arduino with an external sensor using serial communication protocol for implementing an obstacle detection system.

Objectives : This experiment has two goals in mind. First, to use the Arduino Integrated Development Environment (IDE) to write the code for a simple obstacle detection system. This entails creating the instructions and algorithms required for the Arduino microcontroller to detect and react to obstacles around it. The second step is to actually put the intended obstacle detection system into practice by connecting an Arduino microcontroller to the necessary sensor and actuators as needed. participants will gain practical experience with software development for microcontrollers and the actual development of such systems through this experiment, which will deepen their understanding of embedded systems and sensor integration.

Theory and Methodology: The open-source Arduino platform allows to create interactive electronics projects. It consist of an IDE on computer that allows to write and upload software, as well as a programmable microcontroller, code to the PCB of the microcontroller. The Arduino IDE, whi

uses a condensed form of c++ for glamoss wri ting, and a USB cable are sufficient to load co- de onto the Arduino Uno board without the need for any physical circuitry stephen noitastab plos- tado toungiesh. In this experiment, a sens sonar seisong (HCSO4) will be used to measure the dis tance to an obstacle. The number of LEDS that distance to an obstacle. The number of LEDS tha light up upon detecting the obstacle depends on how far the sensor is from the object being detected.

The separation between two objects (HCSO4) the sensor uses a sonar signal to identify this ultra- sonic sensor, reading with an accuracy of 0.3 cm (0.1 inches) over distances between 2 and 400 cm (0.8 and 157 inches). The four pins on the HCSRO4 module are Vcc, GND, Trigger, and Echo. It consists of a transmitter, receiver, and control circuit. Below is a summary of so me of this sensor's features and specifications:

- Power supply : $+5V$ DC
- Quiescent current : $< 2 mA$
- Working current : $15 mA$
- Effective Angle : $< 15°$
- Ranging Distance : $2 cm - 400 cm / 1" - 13 ft.$
- Resolution : $0.3 cm$
- Measuring Angle : $30°$

- Trigger Input Pulse width : 10 μs TTL pulse
- Echo output signal : TTL pulse proportional to the distance range.

The module may be seamlessly connected into Arduino boards through an interface. The module automatically sends eight 40 kHz pulse impulses using the output trigger pin, and it checks to see if the Echo pin is receiving any pulse signals in return. The Arduino Uno R3 board's digital pins 11 and 12 are linked to the sensor's trigger pin and echo pin, respectively. connecting wires. Pin 2 is wired for an LED to show whether an obstruction has been detected. Since the Arduino board will be changing the LED's status (high/low) and generating the trigger, pin 11 and 12 will function as output pins in this case.
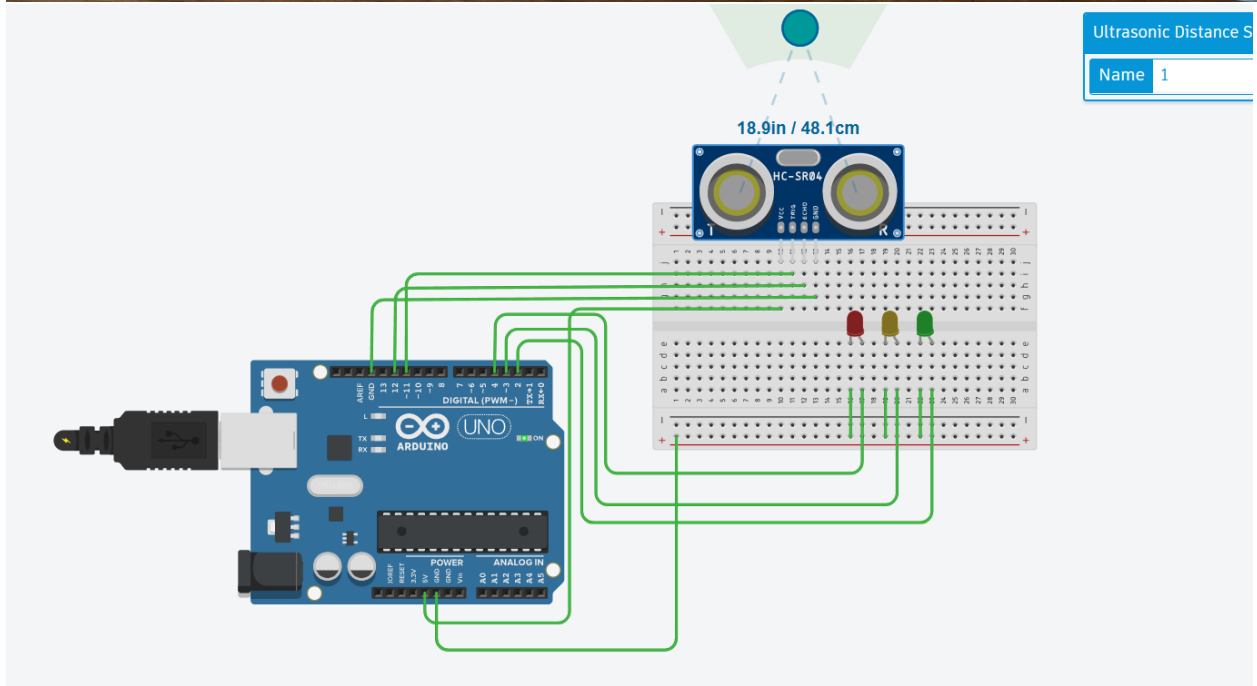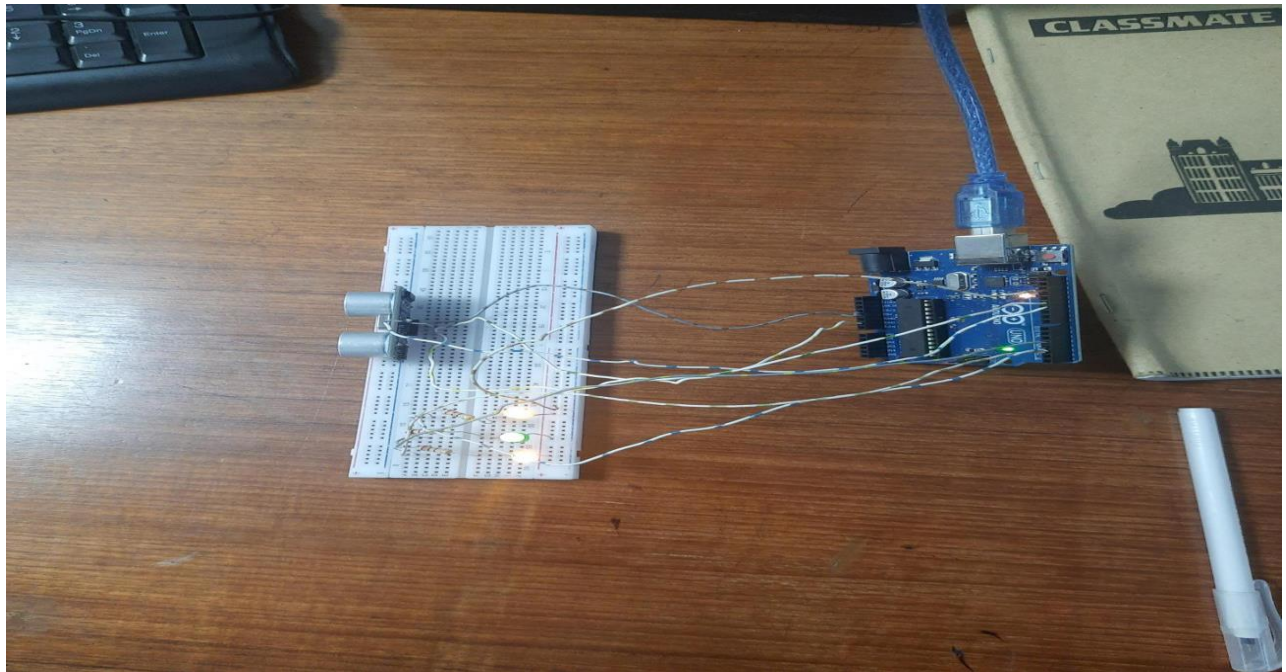
Apparatus:

1. Arduino UNO (any version)
2. Arduino UNO (R3) board.
3. Sonar Sensor (HCSR04)
4. LED

Result and Simulation:

Ultrasonic Distance S

Name 1

18.9in / 48.1cm

HC-SR04
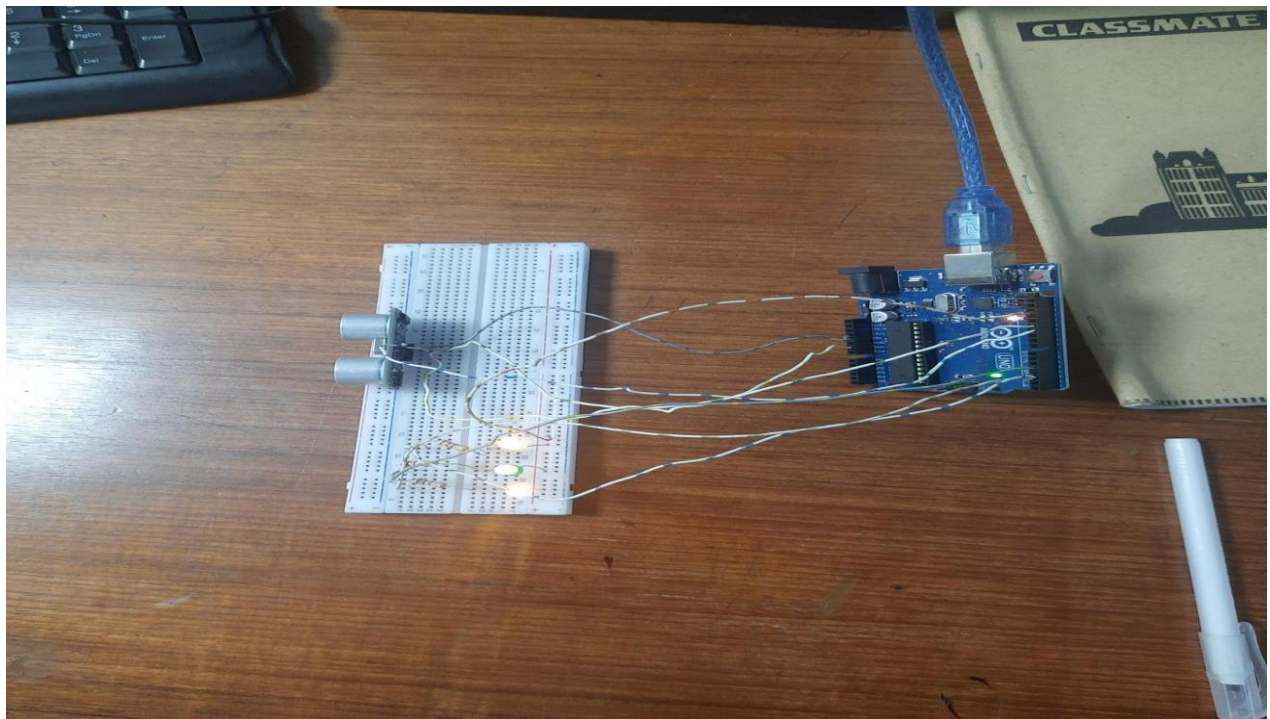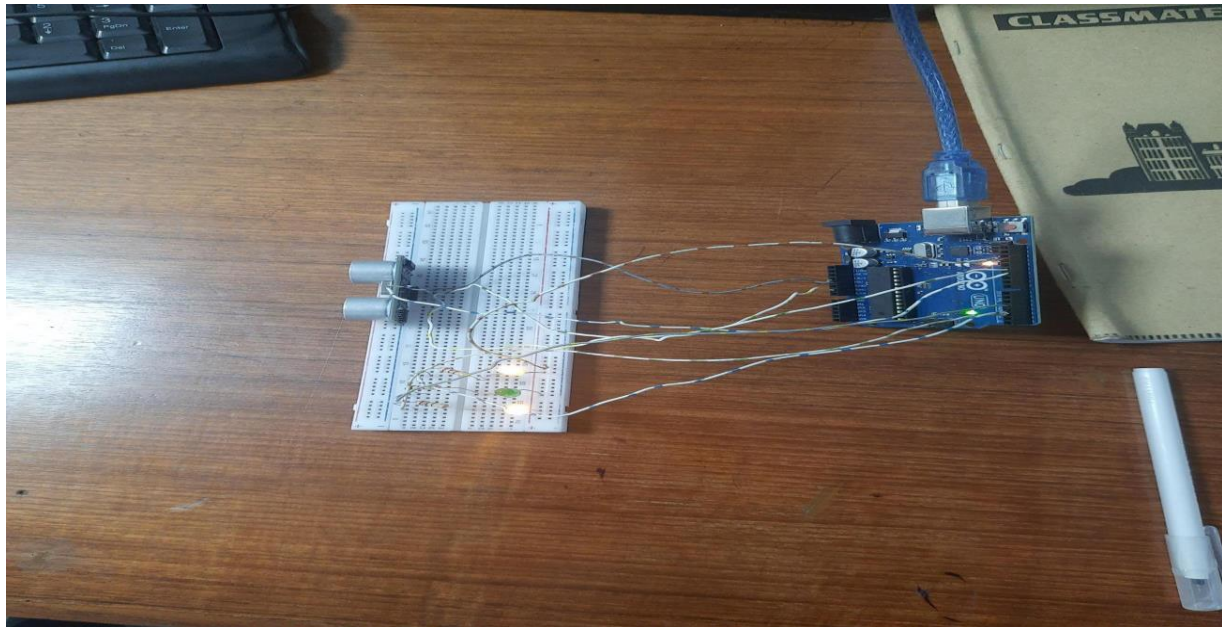
Discussion and conclusion:

Using the Aurduino IDE, an obstacle detection system was introduced in this lab experiment.

First of all, The respectable course instructor began by announcing that there were two experiments due that day, one of which would be in an online lab as physical implementation was not possible in an online class. He would then go on to explain the theory behind the first experiment and the theory behind the second experiment in an online class. Experiment 6 was carried out first on instructed by him, and then the actual creation of this experiment was completed. Subsequently, the gu the teacher verified that each group had performed accurately more moving forward. Sir gave a very through explanation of the experiment 6 theory. The coding was done really well, sir. that clarified the conclusion of that lab as well. Following that, the theoritical portion of the experiment was covered in the online class activity that involved simulating the experiment.

In summary, the entire experimental session yielded significant theoritical and practical knowledge gains.

Reference(s): [1] Arduino IDE, https://www.arduino.cc/en/Main/Software accessed on May 3, 2019. [2] Arduino and Proteus Library, https://etechnophiles.com/add-simulate-ultrasonic-sensorproteus-2018- edition/ accessed on May 3, 2019. [3] Ultrasonic Distance Sensor in Arduino With TinkerCad https://www.instructables.com/id/Ultrasonic⬚Distance-Sensor-Arduino-Tinkercad/ accessed on May 3, 2019.