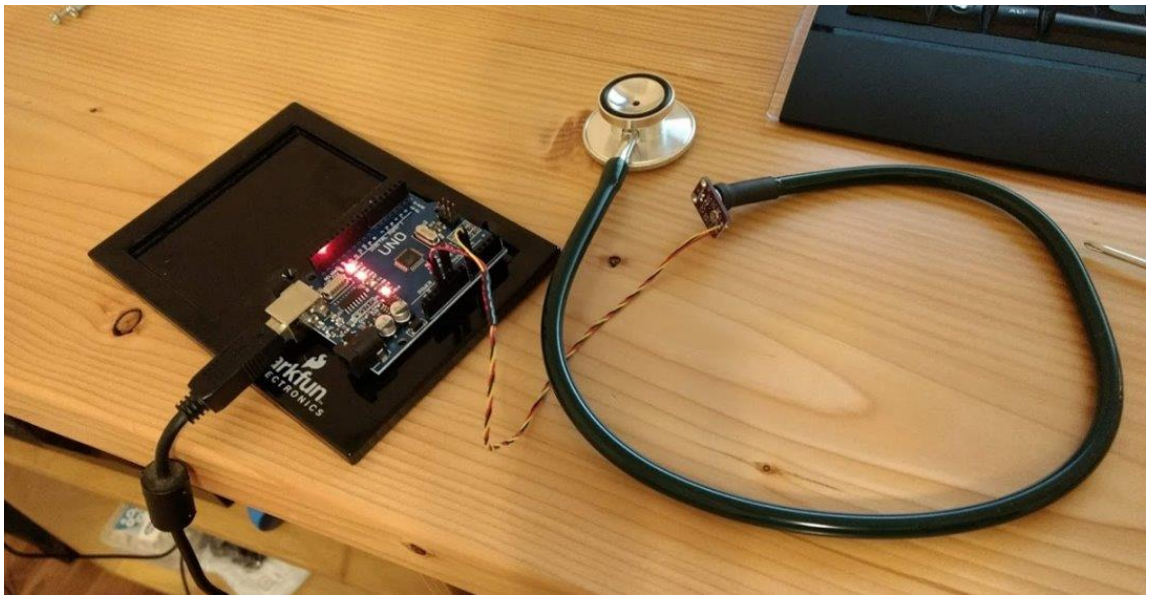
INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

Electronic Stethoscope using Arduino - Project 25



TEAM 16
Section 7
Project 25

Composition:

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Acknowledgements:

We learned a lot during our project, “Electronic Stethoscope”, be it Arduino programming, or the theoretical part of our project. It was our first time being creative with electronics. We faced many difficulties in the journey, like finding the right code for the Arduino, the data upload rate for the Arduino, and errors in graph plotting. However, with the constant guidance & support of our professors, we were able to complete it successfully. We thank our DIY faculty and TAs who allowed us to inculcate practical and communicational skills to work upon.

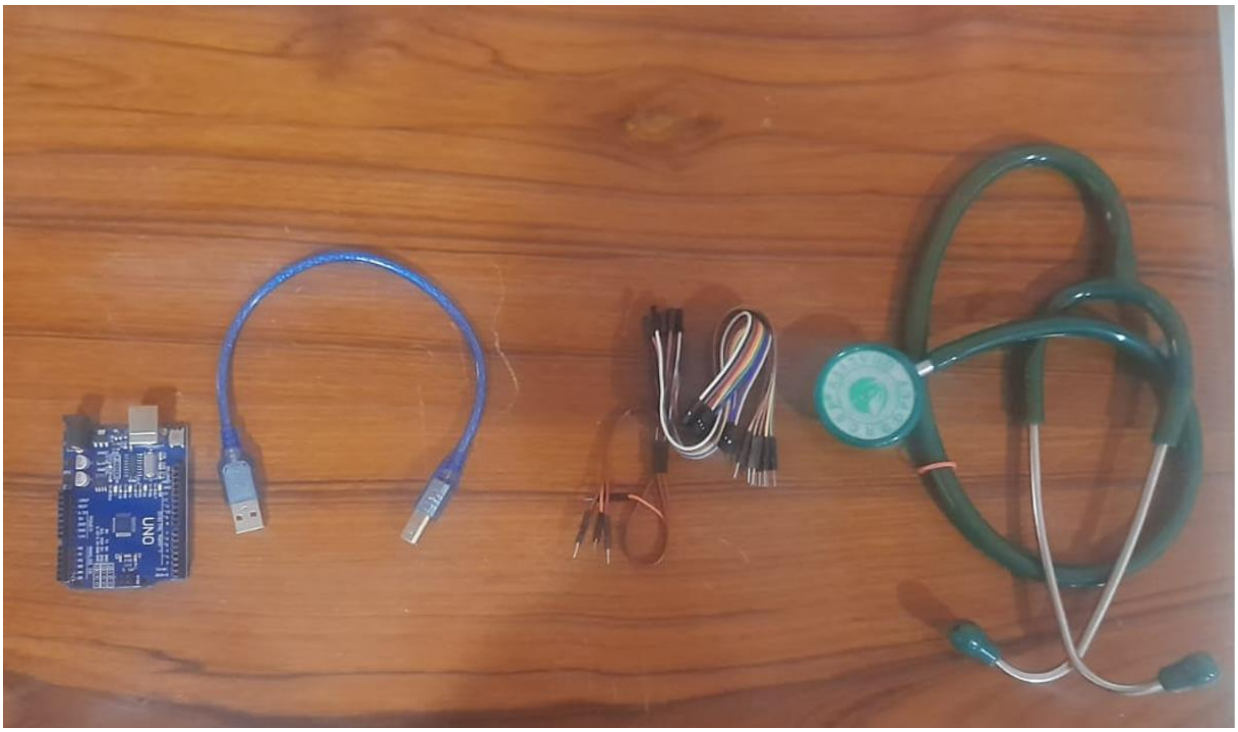
Thank you,

Members of Team 16.

Contents:

Introduction:

A common stethoscope turns the vibrations from the pumping of blood by veins into an audible sound. An electronic stethoscope, on the other hand, records this sound, which makes it useful for comparing with previous examples. In our project, we have designed an electronic stethoscope that works with an Arduino. We have used parts of the common stethoscope, and a MAX4466 microphone-cum-amplifier.



Hardware Requirements:

1. **Common Stethoscope:**

Cost: Pre-owned, ranges between ₹300-1000

Functionality: To read the pulse measurement and heartbeat and produce sound waves as the output.

2. **MAX4466:**

Cost: ₹325

Functionality: This microphone-cum-amplifier converts sound waves from the common stethoscope into electrical signals for the Arduino to read.

3. **Arduino UNO R3:**

Cost: ₹650

Functionality: This is the microcontroller board which will help to plot the voltage-time graph using the signals from the MAX4466 microphone.

4. **Jumper Wire:**

Cost: ₹150

Functionality: To connect the MAX4466 to the Arduino UNO R3

5. **USB Type A to Type B:**

Cost: ₹60

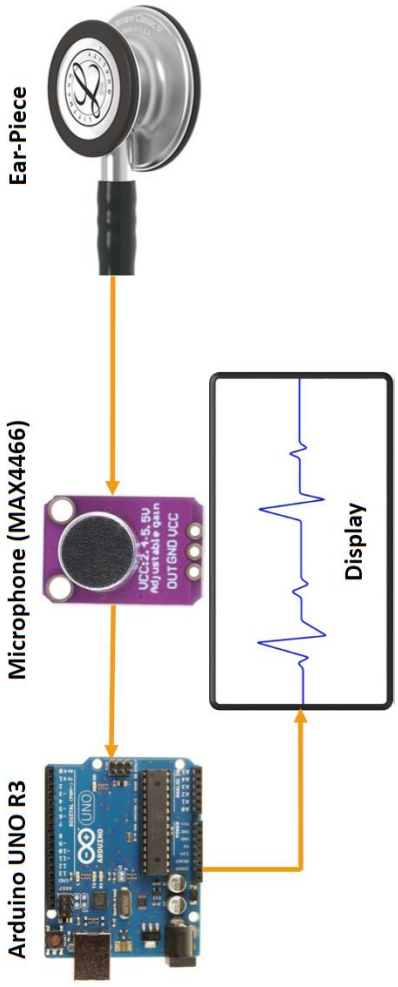
Functionality: To connect the Arduino UNO R3 to the display where the graph will be plotted (in our case, a laptop).

6. **A Laptop:**

Cost: Pre-owned

Functionality: Used for coding the Arduino and as a display for plotting the voltage-vs-time graph.

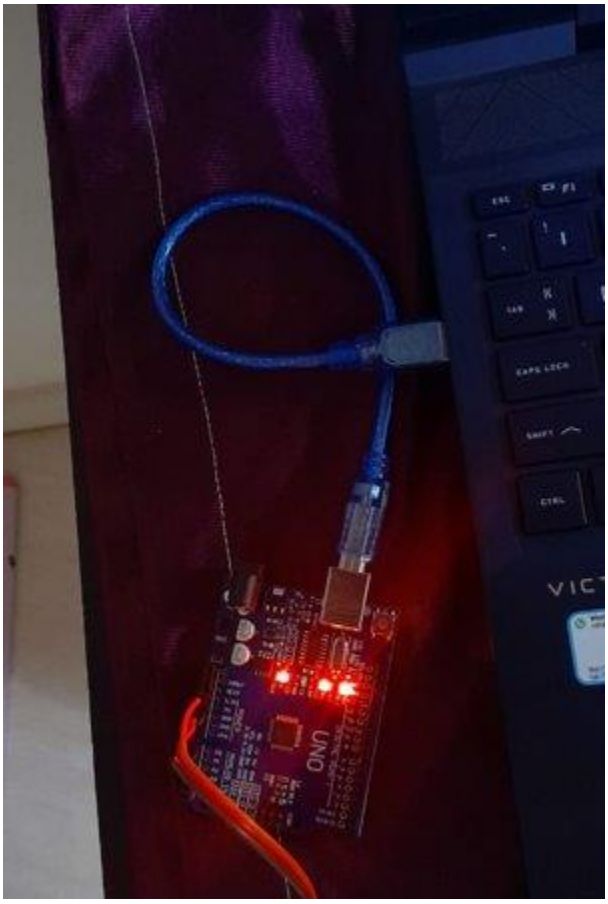
Project Schematic:

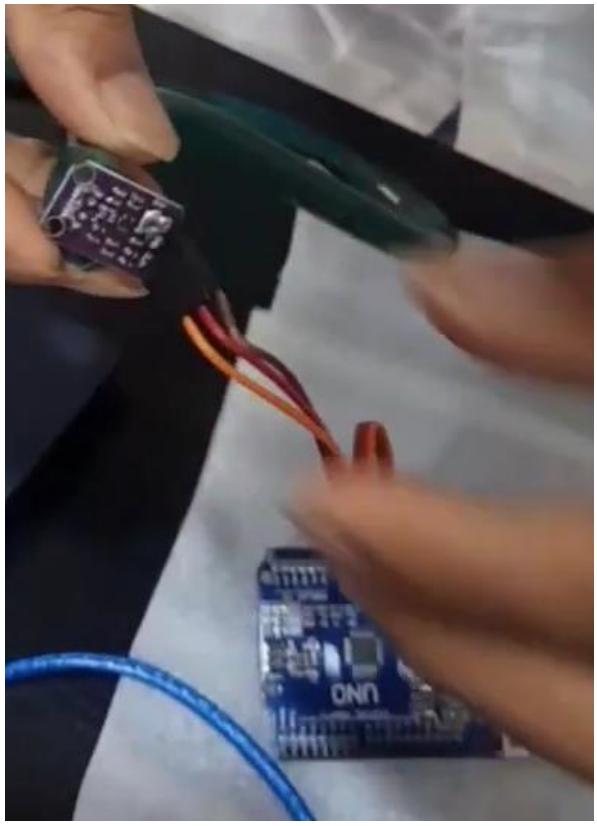


Connections:

One wire connects to the 5V power source pin on the Arduino board to the Voltage Common Collector (VCC) on the MAX4466 Microphone, another connects the ground of the Arduino to the ground on the microphone, and one connects the analog pin A0 on the Arduino to the output pin on the microphone.

The USB male port A is connected to the laptop and the USB male port B to the Arduino board.





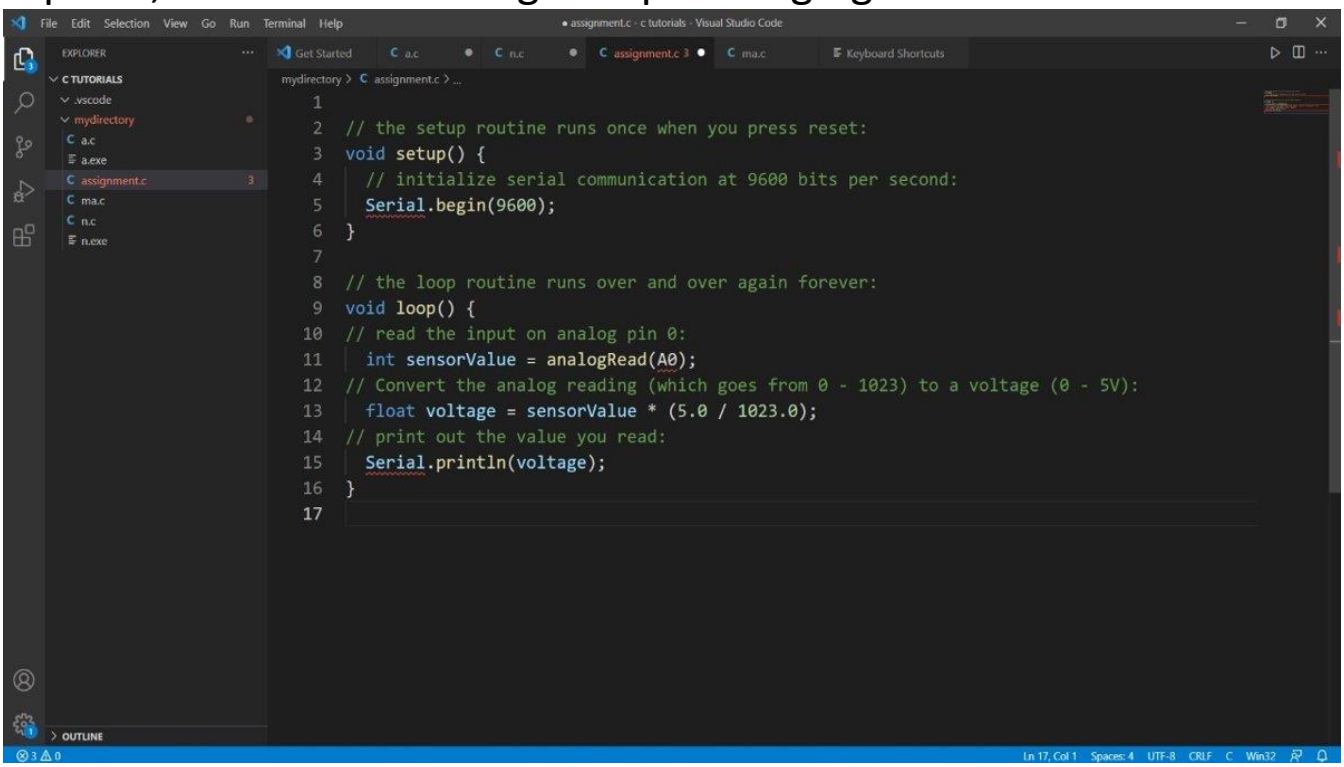
Coding in Arduino IDE for Visual Studio:

About Arduino IDE: Arduino IDE is an open source software which makes it easy to write code and upload it to the board.

Code:

The code is first uploaded to the Arduino at a fixed rate (in this case, 9600 bits per second). Then we use void loop() to repeat the routine over and over again.

Under the loop we set functions to read the signal from A0 of the Arduino and return voltage value to the display. As the loop repeats, the value of voltage keeps changing.



Demonstration:

This voltage value is plotted in a graph using the Serial Plotter in the laptop against time, which is shown in the demonstration video.

https://youtu.be/aULnjEgiwz4

References:

For Arduino:

https://www.arduino.cc/reference/en/

For Visual Studio:

https://visualstudio.microsoft.com/

Ending Note:

We have designed a simple version of the electronic stethoscope with the basic function of plotting a graph onto a display, but this project can be further improved, by coding the Arduino to display the pulse rate, removing unwanted/external noise, using a microphone with higher frequency range to detect anomalies, and using equipment of higher quality for better and more accurate readings. Thank you for reading this report and for giving us an opportunity to work on this project.