Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Creating a distance measurement device using ultrasonic transducers

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BEng Computer Systems and Electronics
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Abstract

An ultrasonic transducer is a device that will transmit a 40KHz ultrasound signal (which cannot be heard by humans as the limit for humans is 20KHz) the signal will try to be rebound off of an obstacle to be received back to the device. This is done by the device being able to convert voltage into sound by using crystals in the device known as Piezoelectric crystals these convert sound into voltage and vice versa.
These such devices are useful in many different methods such as medicine for ultrasound scans etc, parking sensors in newer cars where the sensor will alert when obstacles are near and it can also be used in factory environments to detect distances and other such methods.

Methodology

The device will include many different components to perform as intended. These are added to the breadboard for device use. The components are as follows:
PIC 16F887 Microcontroller
PING 28015 Ultrasonic transducer module
Resistors, capacitors and a crystal clock for the PIC.
LCD Screen for display

Conclusion

In conclusion the device didn't perform as correctly as intended, the device will display the text on the LCD screen that it has initialised however due to an issue with the code the transducers won't send out signals which means nothing is received to display. If more time was given the code could have been changed to allow the proper use.

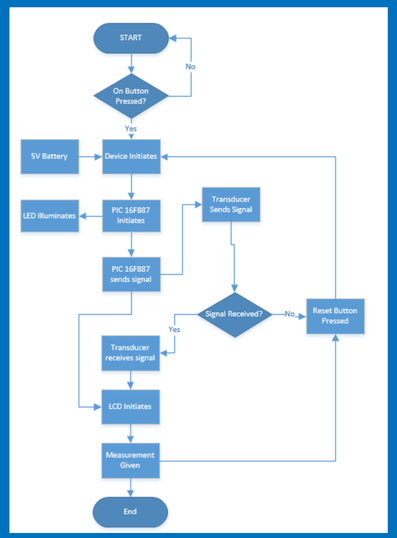


Image of the flowchart explaining how the device is intended to perform.

Aims & Objectives

The objectives of this project are as follows:

Create a device which will transmit a 40KHz ultrasound signal that will rebound off of an obstacle (if there is no rebound a reset button will be pressed) and receive the same signal that will convert using piezoelectric crystals inside the transducers themselves.

Once this has been done the PIC 16F887 microcontroller (using C++ code) will convert the time taken to receive the signal into a unit of measurement (such as centimetres) which will be displayed on the LCD Screen.

Project Results

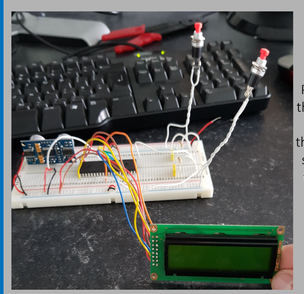


Photo of the Front-view of the device showing the LCD Screen

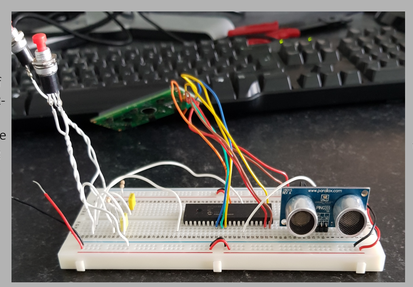
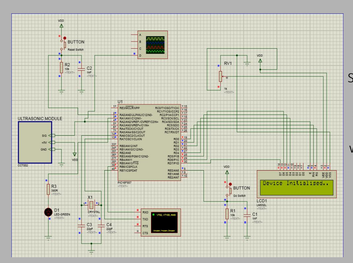


Photo of the Rear view of the device showing the Module



Screenshot of the Device in the simulation software Proteus where the device has been initialised

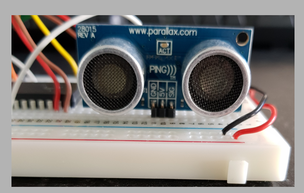


Photo of the Transducer Module that drives the main premise of the circuit (the ultrasound signal)

Future Improvements

If more time was given improvements to the device would have been made these are as follows:

Add a button that will allow the user to change the unit of measurement from centimeters to other such units like millimeters or inches.

Add a rechargeable battery pack to allow the device to be used leniently and be used for longer

A case to allow the device to be used in rougher areas (like building sites) and be shock proof for dropping the device.

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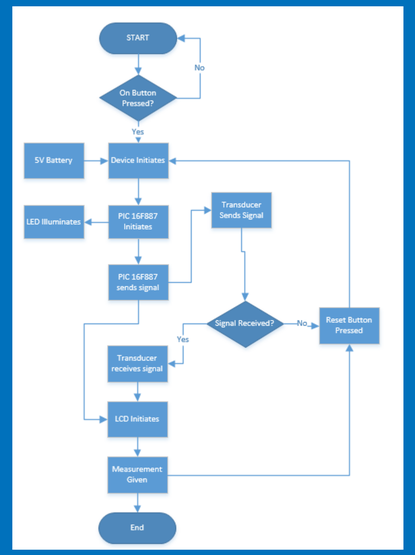


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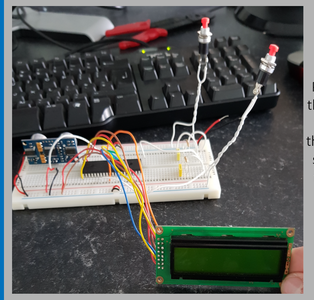


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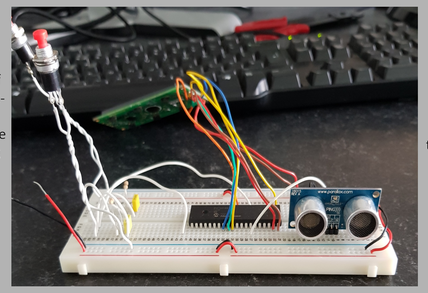
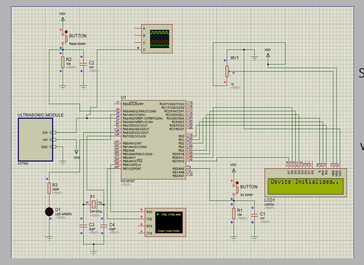


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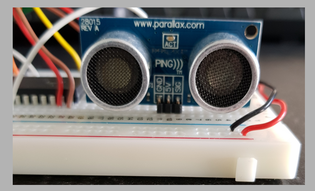


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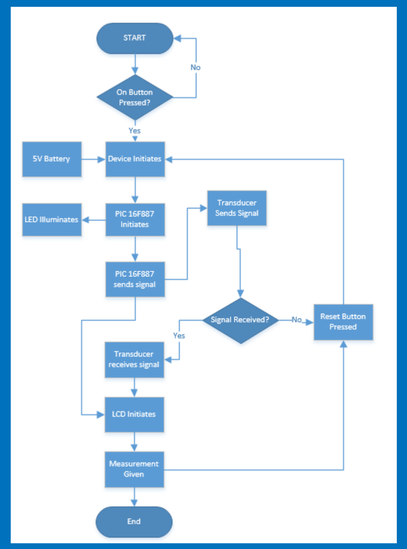


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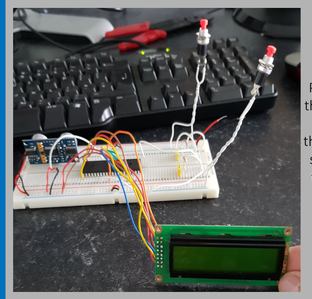


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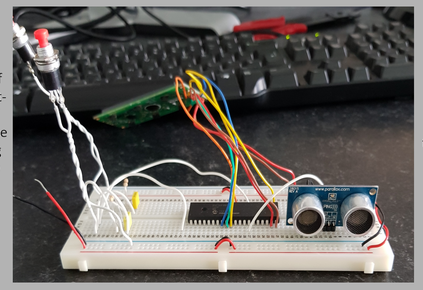
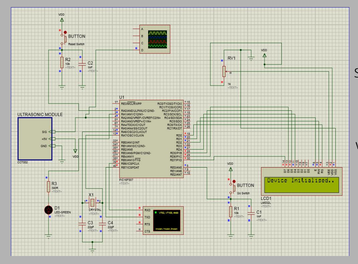


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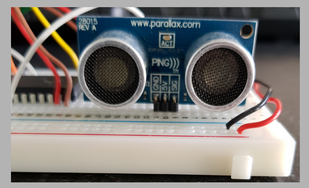


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