EE663- Project 5 Report
QNX Ultrasonic Sensor
Distance measurement

Table of Contents

Overview:

The aim of the project is to measure the distance using ultra sonic sensor.

- Sensor is mounted on the rear bumper of the car.
- The sensor measures the distance between the car and obstacle in its view.
- Continuous stream of sensor data is display for the driver's view.

Cover Page:

Project title	:	QNX Ultrasonic Sensor Distance measurement.
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Date of submission	:	11-23-2016.

Analysis / Design:

The basic idea of the project is to work on a QNX based software PWM generation required of the driving the ultra-sonic sensor and displaying the distance of the obstacle in the vicinity.

Hardware configuration:

The ultra-sonic sensor is connected to the QNX purple box with trigger and echo IO's and the power supply is connected to the sensor.

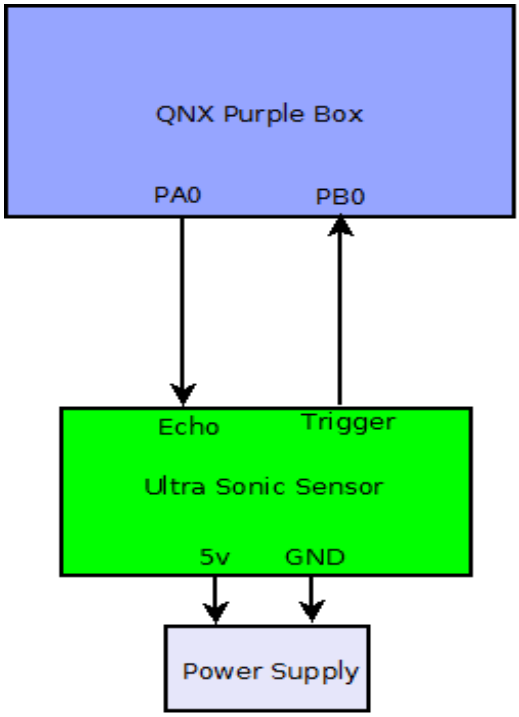

Figure1: Hardware configuration

Software Approach:

The major task for this project was to generate a software based PWM signal to drive the sensor. Ultra-sonic sensor is used to find, if any obstacle is present in-between, using the sound. The principle of ultra-sonic sensor is that, a continuous signal pulse is given to the trigger input of the sensor. Here in our case the sensor requires a minimum of 10microseconds pulse. This generates burst of signal pulses in the sensor and transmitted across the medium to find, if any object is present with-in its vicinity. The sound then gets echoed back into the receiver section of the sensor. Thus, measuring the echo signal received by the QNX will give the distance elapsed between the sensor and the object.

A sensor Thread was created which takes care of the PWM pulse generation. Multi threads was not used here in this programming. As soon as the pulse was high and low, the software to detect the time elapsed between the generation and reception of ECHO low was written. The time gap was measured using the system clock. In this way, we avoid going into multi-threads. Finally, the conversion from the time to distance was done. Thus, the distance from the obstacle at rear bumper of the car to the sensor was calculated and displayed across the QNX terminal.

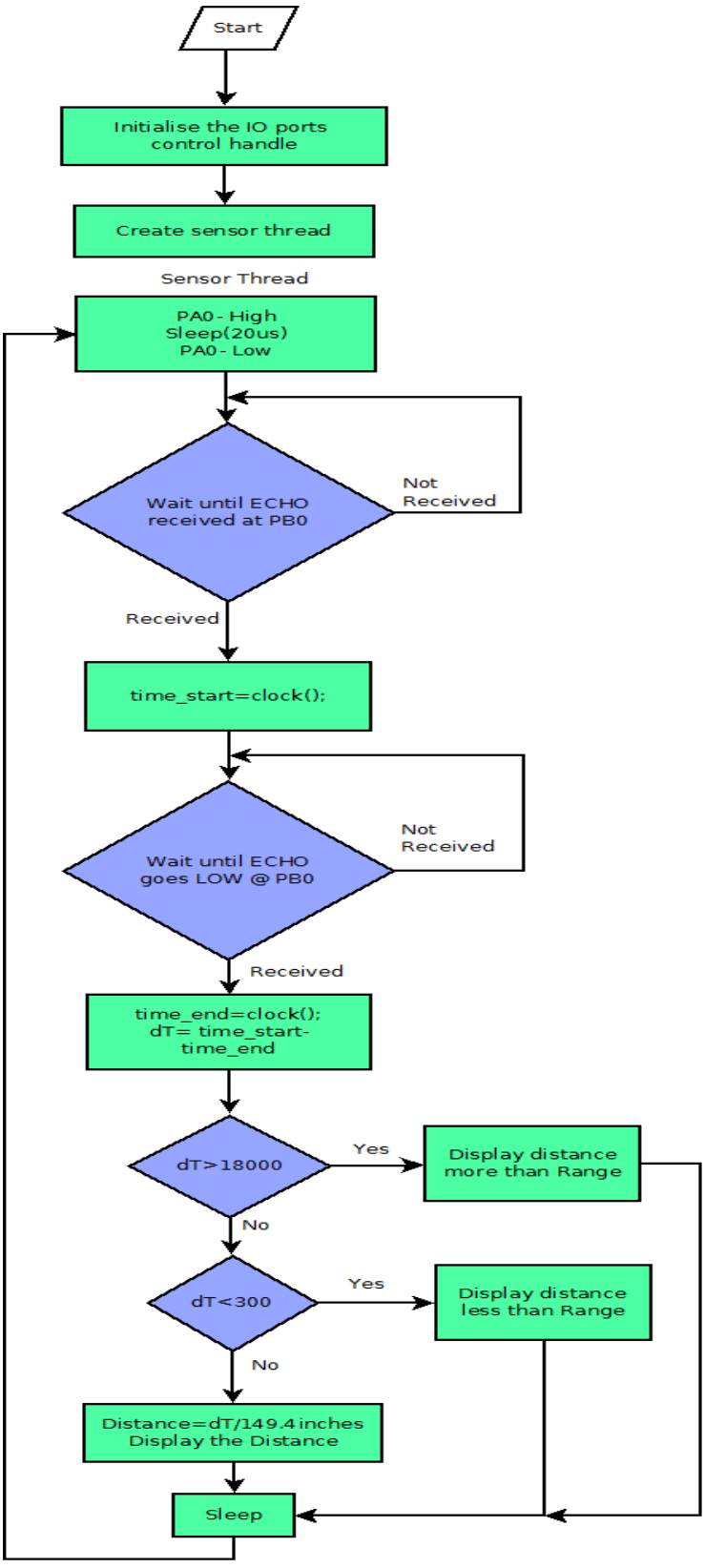

Figure2: Software flowchart

Test Plan:

- Initially generate the Pulse at the output port and check on CRO.
- Integrate the ECHO receive section of code and test.
- Use the reference object to check the maximum distance detected.

Project Results:

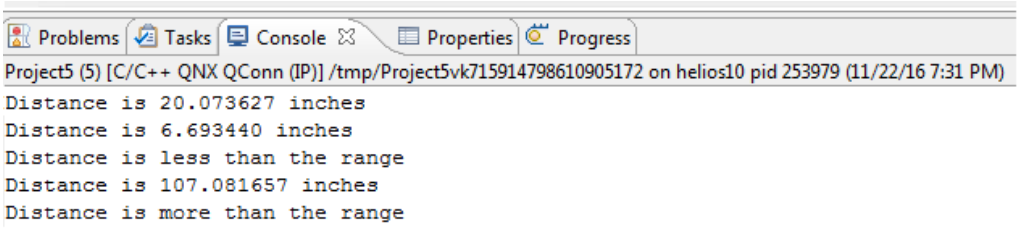

Figure3: Output screen capture

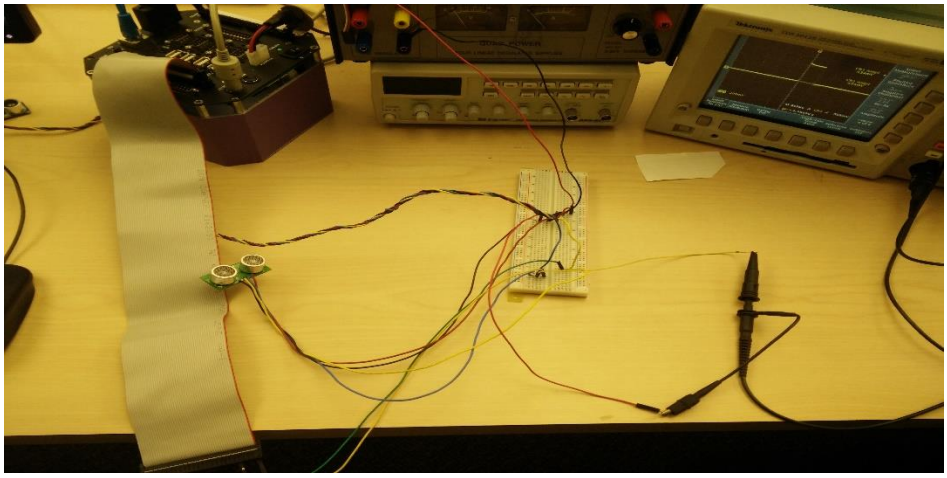

Figure4: Hardware Connections

Lessons Learned:

- Understand the concept of ultra-sonic sensors.
- Configuring the IO ports on QNX box and configuring ultra-sonic sensor.
- Software based PWM generation.
- Using inbuilt sleep functions.
- Debugging the code and to work with RTOS in background.

Submission:

The QNX ultra-sonic distance measurement project was thus successfully developed, tested, and verified.