Rochester Institute of Technology

Real Time and Embedded Systems: Project 5

Project #5:
Design and implement an embedded, stand-alone QNX Neutrino program to measure the distance between the rear bumper of your car and any objects behind the vehicle while parking.

Analysis:
Driver: When the vehicle is placed into reverse, the parking sensor is activated, providing a continuous stream of data on the distance of any objects behind the vehicle.
Car: The parking sensor is mounted on the rear bumper of the car.
Parking Sensor: When activated, the parking sensor measures the distance between itself (as located on the rear bumper) and any objects within its field of view. The distance is reported to the driver on a continuous basis.

Design Constraints:
- The distance is measured at a rate of 10 times per second.
- The results of the measurement is displayed on the console so that the value does not scroll.
- The measured results are rounded to the nearest inch and displayed as integers values only.
- Out-of-range measurements are represented as a flashing asterisk.
- The measuring process is started when the user selects a key, and ended when the user selectsanother.
- After measurements are ended, display the maximum and minimum distances measured.
- In your report, include test cases and explicit results indicating the practical range of your ultrasound sensor.

Technical Notes:
To measure distance with the ultrasound sensor, generate a positive “ping” pulse that remains high for at least 10 microseconds. The output from the ultrasound sensor returns a positive pulse, the duration of which will be from 100 microseconds to 18 milliseconds. The duration of the return pulse equals the round-trip propagation time of the “ping” pulse between the sensor and the target. The distance is determined by measuring the duration of the return pulse between the rising and falling edges, and calculating the distance based on the speed of sound in air at room temperature (769.55 mph). Please refer to the technical data sheet for the ultrasound sensor for more information.

Report:
In addition to the demonstration of your project, a brief report is required to illustrate your design, list the trade-offs and assumptions of your implementation, and show one run of your output. Your source code should be included in your electronic submission.

This project is due and will be demonstrated in class 21. No demo will be conducted without a complete, electronic and hardcopy report provided to the instructor before presentation of the demo.

Grading Criteria:
- Program Operation - 50%
- Program Design - 15%
- Source Code Structure and Readability - 10%
- Report Content - 25%