California University of PA

Dept. of Computer Science, Info Systems, and Engineering Technology

CET335 Microprocessor Interfacing

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= Lab Report =

Project Proposal: Ultrasonic Sensor with Interrupts

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I. OVERVIEW

Create a range finder that uses an ultrasonic Sensor to measure the distance, interrupts to allow computing while signal is traveling and when it returns. While the sensor waits for the return input, an interrupt with be used so that we can continue computing while we wait for the pulse data to come in. While the signal is traveling the ultrasonic sensor will be waiting for the input and three green LED's will toggle one after another to show that "computing" is happening. Once the signal is detected another interrupt will be issued so the correct time for the range can be computed. The range will then be calculated and if it is 2cm to 1m a red LED turn on, if its 1m to 2m a blue LED will turn on, if its 2m to 3m a green LED will turn on, if its 3m to ~4m a white LED will turn on, and if it is out of range or an error occurs it will cycle the red, blue, green LED. All the mentioned LEDs in the distance calculation will be on the Tiva LaunchPad.

II. PROCEDURE

1. Use the template project as a shell for the program.
2. Initialize SysTick, PLL, and PWM
3. Initialize PortF, PortB(PWM), and PortE
4. Set up FSM for the LED outputs
5. Create interrupt function
6. `enableinterrupts();`
7. Build the main program
8. Build the circuit
9. Trouble shoot main program

III. INPUTS/OUTPUTS/EQUIPMENT

a. Inputs

1. SW1(PF4) to send out pulse trigger.
2. Input pulse from ultrasonic Sensor.

b. Outputs

1. 3 Green LED for "computing" cycle
2. Tiva LaunchPad LED red, blue, green, white (FSM)

c. Equipment

1. Tiva LaunchPad
2. Ultrasonic Ranging Module HC-SR04
3. Breadboard
4. Jumper cables
5. Green LED x3
6. 220Ω Resistor x3
7. Power supply module with 9V 1A Power Supply

IV. DATA FOR THE HC-SR04

- Working Voltage and Current: $5V_{DC}$, 15mA
- Working Frequency: 40Hz
- Max, Min range and Measuring Angle: 4m, 2cm, 15°
- Trigger Input Signal: 10µs TTL pulse
- Echo Output Signal: Input TTL lever signal and the range in proportion