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Speedometer and Temperature Monitoring System for a Car

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Introduction:

This lab aims to introduce students to ADC and interrupts, and LCD with a PIC16F877A MCU. A digital speedometer and temperature monitoring system for cars was simulated. Road accidents are very common, and sometimes it is as a result of over speeding. This system works such that it can notify the driver on a dashboard(LCD). The driver can take precaution by reducing the speed of the car appropriately. This solution can decrease the rate of road accidents due to over speeding. In addition, the temperature of the car is checked and an interrupt is generated as a preventive measure of car over heating. Hence, the driver is warned.

Objectives:

To simulate a speedometer of a car using ADC principles and interrupt service routines in Proteus and on a breadboard. The results are displayed on a LCD. The following are displayed:
Speed(S): S reaches 60km/h display " Max Speed Reached", " Drive Safely".
Temperature: rises above 40°C, " High Temperature" , " Check Coolant".
Push Button: "Ext. ISR", "Drive Safely".

Materials:

- PIC16F877A
- DHT11 sensor
- LCD (16*2)
- 16MHz Crystal
- MPLAB V5.05 IDE
- Push Button
- Two 0.1uF Capacitors
- 10kΩ Potentiometer
- PICKit 3
- Jumper Wires
- MPLAB V5.05 IPE

Image Showing the Hardware Implementation of the System

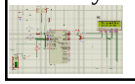
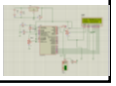
The System shows a scenario were the push button interrupt was triggered. When the button is triggered a warning is displayed on the LCD as follows:
" Ext. ISR"
" Drive Safely"

Connections

The DHT11 sensor pin connects to RB1 of the PIC16f877A.
The push button is connected to pin RB0.
A potentiometer represents the speed sensor in this lab, and it is wiper pin is connected to RA0.
The ADC aids in creating a count that makes it possible to implement the speed check .

Reflection/Discussion

This lab was successfully implemented on Proteus. The result below shows the Proteus simulation for when speed limit is exceeded(right), and when temperature exceeds threshold(left).
A major challenge with this lab was with programming the MCU. The PIC16F877A could not be programmed on my PC. Another challenge is with the DEMO. Proteus Simulation works perfectly but with demo there was issues getting the temperature readings. A reason for this is because the DHT11 picks value once in a second, and I used a delay that was too fast.

Conclusion

In conclusion, the use of interrupts are used daily in electronic devices. In this lab ADC was use to simulate a speedometer. Interrupts were programmed to displayed information to the LCD when any of the interrupts are triggered. The three interrupts come from temperature exceeding 40degrees, push button and speed exceeding 60km/hr. Hence, the system serves to warn drivers when they over speed.

[1]Moiz, "Displaying ADC values on LCD using PIC Microcontroller," *Techetrx*, Sep. 28, 2018. https://techetrx.com/pic-microcontroller/adc-in-pic16f887-microcontroller/ (accessed Mar. 15, 2023).