PRINCIPLES AND APPLICATION OF MICROCONTROLLERS
AVR C Lab7: DMS Distance Meter

Introduction

In this lab, you are required to design and build a distance meter using an AVR ATmega328P microcontroller. The meter you are required to build will acquire distance using a DMS sensor. It will display the distance in centimeters of 2 decimals on two 7-segment LEDs continuously. The meter will also send the distance readings back to a personal computer. After completing this lab you should be able to:

- Master in AVR ADC programming
- Master in AVR serial programming
- Perform sensor calibration

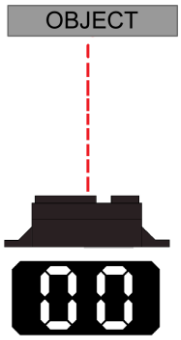

Figure 1: Distance meter

Parts List

- A breadboard
- An AVR ATmega328P MCU
- Resistors
- Two 7-segment LEDs
- A GP2Y0A21YK DMS sensor
- A capacitor

Distance Meter

A distance meter is used for accurately determining the distance of an object without contact the object. The distance measurement can be achieved using various approaches, including ultrasonic ranging module, laser rangefinder, radar distance measurement, and etc. In this lab, the distance measurement will be achieved using a Sharp GP2Y0A21YK DMS sensor.

Procedure

Use the pins of Port C to read the DMS signals. Use PD1 as the TX to send the readings to a computer (Fig. 2). Use the rest of the pins of Port D as the output to a 7-segment LED. Use Port B as the output to the other 7-segment LED. Remember to calibrate the meter you build so that it gives the actual distances rather than the voltages of the DMS sensor.

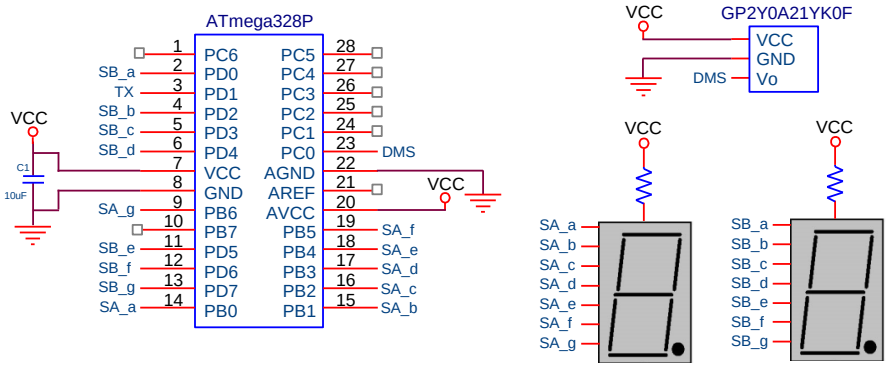

Figure 2: Circuit diagram of DMS distance meter

Deliverables

Demo the result to the TAs, or record it in a video. Provide the C program and a photo of your physical circuit as the appendix in your lab report. Upload your lab report to ceiba.