

Embedded Systems

ELEC3020

Lab Assignment 5 – Servo Actuator and Analog Sensor Points: 10

TEAMS: This lab will be conducted in teams of 2 students

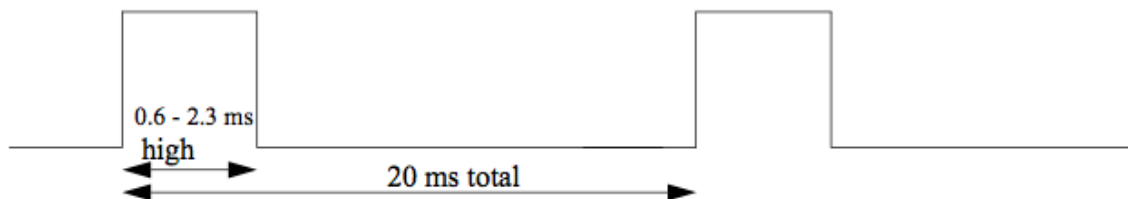
EQUIPMENT: TTGO Embedded Controller
USB cable to connect to laptop
Protoboard with cables
1 Servo
1 analog PSD sensor
Oscilloscope



EXPERIMENT 1 (3 points)

Write a program that will output a repetitive rectangle signal as shown below in the range of (0.6ms, 2.3ms) with initial setting 1ms high and 19ms low.

Pushing the left button should reduce the uptime in 0.1ms intervals (min. value 0.6); pushing the right button should increase the uptime accordingly (max value 2.3). Write the uptime and downtime values onto the screen of the TTGO controller.



Connect the output pin to an oscilloscope and observe the generated curve; there should be a stable signal.

Then **connect a servo** to the output line. It should drive to the designated orientation which can be changed by button presses.

EXPERIMENT 2 (1 point)

Try drawing the waveform to the screen, again adjusting the uptime should be visibly seen on the screen.

EXPERIMENT 2 (4 points)

Connect a potentiometer to the controller input. Write a program to continuously read its value, scale it to range (0, 255) and display it in text form on the LCD.

Replace the potentiometer by an analog PSD sensor, translate the PSD readings to distances in [mm] and display them on the screen. Note that the PSD output may not be linear, so a formula or a lookup table may work best.

EXPERIMENT 3 (2 points)

Write a program to combine the two previous experiments as follows:

- In a continuous loop, read the PSD sensor value, then set the servo output accordingly.
- Vary the servo up-time output in range 1.0–2.0ms, depending on PSD input.

The servo should move to different positions, depending on the PSD sensor's measured distance.

