

## CS 490 / ECE 492: Embedded Systems Security Simple Web Controlled Sensor/Actuator System #04

**Total Points: 100**

**Assigned Date** : Wednesday, February 03, 2016  
**Due Date** : Monday, February 15, 2016 @ 11:59:59 a.m. [Group assignment.]

### 1 Simple Sensor/Actuator System

In this lab, we will be constructing a very rudimentary sensor/actuator system. You will be provided with a stepper motor (Mercury Motor ST-PM35-15-11C), H-Bridge driver (SN754410NE), and an analog temperature sensor (TMP 36). Connect the motor as shown below (GND can be any of the BeagleBone ground pins ie. P9\_1 or P9\_2. You should use one of the vertical buses on your breadboard):

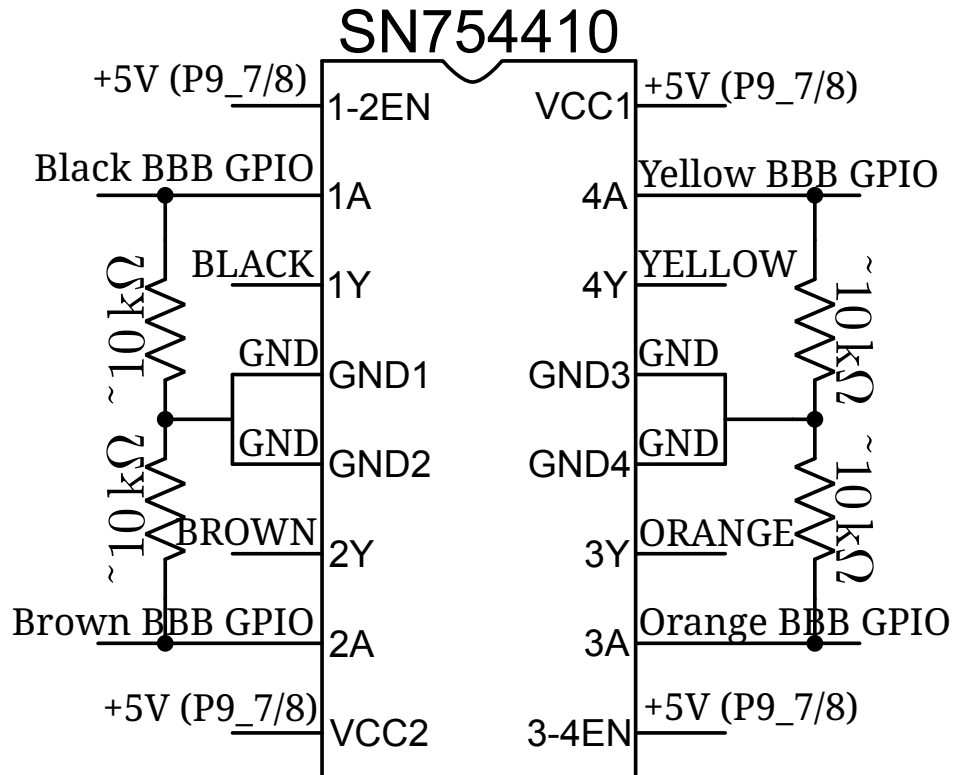


Figure 1: Motor Wiring

Connect the temperature sensor as follows:

$+V_S$  : P9\_3 or P9\_4 (+3.3V)

$V_{out}$  : P9\_39 (AIN0)

GND : P9\_34 (AGND) P9\_45 (GND)

Write one program that outputs the current temperature (in Fahrenheit) based on the samples read from the ADC.

Write another program that spins the motor clockwise or counter-clockwise with a step speed indicated by the user (NOTE: There is a maximum step speed. Read the datasheet of the motor for details).

## 2 Web Controlled System

Every even and odd station (ie. .20 and .21) should pair up. Using a simple HTTP interface, the odd station should respond with the current temperature whenever the even station requests it and vice-versa. (ie. .20 should be able to request .21's current temperature and .21 should be able to request .20's current temperature). The odd station should also be able to set the even station's motor speed and direction and vice-versa (ie. .20 could set .21's motor to spin clockwise with 30 ms timing between pulses). The network topology is as follows: the BeagleBones should be connected to the desktops on the private side of your now OpenWRT router. Route the BeagleBone traffic through the desktops and ensure that port forwarding allows connections to your BeagleBone on Port 80.

### References

Molloy Book, Chs. 6, 9, 10.