Motor Controller

The objective of this project is to control the speed of a motor, by adjusting the duty cycle of a Pulse Width Modulated (PWM) signal. The kit for this project consists of a motor with a built in tachometer, a small circuit to convert the tachometer signal to a digital signal and a motor driver to allow the Arduino to drive the motor. An RPM readout (LCD) and speed control (knob) will be expected.

Some of the details of computing RPM from the tachometer signal, requires a couple important points. First the tachometer produces 8 cycles per revolution, so if you measure the cycle time (Δt) in μseconds from rising edge to rising edge you will compute RPM as

$$RPM = 60{,}000{,}000\left(\frac{\mu\, sec}{minute}\right) * \frac{1}{8 * \Delta t}\left(\frac{Rev}{\mu\, sec}\right)$$

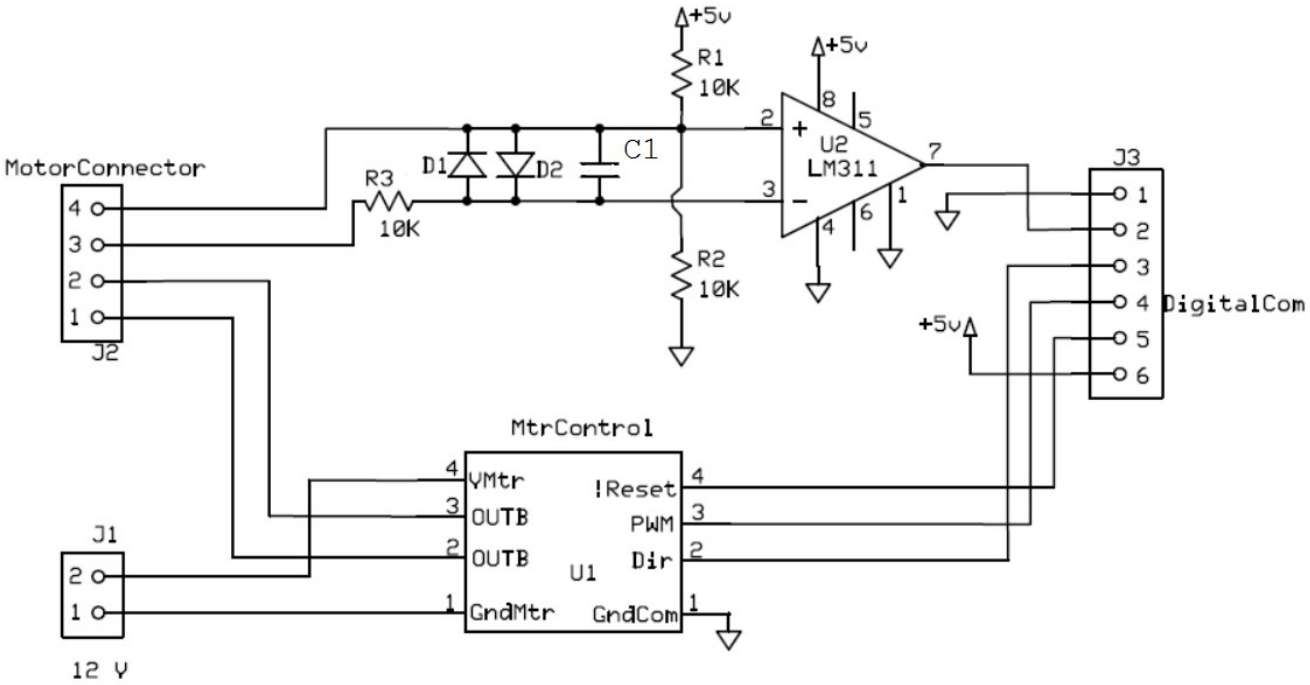


Figure Proj-1. Schematic for the Motor Controller.

Thermostat

The objective of this project is to control the temperature of a location, by turning on a fan when the temperature gets above a certain level and tuning off the fan, once the temperature drops. The kit will consist of a thermometer, a fan, and circuitry to allow the Arduino to turn on and off the fan. Temperature read out (LCD) and changing the control temperature (knob) are expected.

Also part of this system should be a clock that keeps time and has one set of temperatures for day time (6 AM to 6 PM) and another set of temperatures for night time. These time ranges were chosen for simplicity.

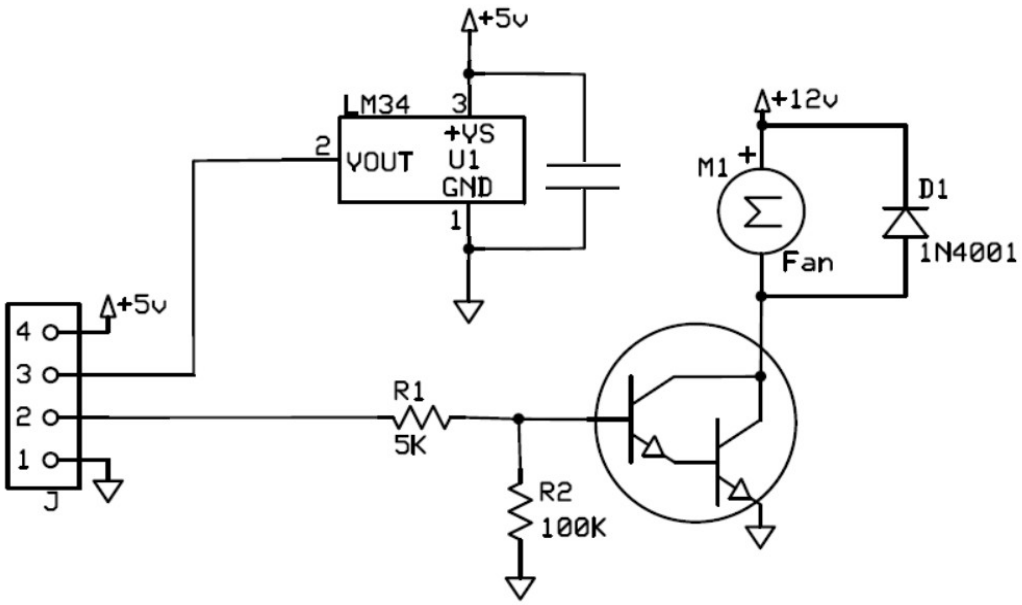


Figure Proj-2. Schematic for the Thermostat.

Solar Tracker

The objective of this project is use a servo motor to turn a set of light sensors towards a light source. This system could be used to keep a solar cell pointed directly at the sun. A time of day and angle readout (LCD) are expected.

Consider the voltage on pin 3 (coming from between R1 and R2) as the measure of the total light present. Then if this voltage is too high, indicating that there is not enough light, you should set the position of the servo based on the time of day. For simplicity, simply set the position to 0 for 6 AM, 180 for 6 PM and linearly in between. Note that for after 6 PM, it should simply move to 0 in anticipation.

If the total light is sufficient, you should move the servo, such that voltage on pin 4 (from between R2 and R3) is approximately half of the voltage on pin 3.

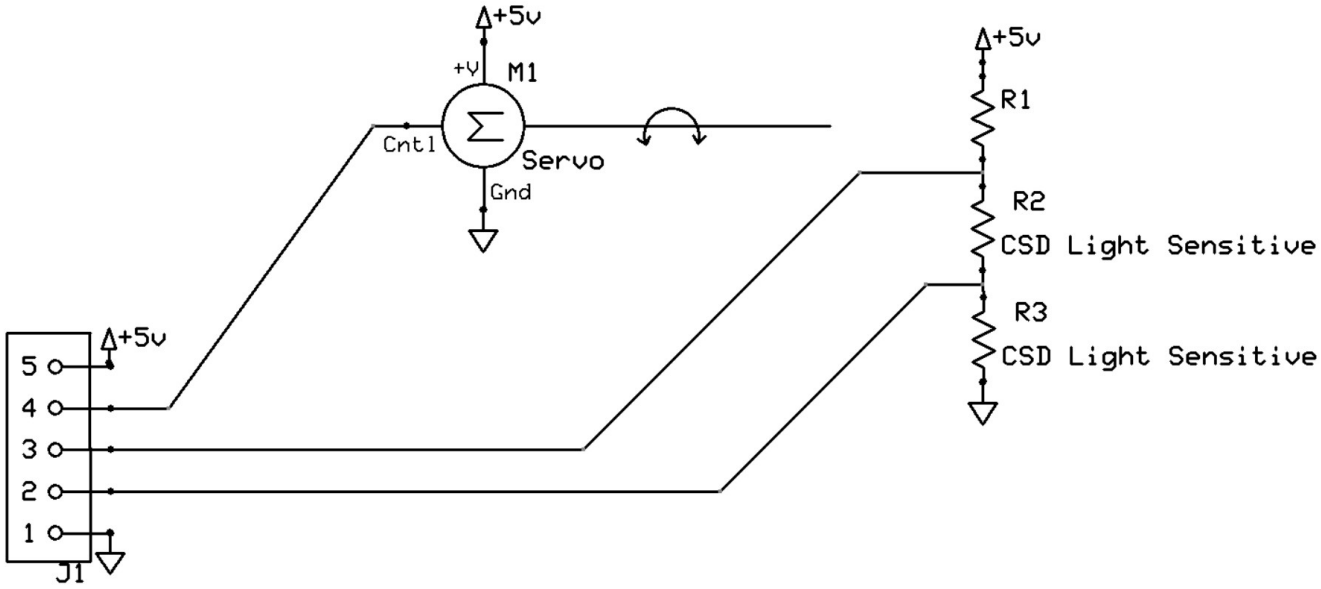


Figure Proj-3. Schematic for the Solar Tracker.

Dispenser

The objective of this project is to turn the stepper motor a set number of revolutions, each time the opto-interrupter shows open. This system might be used to dispense towels in a restroom.

Note it should not keep rotating the motor if the opto-interrupter is stuck open. Rather you should stop the motion (once a complete number of revolutions), and show an error message. However if a user wants to override this case, if the push button is pressed it should again turn the motor the correct number of revolutions and respond as before.

As an extra note, the stepper motor sold in the kit has 96 steps per revolution.

Also the encoder should be used to set the number of revolutions that the motor will move for a given cycle. The number of cycles and status messages are to be displayed on the LCD.

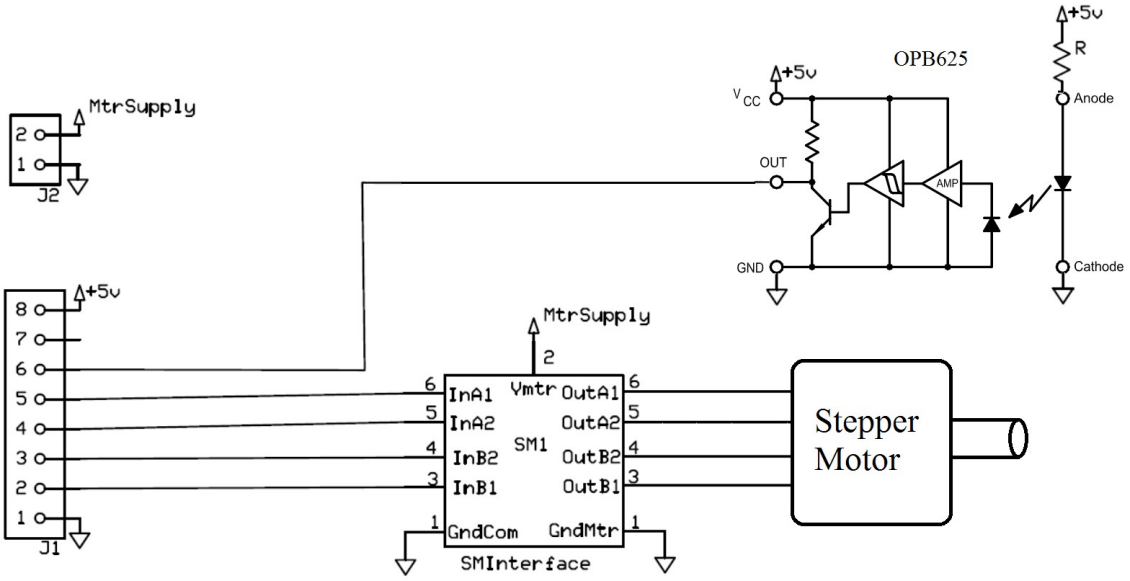
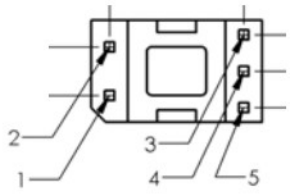


Figure Proj-4. Schematic for the Thermostat.

Physical Pin Out for OPB625



Pin Color/ Number	Description
1	Anode
2	Cathode
3	Vcc
4	Output
5	Ground