ECPS 206

Lab 1

LightSwarm in the Textbook

Two devices: ESP8266 and RPi

- ESP8266: WiFi IoT device $10
  - 80 MHz microcontroller
  - 1 x Analog input (1.0V max)
  - 13 x GPIO (3.3V logic), which can also be used for I2C or SPI
  - 2 x UART pins
  - 2 x 3-6V power inputs, reset, enable, LDO-disable, 3.3V output
  - *can be programmed using Arduino IDE*
- NodeMCU video
  - https://youtu.be/G6CqvhXpBKM
- RPi: User interface and control, as an edge server

Instructions to Install USB driver

If the ESP8266 USB is using VCP, get the driver from below:

- https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers , and select the right driver for your laptop OS
- [On Mac] open the package and run the “VCP Driver.pkg”

Some ESP8266 may need to get the driver for CH340G

  - http://robotdyn.com/catalog/boards/wifi_nodem_esp8266_32m_flash/
  - or, you can go to https://github.com/adrianmihalko/ch340g-ch34g-ch34x-mac-os-x-driver

Arduino IDE

- Can run on Windows, Mac, Linux
- Can program many Arduino boards
  - For ESP8266, you need to download the board package by following the instructions on:

    https://learn.adafruit.com/adafruit-io-basics-esp8266-arduino/arduino-io-library?view=all

    - or https://github.com/esp8266/arduino
- You can also use Arduino for Raspberry Pi:

  https://youtu.be/lZvhtfUlY8Y

Detailed steps for Setting Up IDE

https://youtu.be/G6CqvhXpBKM

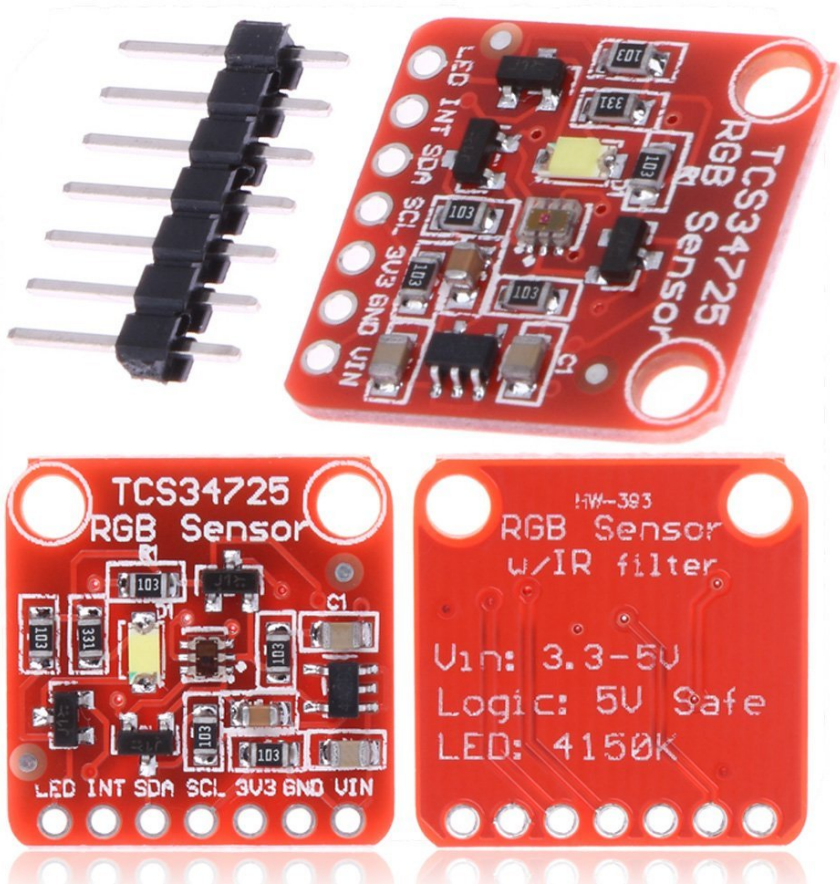
1. Download the latest Arduino IDE.
2. Start IDE and go to the (Arduino/File)-Preferences menu and enter http://arduino.esp8266.com/stable/package_esp8266com_index.json into the Additional Board Manager URLs field
3. Restart IDE, and go to the tools-Boards menu and start the "Boards Manager …" to find esp8266. Click the selection to show the "Install" button. Click the "Install" button to start the package download.
4. When you've restarted IDE, select **NodeMCU 1.0 (ESP-12E)** from the Tools->Board dropdown menu.

Test Blink Example

- On our board, the on-board LED is on D4.
  - HIGH is to turn off, LOW is to turn on.
- But you can connect an external LED directly to D4 pin, or any other pin, and it would work correctly with HIGH for LED On and LOW for LED Off.

RGB Light-sensing

- TCS34725 has an IR blocking filter, integrated on-chip and localized to the color-sensing photodiodes, minimizes the IR spectral component of the incoming light and allows color measurements to be made accurately.
- The sensor also has a 3,800,000:1 dynamic range with adjustable integration time and gain so it is suited for use behind darkened glass or directly in the light.



Board to RGB Sensor Wiring List

From	To	Description
ESP8266 / G	TCS34725 /GND	Ground for I2C Light Sensor
ESP8266 / 3V	TCS34725 / 3V3	3.3V Power for I2C Light Sensor
ESP8266 / D2	TCS34725 /SDA	SDA for I2C Light Sensor
ESP8266 / D1	TCS34725 /SCL	SCL for I2C Light Sensor
TCS34725 / LED	TCS34725 / INT	Connecting these two pins together allow for software control of bright LED on TCS34725 board

What is I^2C

- **The name stands for "Inter - Integrated Circuit Bus"**
- **A Small Area Network connecting ICs and other electronic systems**
- **Originally intended for operation on one single board / PCB**
  - Synchronous Serial Signal
  - Two wires carry information between a number of devices
  - One wire use for the data
  - One wire used for the clock
- **Today, a variety of devices are available with I^2C Interfaces**
  - Microcontroller, EEPROM, Real-Timer, interface chips, LCD driver, A/D converter

I2C

- The I2C was first developed by Phillips (now NXP Semiconductors). To get around licensing issues, often the bus will be called TWI (Two Wire Interface).
- SMBus, developed by Intel, is a subset of I2C that defines the protocols more strictly.
- Modern I2C systems take policies and rules from SMBus sometimes supporting both with minimal reconfiguration needed.
- The Raspberry Pi and the Arduino are both these kinds of devices. Even the ESP8266 used in this project can support both.

GitHub Tutorial

- GitHub is a code hosting platform for version control and collaboration. It lets you and others work together on projects from anywhere.

  https://guides.github.com/activities/hello-world/
- The code for Light Swarm can be found in:

  https://github.com/switchdoclabs/LightSwarm