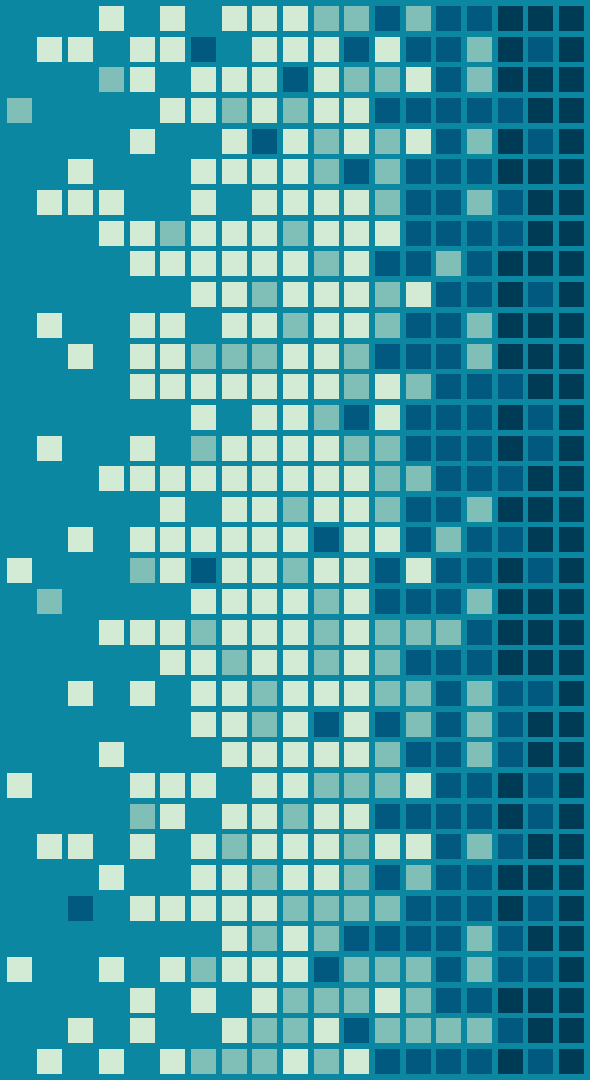
KIT OVERVIEW

Michael D'Argenio – mjdargen@ncsu.edu
Electrical Engineering – SS 2019 – Duke TIP



Elegoo UNO R3: The Most Complete Ultimate Starter Kit

Elegoo UNO R3: Ultimate Starter Kit

- Elegoo UNO R3: The Most Complete Ultimate Starter Kit
- Info: https://www.elegoo.com/product/elegoo-uno-r3-project-complete-starter-kit/
- Downloads: https://www.elegoo.com/tutorial/Elegoo%20The%20Most%20Complete%20Starter%20Kit%20for%20UNO%20V1.0.2019.03.04.zip


ELEGOO
PDF
CODE
LIBRARIES
The Most Complete Starter Kit
for
UNO
10K
10K
ELEGOO
UNO R3
HC-SR04
SONGLE
SRD-05VDC-SL-C
POWERFULCELL
CLK
DT
SW
+
GND

Elegoo Arduino Uno R3

Passive Components

- 10x Resistor (10)
- 10x Resistor (100)
- 10x Resistor (220)
- 10x Resistor (330)
- 10x Resistor (1K)
- 10x Resistor (2K)
- 10x Resistor (5K1)
- 10x Resistor (10K)
- 10x Resistor (100K)
- 10x Resistor (1M)
- 5x White LED
- 5x Yellow LED
- 5x Blue LED
- 5x Green LED
- 5x Red LED
- 1x Common Cathode RGB LED
- 5x 22pf Ceramic Capacitor
- 5x 104 Ceramic Capacitor
- 2x Electrolytic Capacitor(10UF)
- 2x Electrolytic Capacitor (100UF)
- 5x Diode Rectifier (1N4007)
- 5x NPN Transistor (PN2222)
- 5x NPN Transistor (S8050)
- 2x Photoresistor
- 1x Thermistor
- 1x Tilt Switch
- 5x Pushbutton
- 1x Active Buzzer
- 1x Passive Buzzer
- 2x Potentiometer

Active Components & Sensors

- 1x IC 74HC595
- 1x 5V Relay
- 1x IC L293D H-bridge Motor Driver
- 1x ULN2003 Stepper Motor Driver
- 1x Servo Motor (SG90)
- 1x Stepper Motor
- 1x 3V Motor
- 1x RTC Module
- 1x DHT11 Temp & Humidity Module
- 1x Rotary Encoder Module
- 1x Joystick Module
- 1x Keypad Module
- 1x Remote
- 1x IR Receiver Module
- 1x Sound Sensor Module
- 1x LCD1602 Module
- 1x GY521 Module
- 1x RC522 RFID Module
- 1x HC-SR501 PIR Motion Sensor
- 1x Ultrasonic Sensor
- 1x Water Lever Sensor
- 1x MAX7219 8x8 LED Matrix
- 1x 1 digit 7-segment Display
- 1x 4 digit 7-segment Display

Prototyping Materials

- 1x 9V 1A Power Supply
- 1x Power Supply Module
- 1x 9V Battery with DC
- 1x USB Cable
- 65x Jumper Wires
- 20x Extension Wires
- 1x Breadboard
- 1x Prototype Expansion

PASSIVE COMPONENTS

Discrete Components

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- 10x Resistor (100)
- 10x Resistor (220)
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- 1x Thermistor
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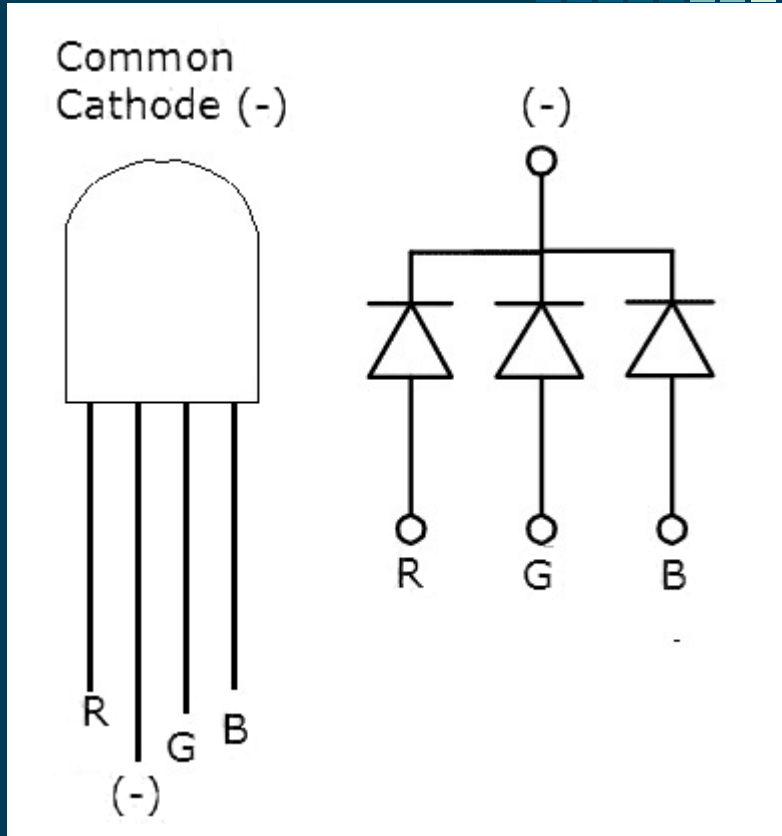
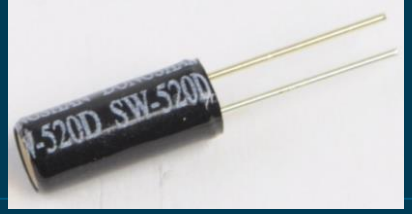
- 5x Pushbutton
- 1x Active Buzzer
- 1x Passive Buzzer
- 2x Potentiometer

Common Cathode RGB LED

- Has 3 distinct LEDs – red, green, and blue.
- All 3 LEDs share a common cathode.
- Each LED needs its own series resistor because they each have their own forward voltage.



Tilt Switch



- A sensor that allows you to detect an orientation or inclination.
- It closes the switch in a specific orientation and is open otherwise.

- For more info and examples: https://learn.adafruit.com/tilt-sensor/overview

Active Buzzer

- Emits a buzzing sound with a DC voltage.
- No control over frequency.
- Can be driven by digital output pin.
- Good for signaling alarm.

Passive Buzzer or Piezo Buzzer/Speaker

- Requires an AC voltage to resonant the piezo crystal and emit a sound.

- For more info and example code: https://learn.adafruit.com/using-piezo-buzzers-with-circuitpython-arduino/overview

ICs, MODULES, & SENSORS

ICs, Modules, & Sensors

- 1x IC 74HC595
- 1x 5V Relay
- 1x IC L293D Step Motor Driver
- 1x ULN2003 H-bridge Motor Driver
- 1x Servo Motor (SG90)
- 1x Stepper Motor
- 1x 3V Motor
- 1x RTC Module
- 1x DHT11 Temp & Humidity Module
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- 1x RC522 RFID Module
- 1x HC-SR501 PIR Motion Sensor
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- 1x MAX7219 8x8 LED Matrix
- 1x 1 digit 7-segment Display
- 1x 4 digit 7-segment Display

74HC595 – Shift Register

- If you run out of digital output pins, you can use a shift register.
- It essentially allows you to drive 8 outputs using only 3 pins on your Arduino.
- You have to communicate “serially”.

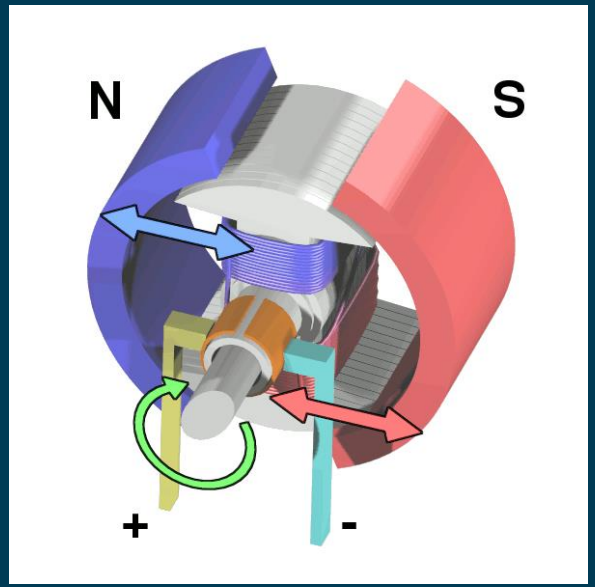
- For more information, examples, and code: https://www.arduino.cc/en/Tutorial/ShiftOut

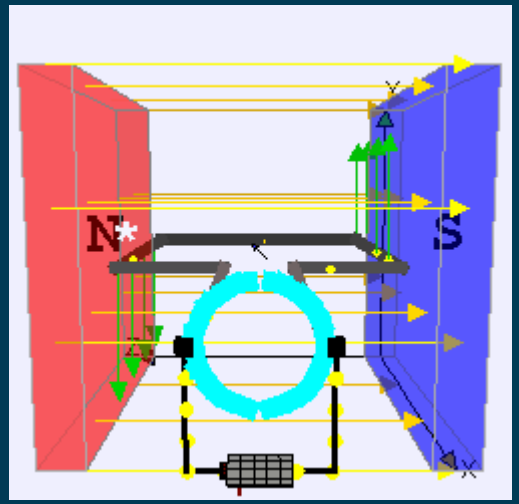
5V Relay

- Used to switch higher voltages and currents than the Arduino or our transistors can withstand.
- Single Pole Single Throw (SPST) relay.
- Drive relay by powering coil with 5V.
  - Cannot drive coil with Arduino (large inrush current and reverse fly back voltage)
  - Drive coil with a transistor switched by relay
- Has NO (normally open) and NC (normally closed) contacts.
  - When coil is de-energized, NC is connected to common.
  - When coil is energized, NO is connected to common.
- https://create.arduino.cc/projecthub/tarantula3/driving-a-relay-with-an-arduino-722c24
- Elegoo Lesson 30

DC Motors

- ElectroBOOM
  https://www.youtube.com/watch?v=y09xlVv8ryc





DC Motor

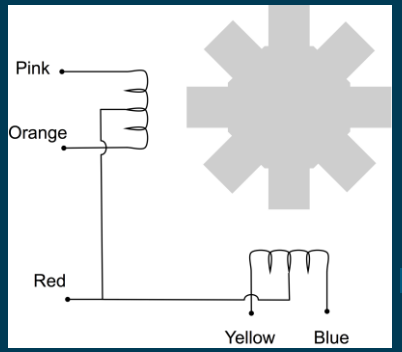
- True DC motor. Apply DC voltage to motor to drive.
- Use PWM to control speed/power.
- Can’t drive directly. Use L293D H-bridge circuit (4 FETs in H configuration) to drive motor.
- Elegoo Lesson 29

SG90 Servo Motor

- Motor with internal electronics
- 3 connections: 5V (red), GND (brown), Pulse (orange)
- Pulse – 50 Hz pulse. Vary the on-time between 1 and 2 ms to change the position of the motor.
- For more info and tutorial: https://learn.adafruit.com/adafruit-arduino-lesson-14-servo-motors
- How servos work: https://www.youtube.com/watch?v=J8atdmEqZsc
- Elegoo Lesson 9

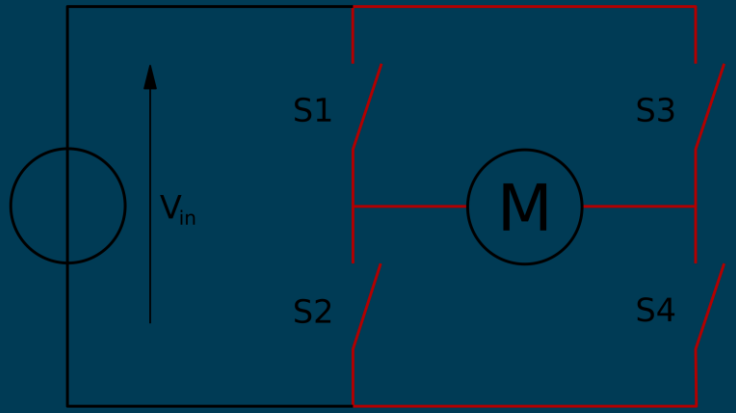
Stepper Motor

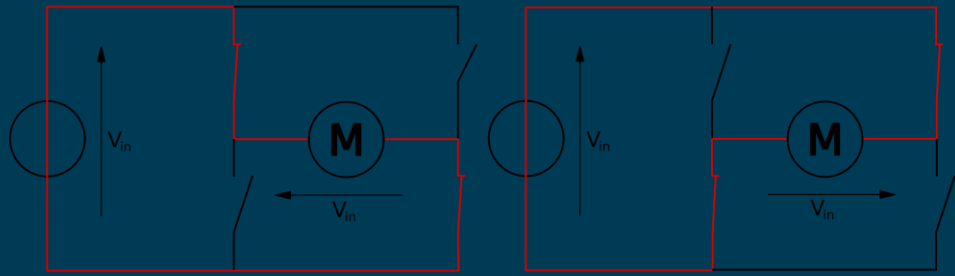
- Bipolar stepper motor – 4 connections and no common
- Has 2048 different steps for full 360° rotation
- More info and tutorial to drive it with L293D: https://learn.adafruit.com/adafruit-arduino-lesson-16-stepper-motors/overview
- Arduino Library and Info: https://www.arduino.cc/en/Reference/Stepper
- Elegoo Lesson 31 – shows how to drive it with ULN2003



L293D H-Bridge Motor Driver

- Can be used to drive the motors.
  - Built to withstand the current.
  - Can drive 2 motors.
- H-Bridge can swap polarity on the motor and change directions the motor rotates.
- Use this for any high current 5V device.
- For more info and an example: https://learn.adafruit.com/adafruit-arduino-lesson-15-dc-motor-reversing/overview
- Elegoo Lesson 29





ULN2003 Stepper Motor Driver Board

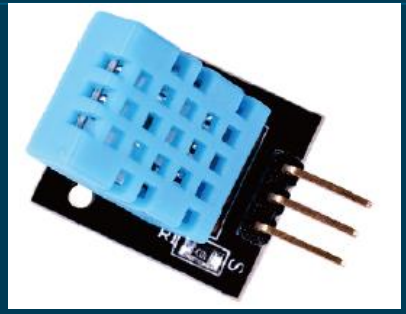
- For use with stepper motor.
- Can use in place of L293D H-Bridge
- https://www.instructables.com/id/BYJ48-Stepper-Motor/
- Elegoo Lesson 31 – how to use it with stepper motor

Real Time Clock (RTC) Module

- Provides real time-date clock data across power cycles.
- Communicates using I2C.

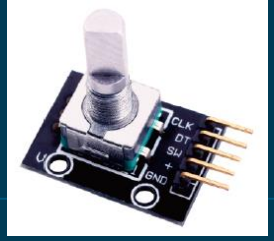
- For more info and tutorial: https://learn.adafruit.com/ds1307-real-time-clock-breakout-board-kit
- Elegoo Lesson 19

DHT11 Temperature & Humidity Module



- Contain capacitive humidity sensor and thermistor for temperature
- Communicate over single data line.
  - Uses an available library.
- For more info and tutorial https://learn.adafruit.com/ds1307-real-time-clock-breakout-board-kit
- Elegoo Lesson 12

Rotary Encoder Module



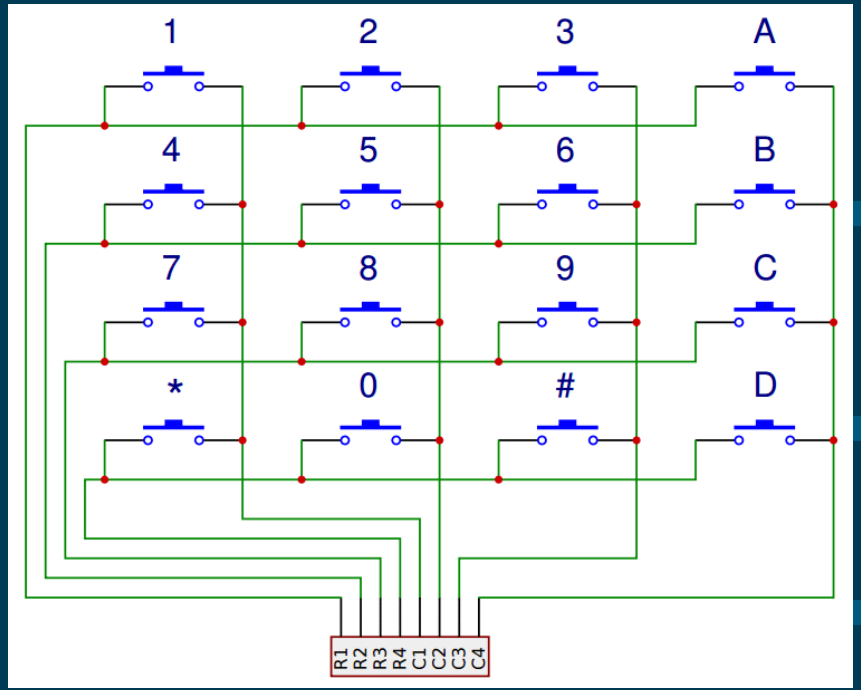
- Rotating knob that will give you information about how fast it is turning and in what direction.
  - Rotates an infinite number of revolutions
  - Can be very difficult to setup
- https://playground.arduino.cc/Main/RotaryEncoders/
- https://www.instructables.com/id/Improved-Arduino-Rotary-Encoder-Reading/
- Elegoo Lesson 31

Joystick Module

- Tells you X and Y position and has a push button.
- 5 pins to wire up
  - VCC – Connect to 5V.
  - GND – Connect to GND.
  - X - Works like potentiometer. To ADC.
  - Y – Works like potentiometer. To ADC.
  - Switch – If button is pressed. To digital input.
- For more info and tutorial (does not have button): https://www.arduino.cc/en/Tutorial/JoyStick
- Elegoo Lesson 13

Keypad Module

- Requires 4 digital outputs and 4 digital inputs.

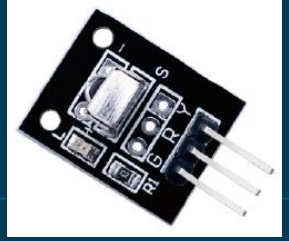


- More info & tutorial: https://www.teachmemicro.com/arduino-keypad-interfacing-4x4-matrix/
- Elegoo Lesson 11

IR Remote

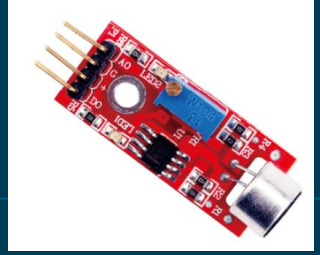
- Sends hexadecimal data using infrared light (IR) light.
- Use with IR Receiver.
- More info here:
- https://learn.adafruit.com/using-an-infrared-library/overview
- Elegoo Lesson 14

IR Receiver Module



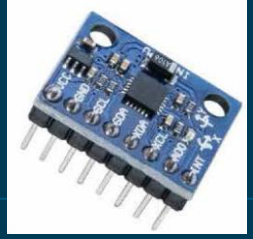
- Use with IR Remote.
- Receives IR light information.
- Sends data out a single data line. Wire to digital in.
- For more info and tutorial: https://learn.adafruit.com/using-an-infrared-library/overview
- Elegoo Lesson 14

Sound Sensor Module



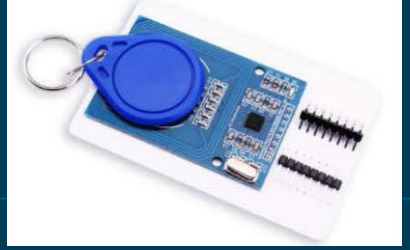
- Microphone module that detects sound.
- Has 2 outputs:
  - A0 - analog output, real-time output voltage signal of the microphone
  - D0 – digital output, when the sound reaches a certain threshold, drives the output high
- Elegoo Lesson 20

GY521 IMU Module



- IMU – Inertial Measurement Unit. Uses 2 devices:
  - Gyrometer - measures angular velocity i.e. rotation.
  - Accelerometer – measures acceleration in 3 directions.
- Accelerometer can't differentiate between acceleration of the device and the earth's gravity when moving. Gyrometer helps.
- Communicates using I2C.
- https://create.arduino.cc/projecthub/Nicholas_N/how-to-use-the-accelerometer-gyroscope-gy-521-6dfc19
- Elegoo Lesson 16

RC522 RFID Module



- RFID – Radio Frequency Identification
- Uses high frequency electromagnetic fields to read an RFID card with antenna inside.
- Has SPI, UART, and I2C interface. Most exps use SPI.
- https://www.instructables.com/id/Interfacing-RFID-RC522-With-Arduino-MEGA-a-Simple-/
- https://www.instructables.com/id/Arduino-RC522-RFID-Door-Unlock/
- Elegoo Lesson 21

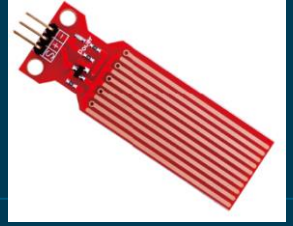
HC-SR501 PIR Motion Sensor

- PIR – Passive Infrared sensor
- Measures IR radiating from objects in its field of view.
- Used to detect motion or presence.
- PIR has a digital output that goes high when presence detected.
- For more info and tutorial: https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/overview
- Elegoo Lesson 17

Ultrasonic Sensor

- Works like sonar or echo-location.
- Emit high frequency sound waves and calculates time until the waves are reflected backwards.
- Send a trigger signal (digital out) then monitor echo signal (digital in) to see how far away the objects are.
- For more info and Tutorial: https://www.instructables.com/id/Simple-Arduino-and-HC-SR04-Example/ https://www.makerguides.com/hc-sr04-arduino-tutorial/
- Elegoo Lesson 10

Water Level Sensor

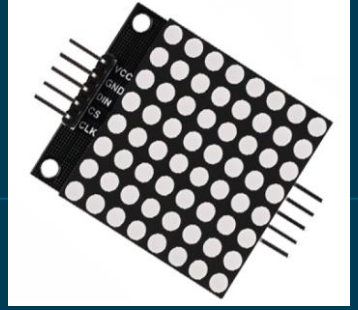


- Detects water level by detecting when water shorts exposed contacts.
- Can use digital input to detect if water is present.
- Can use analog input to check voltage level to see how high water level is.
- Elegoo Lesson 18

LCD 16x2

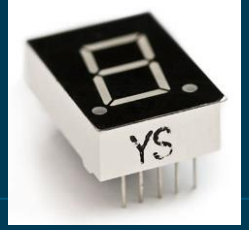
- LCD – Liquid Crystal Display – 16 characters across and 2 characters down.
- Uses a parallel communications method.
- https://learn.adafruit.com/adafruit-arduino-lesson-11-lcd-displays-1
- https://learn.adafruit.com/adafruit-arduino-lesson-12-lcd-displays-part-2
- Elegoo Lesson 22

MAX7219 8x8 LED Matrix

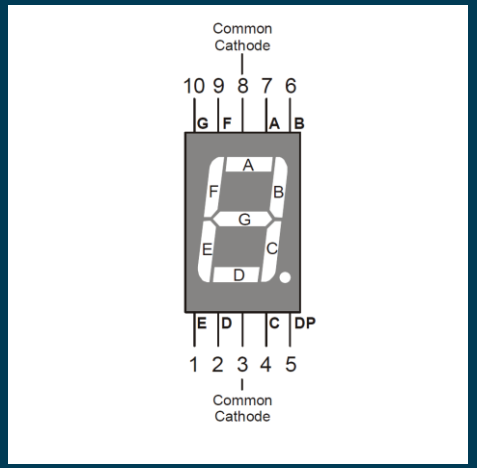


- Uses SPI to communicate.
- 8x8 LED Matrix. Can individually control each LED
- For more info and code: https://playground.arduino.cc/Main/MAX72XXHardware/
- Elegoo Lesson 15

1 digit 7-segment Display



- Requires 8 digital output pins to individually drive each LED (7 segments and decimal point)
- Use 74HC595 to reduce it to 3 digital outputs.
- http://www.circuitbasics.com/arduino-7-segment-display-tutorial/
- Elegoo Lesson 27



4 digit 7-segment Display

- Same as single digit, but must select which digit you are configuring.
- Requires 8 outputs for each segment + 4 more outputs to select which of the 4 digits.
- http://www.circuitbasics.com/arduino-7-segment-display-tutorial/
- Elegoo Lesson 28

PROTOTYPING MATERIALS

Prototyping Materials

- 1x 9V 1A Power Supply
- 1x Power Supply Module
- 1x 9V Battery with DC
- 1x USB Cable
- 65x Jumper Wires
- 20x Extension Wires
- 1x Breadboard
- 1x Prototype Expansion

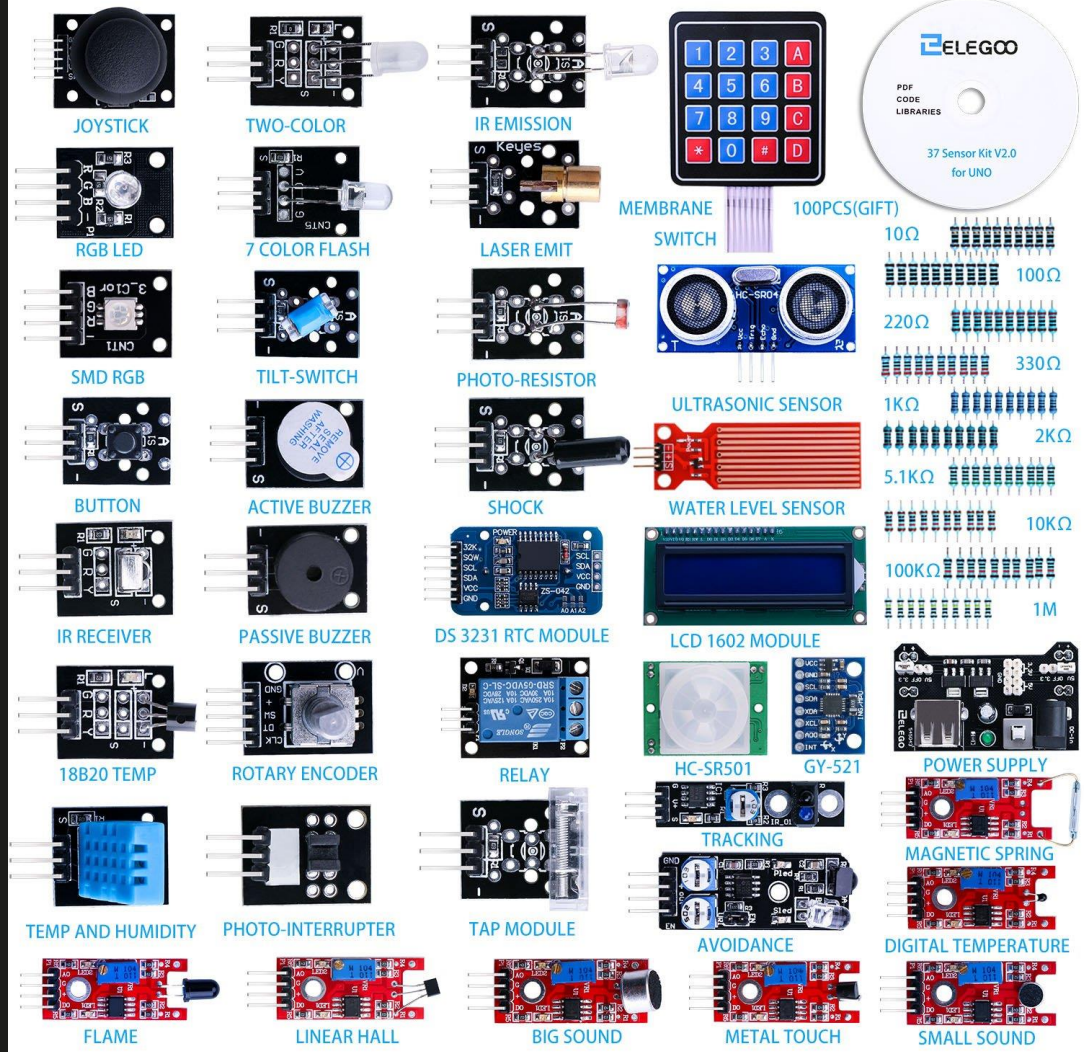
Power Supply Module

- Locking On/Off Switch
- LED Power Indicator
- Input voltage: 6.5-9V (DC) via 5.5mm x 2.1mm plug
- Output voltage: 3.3V/5V
- Maximum output current: 700 mA
- Independent control rail output. 0v, 3.3v, 5v to breadboard
- Output header pins for convenient external use
- Size: 2.1 in x 1.4 in
- USB device connector onboard to power external device
- Easily plugs into solderless breadboard.

ELEGOO 37-in-1 Sensor Modules Kit V2.0

ELEGOO 37-in-1 Sensor Modules Kit

- Elegoo Info: https://www.elegoo.com/product/elegoo-upgraded-37-in-1-sensor-modules-kit-v2-0/
- Elegoo Downloads: https://www.elegoo.com/tutorial/Elegoo%2037%20Sensor%20Kit%20Tutorial%20for%20UNO%20R3%20and%20Mega%202560%20V2.0.0.2019.05.22.zip
- Additional info and tutorials for sensor kits:
  - https://www.instructables.com/id/Arduino-37-in-1-Sensors-Kit-Explained/
  - https://tkkrlab.nl/wiki/Arduino_37_sensors


JOYSTICK
TWO-COLOR
IR EMISSION
MEMBRANE SWITCH
100PCS(GIFT)
PDF
CODE
LIBRARIES
37 Sensor Kit V2.0
for UNO
RGB LED
7 COLOR FLASH
LASER EMIT
10Ω
100Ω
220Ω
330Ω
1KΩ
2KΩ
5.1KΩ
10KΩ
100KΩ
1M
SMD RGB
TILT-SWITCH
PHOTO-RESISTOR
ULTRASONIC SENSOR
BUTTON
ACTIVE BUZZER
SHOCK
WATER LEVEL SENSOR
IR RECEIVER
PASSIVE BUZZER
DS 3231 RTC MODULE
LCD 1602 MODULE
18B20 TEMP
ROTARY ENCODER
RELAY
HC-SR501
GY-521
POWER SUPPLY
TRACKING
MAGNETIC SPRING
TEMP AND HUMIDITY
PHOTO-INTERRUPTER
TAP MODULE
AVOIDANCE
DIGITAL TEMPERATURE
FLAME
LINEAR HALL
BIG SOUND
METAL TOUCH
SMALL SOUND

37 Sensors/Modules

- Joystick Module
- Relay Module
- Rotary Encoder Module
- DS-3231 RTC Module
- Ultrasonic Sensor Module
- HC-SR501 PIR sensor
- Flame Sensor Module
- Linear Hall Module
- Metal Touch Module
- Digital Temperature Module
- Big Sound Module
- Small Sound Module
- RGB LED Module
- SMD RGB Module
- Two-tone Color Module
- 7 Color Flash Module
- Laser Emit Module
- Shock Module
- IR Receiver Module
- IR Emission Module
- Tilt Switch Module
- Button Module
- Active Buzzer Module
- Passive Buzzer Module
- 18B20 temp Module
- Photo-resistor Module
- Temperature & Humidity Module
- GY-521 Module
- Photo-interrupter Module
- Tap Module
- Membrane Switch Module
- Avoidance Module
- Tracking Module
- Magnetic Spring Module
- Water Lever Sensor
- Power Supply Module
- LCD1602 Module

Elegoo UNO Smart Robot Car Kit V3.0

Elegoo UNO Smart Robot Car Kit V3.0

- Info: https://www.elegoo.com/product/arduinocarv3-0/
- Downloads: https://www.elegoo.com/tutorial/Elegoo%20Smart%20Robot%20Car%20Kit%20V3.0.2019.03.19.zip


ELEGOO
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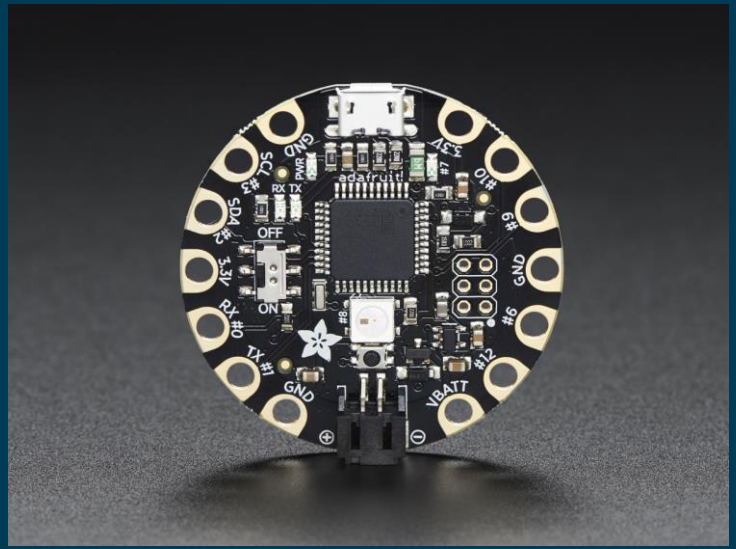
Smart Robot Car Kit V 3.0
Tutorial
HC-SR04

ADAFRUIT FLORA

Adafruit Flora MCU

- https://www.adafruit.com/product/659

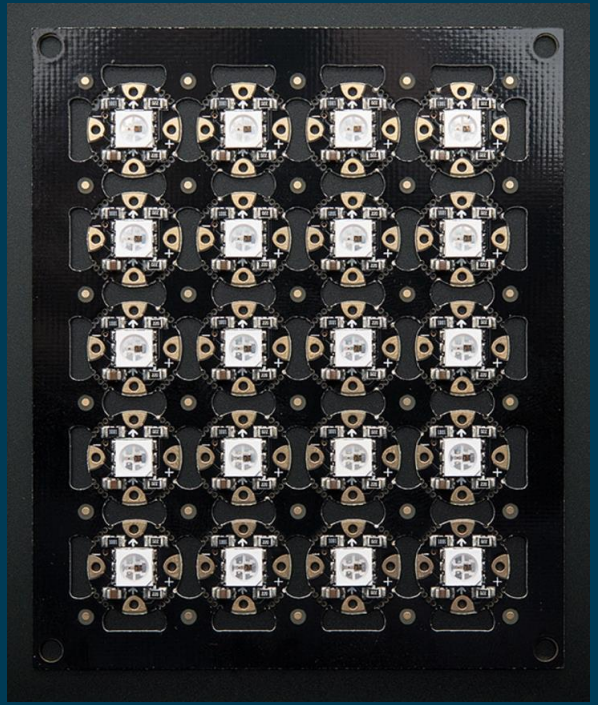


Adafruit Flora MCU

- Adafruit's fully-featured wearable electronics platform.
- It's a round, sewable, microcontroller designed to empower amazing wearables projects.
- Compatible with Arduino IDE and programming language.
- Getting started with Flora: https://learn.adafruit.com/getting-started-with-flora/overview
- Example projects using the Flora: https://learn.adafruit.com/category/flora

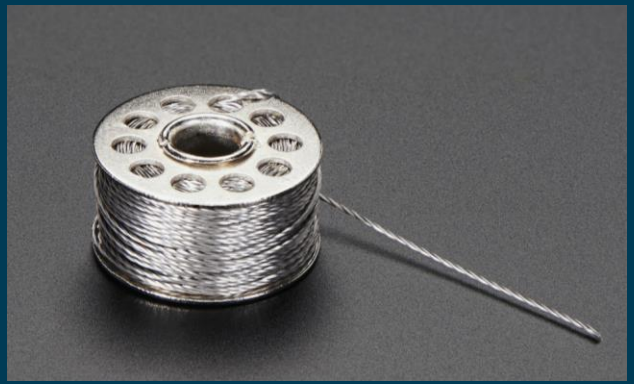
Flora RGB Smart Neopixel

- Tiny smart pixels.
- Full 24-bit color ability
- Ultra-bright LEDs have a constant-current driver cooked right into the LED package!
- The pixels are chainable – so you only need 1 pin/wire to control as many LEDs as you like.
- https://www.adafruit.com/product/1559
- https://learn.adafruit.com/flora-rgb-smart-pixels



Conductive Thread

- Use to sew connections between battery, Flora, and Neopixels.
- https://www.adafruit.com/product/641



ADDITIONAL MATERIALS

Additional Stepper Motor Kit

- 10 Stepper Motors
- 10 ULN2003

- https://www.elegoo.com/tutorial/Elegoo%20ULN2003%20Stepper%20Driver%20Boards.zip

LCD 20x4

- 2 additional larger LCDs
- 20 characters by 4 characters