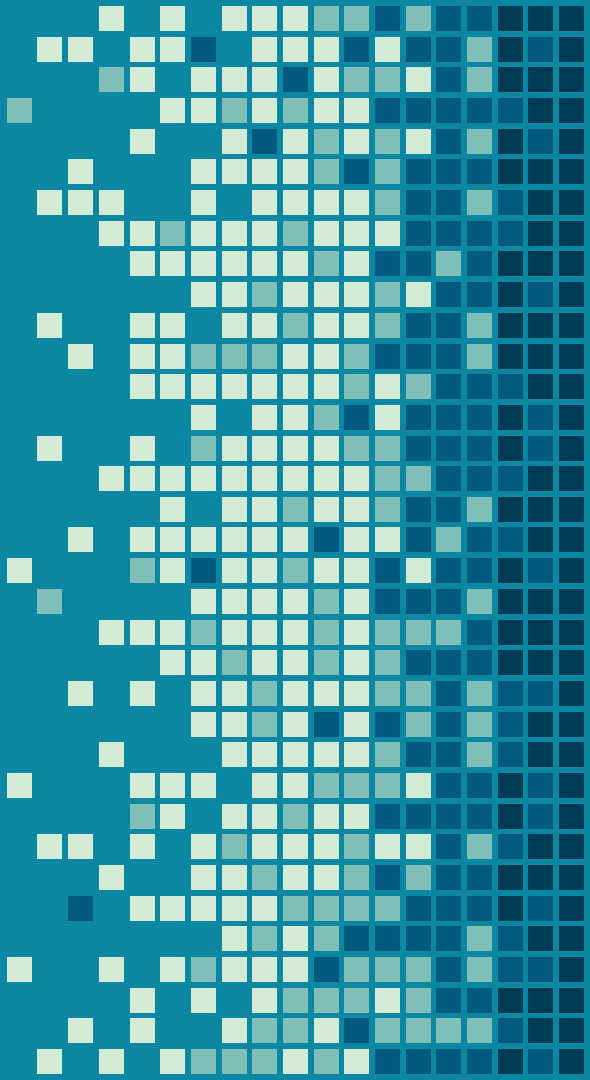
PERIPHERALS KIT OVERVIEW

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 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

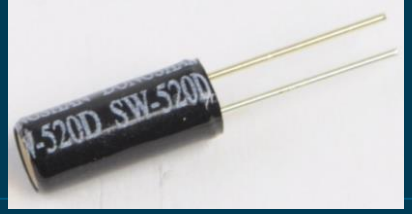
- 1x 9V 1A Power Supply
- 1x Power Supply Module
- 1x 9V Battery with DC
- 1x USB Cable
- 65x Jumper Wires
- 20x Extension Wires
- 1x Breadboard
- 1x Prototype Expansion

PASSIVE COMPONENTS

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 RGB LED
- 5x 22pf Ceramic Capacitor
- 5x 104 Ceramic Capacitor
- 2x Electrolytic Cap (10UF)
- 2x Electrolytic Cap (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

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

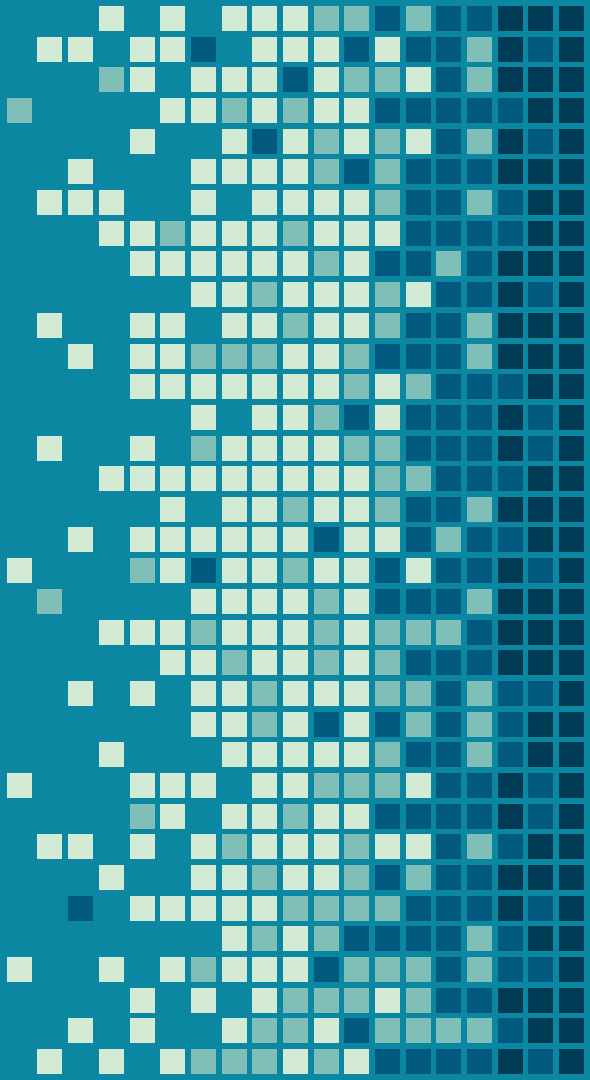
- Emits a buzzing sound with a DC voltage.
- No control over frequency.
- Can be driven by digital output pin.
- Good for signaling alarm.

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

ACTIVE COMPONENTS & SENSORS



ACTIVE COMPONENTS AND 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
- 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

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”.

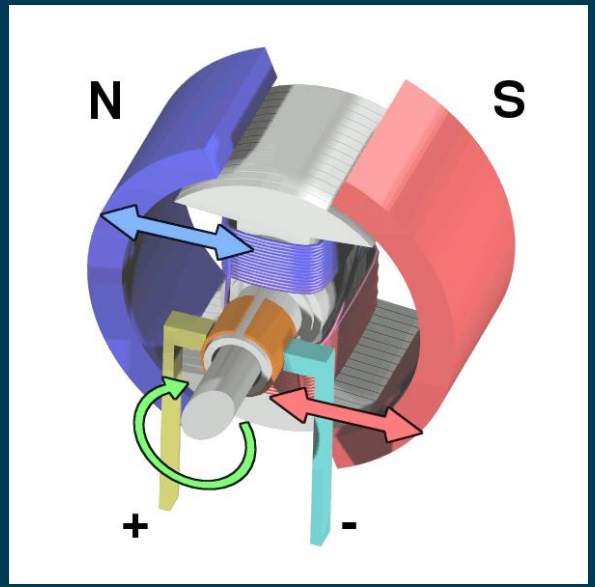
- For more information, examples, and code: https://www.arduino.cc/en/Tutorial/ShiftOut

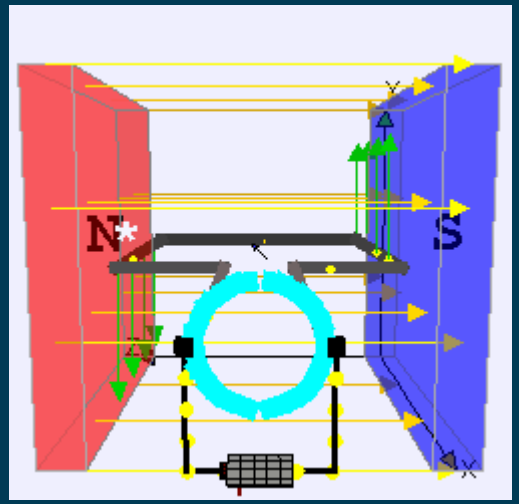
5V Relay

- 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

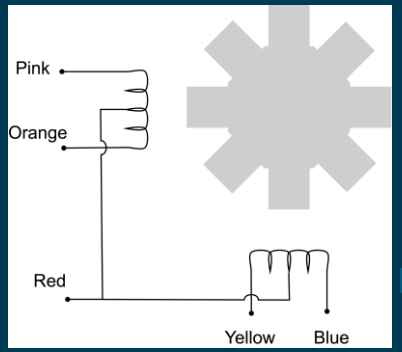
- True DC motor. Apply DC voltage to motor to drive.
- Use PWM to control speed/power.
- Can’t drive directly. Use L293D H-bridge circuit (4 FETs in H configuration) to drive motor.
- Elegoo Lesson 29

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

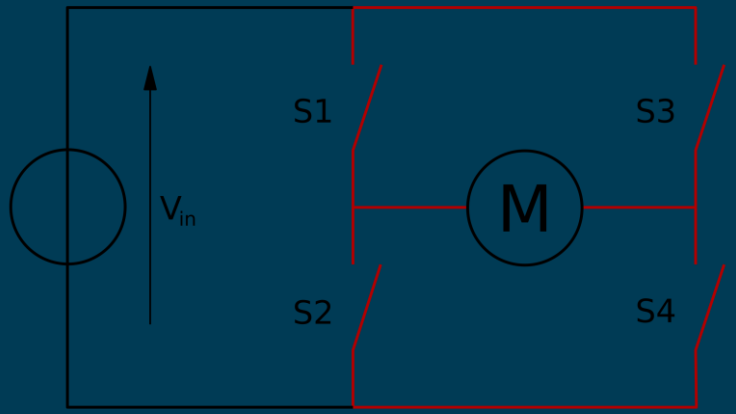
Stepper Motor

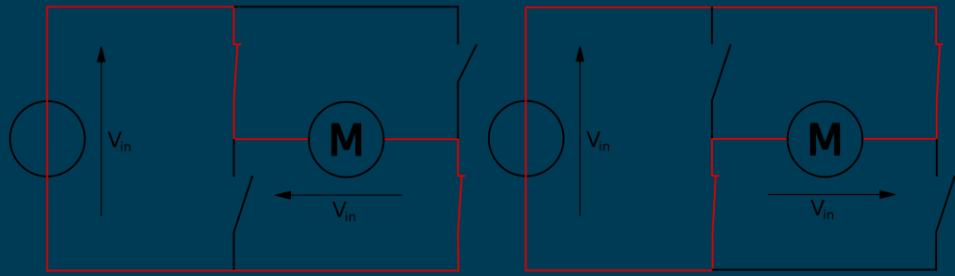
- Bipolar stepper motor – 4 connections and no common
- Has 2048 different steps for full 360° rotation
- More info and tutorial to drive it with L293D: https://learn.adafruit.com/adafruit-arduino-lesson-16-stepper-motors/overview
- Arduino Library and Info: https://www.arduino.cc/en/Reference/Stepper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

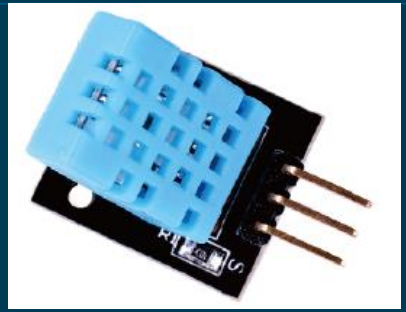
- For use with stepper motor.
- Can use in place of L293D H-Bridge
- https://www.instructables.com/id/BYJ48-Stepper-Motor/
- Elegoo Lesson 31 – how to use it with stepper motor

Real Time Clock (RTC) Module

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

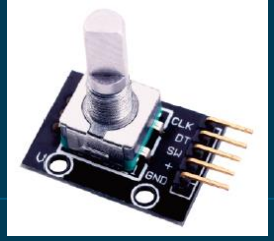
- For more info and tutorial: https://learn.adafruit.com/ds1307-real-time-clock-breakout-board-kit
- Elegoo Lesson 19

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



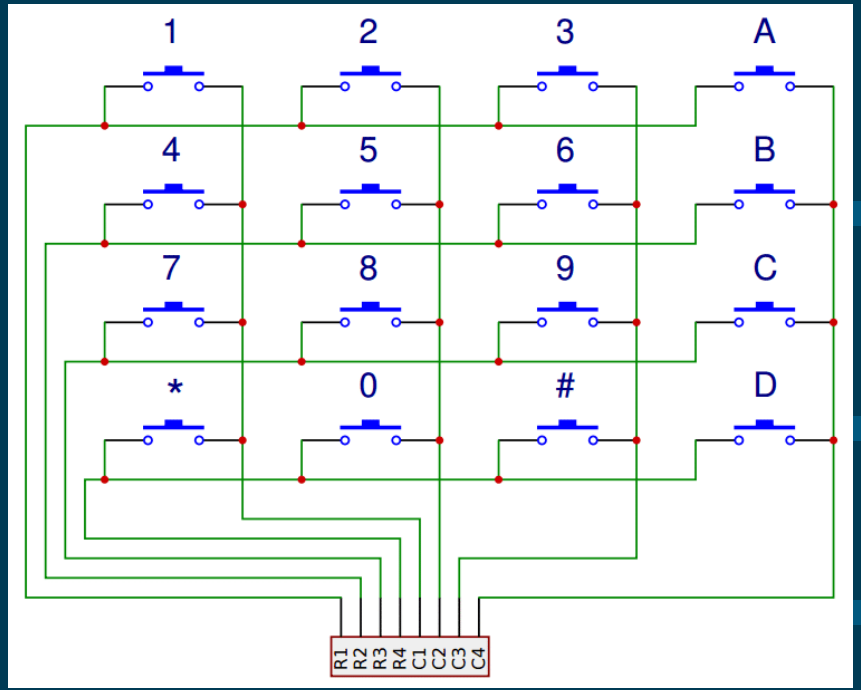
- Rotating knob that will give you information about how fast it is turning and in what direction.
  - Rotates an infinite number of revolutions
  - Can be very difficult to setup
- https://playground.arduino.cc/Main/RotaryEncoders/
- https://www.instructables.com/id/Improved-Arduino-Rotary-Encoder-Reading/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

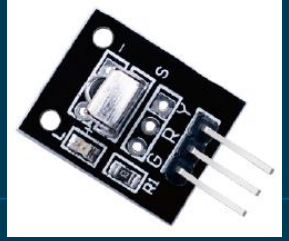


- More info & tutorial: https://www.teachmemicro.com/arduino-keypad-interfacing-4x4-matrix/
- Elegoo Lesson 11

IR Remote

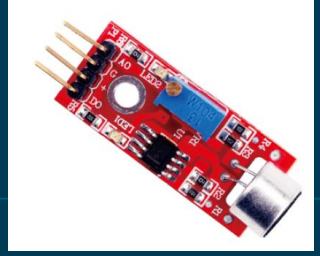
- Sends hexadecimal data using infrared light (IR) light.
- Use with IR Receiver.
- More info here:
- https://learn.adafruit.com/using-an-infrared-library/overview
- Elegoo Lesson 14

IR Receiver Module



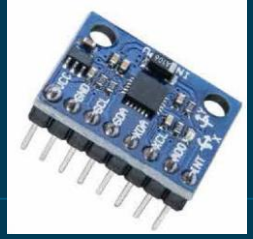
- Use with IR Remote.
- Receives IR light information.
- Sends data out a single data line. Wire to digital in.
- For more info and tutorial: https://learn.adafruit.com/using-an-infrared-library/overview
- Elegoo Lesson 14

Sound Sensor Module



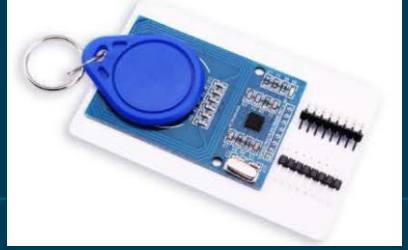
- Microphone module that detects sound.
- Has 2 outputs:
  - A0 - analog output, real-time output voltage signal of the microphone
  - D0 – digital output, when the sound reaches a certain threshold, drives the output high
- Elegoo Lesson 20

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

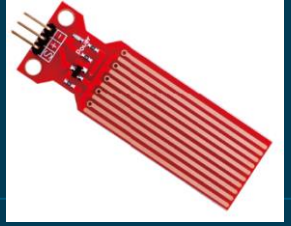
HC-SR501 PIR Motion Sensor

- 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

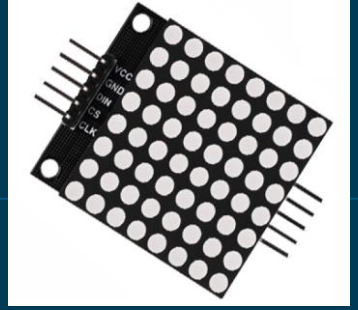


- Detects water level by detecting when water shorts exposed contacts.
- Can use digital input to detect if water is present.
- Can use analog input to check voltage level to see how high water level is.
- Elegoo Lesson 18

LCD 16x2

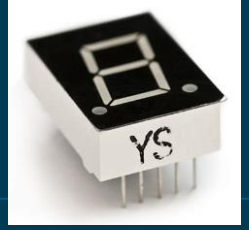
- LCD – Liquid Crystal Display – 16 characters across and 2 characters down.
- Uses a parallel communications method.
- https://learn.adafruit.com/adafruit-arduino-lesson-11-lcd-displays-1
- https://learn.adafruit.com/adafruit-arduino-lesson-12-lcd-displays-part-2
- Elegoo Lesson 22

MAX7219 8x8 LED Matrix

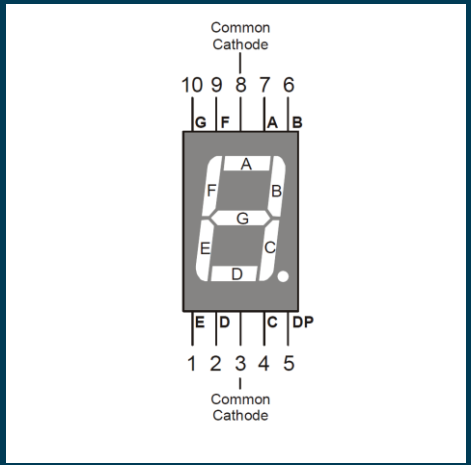


- Uses SPI to communicate.
- 8x8 LED Matrix. Can individually control each LED
- For more info and code: https://playground.arduino.cc/Main/MAX72XXHardware/
- Elegoo Lesson 15

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

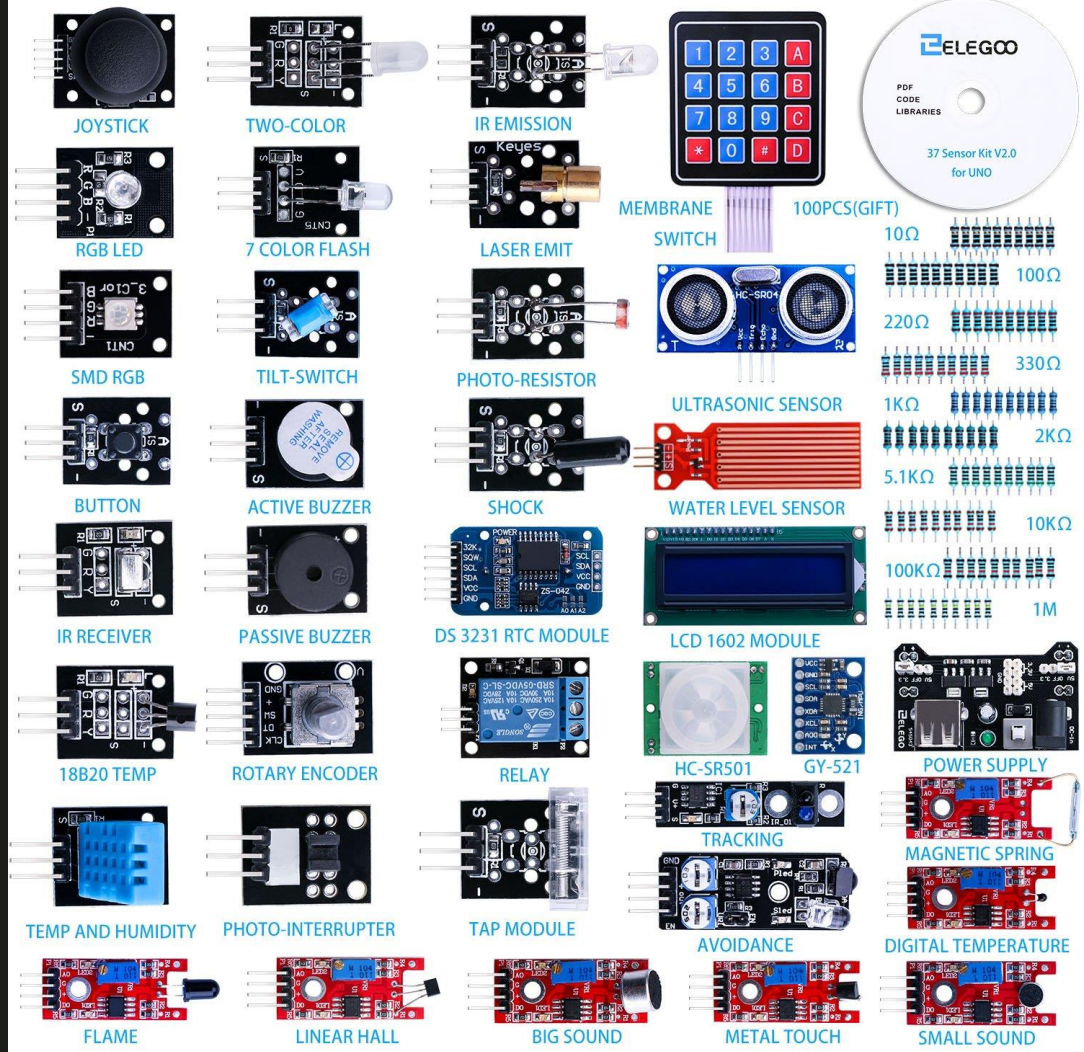
Power Supply Module

- 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
SMD RGB
TILT-SWITCH
PHOTO-RESISTOR
ULTRASONIC SENSOR
10Ω
100Ω
220Ω
330Ω
1KΩ
2KΩ
5.1KΩ
10KΩ
100KΩ
1M
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

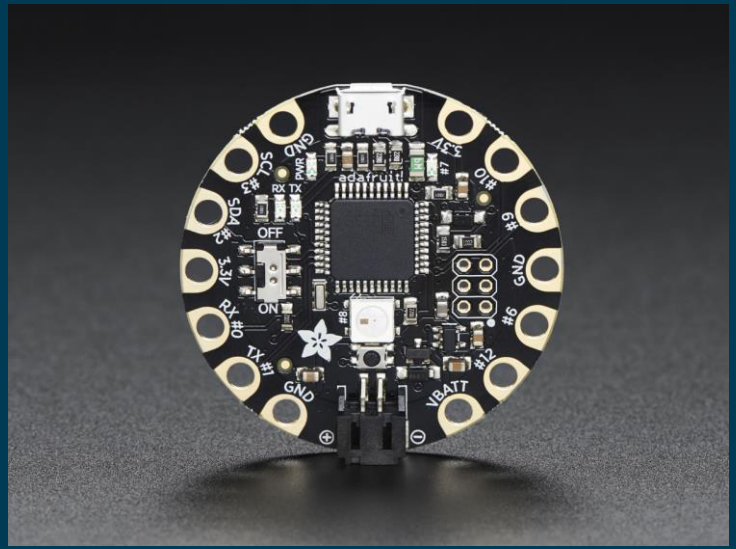
- Info: https://www.elegoo.com/product/arduinocarv3-0/
- Downloads: https://www.elegoo.com/tutorial/Elegoo%20Smart%20Robot%20Car%20Kit%20V3.0.2019.03.19.zip


ELEGOO
UNO R3
HC-SR04
ELEGOO
PDF
CODE
LIBRARIES
Smart Robot Car Kit V 3.0
Tutorial

ADAFRUIT FLORA

Adafruit Flora MCU

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

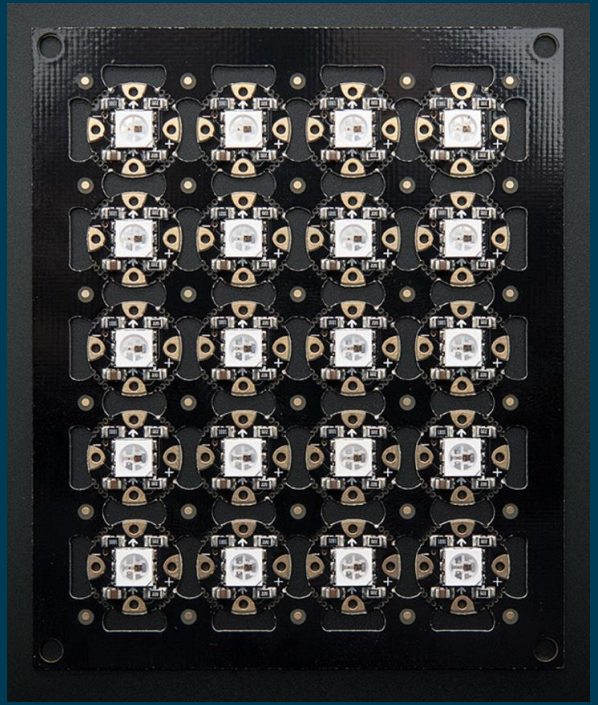


Adafruit Flora MCU

- 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

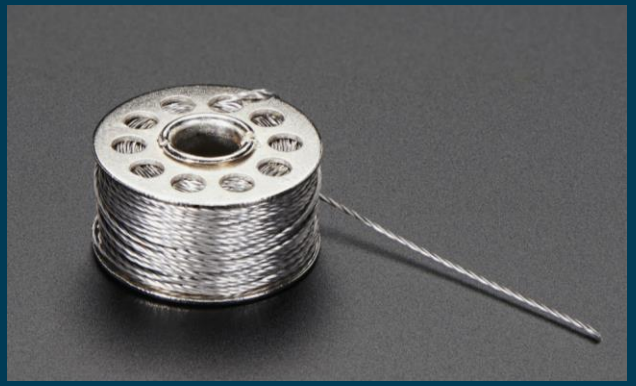
Flora RGB Smart Neopixel

- 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

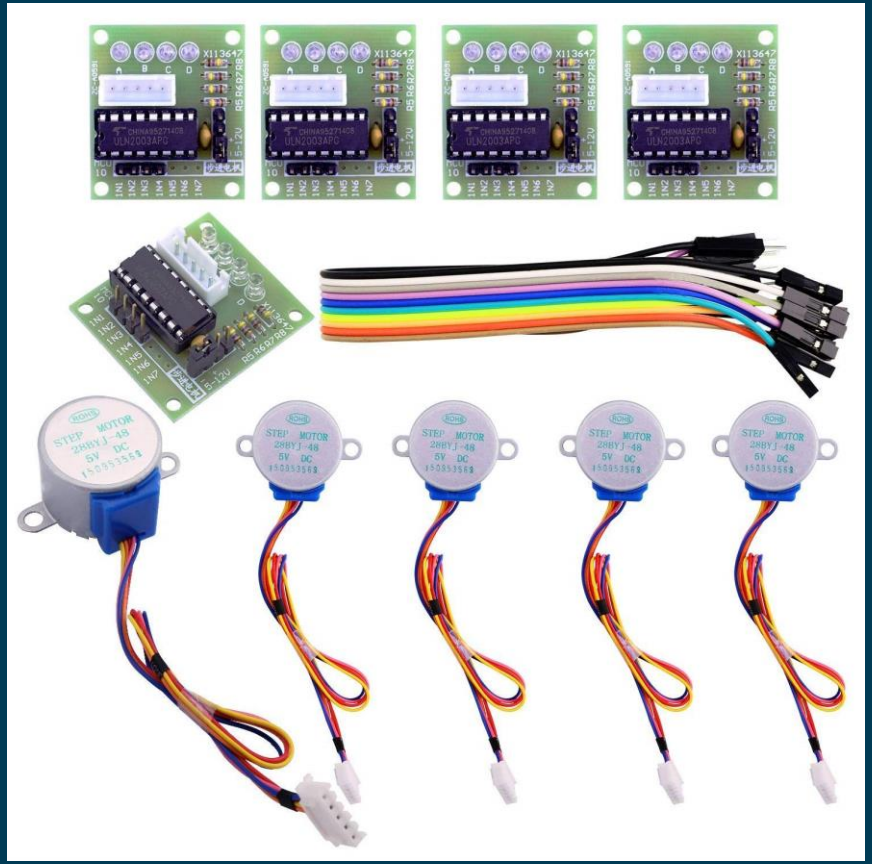


ADDITIONAL MATERIALS

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