List of Materials

- Breadboard
- Connecting Wires
- Battery
- Relay
- Voltage Regulator
- Capacitor
- Ultrasonic Sensor
- Arduino Kit
- Six-legged Robot Kit

Breadboard

A breadboard or protoboard is usually a construction base for prototyping of electronics. The term "breadboard" is commonly used to refer to a solderless breadboard (plugboard) for it does not require soldering, thus make it reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design without too much cost. The concept of "breadboarding" as prototyping is not confined to electronic design but in various field of expertise most especially in the field of engineering.

Connecting Wires

A wire is a single, usually cylindrical, flexible strand or rod of metal which are used to bear mechanical loads or electricity and telecommunications signals. The term wire is
also used more loosely to refer to a bundle of such strands, as in 'multi-stranded wire', which is more correctly termed a wire rope in mechanics, or a cable in electricity.

Solid wire, also called solid-core or single-strand wire, consists of one piece of metal wire, useful for wiring breadboards, cheaper to manufacture than stranded wire and is used where there is little need for flexibility in the wire. Solid wire also provides mechanical ruggedness; and, because it has relatively less surface area which is exposed to attack by corrosives, protection against the environment.

Stranded wire is composed of a number of small gauge wire bundled or wrapped together to form a larger conductor, more flexible than solid wire of the same total cross-sectional area and is used when higher resistance to metal fatigue is required. Stranded wire tends to be a better conductor than solid wire because the individual wires collectively comprise a greater surface area.

Battery

An electric battery is a device consisting of one or more electrochemical cells that convert stored chemical energy into electrical energy. Each cell contains a positive terminal, or cathode, and a negative terminal, or anode. Electrolytes allow ions to move between the electrodes and terminals, which allows current to flow out of the battery to perform work.

Primary batteries are used once and discarded common examples are the alkaline battery used for flashlights and a multitude of portable devices. While secondary (rechargeable batteries) can be discharged and recharged multiple times; examples include the lead-acid batteries used in vehicles and lithium ion batteries used for portable electronics. Batteries come in many shapes and sizes, from miniature cells used to power hearing
aids and wristwatches to battery banks the size of rooms that provide standby power for telephone exchanges and computer data centers.

**Reed relay**

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

A reed relay is a type of relay that uses an electromagnet to control one or more reed switches. The contacts are of magnetic material and the electromagnet acts directly on them without requiring an armature to move them. As the moving parts are small and lightweight, reed relays can switch much faster than relays with armatures. They are mechanically simple, making for reliability and long life.

**Voltage Regulator**

A voltage regulator is designed to automatically maintain a constant voltage level. It may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. Electronic voltage
regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements.

The common applications of regulators are to step down the output voltage most especially needed by most semiconductor industry. Most appliances uses regulator to sustain the stability and performance needed by the integrated circuits (ICs). By all means, addition of heat sink lessen the heat produce by the voltage regulator that makes it work for a longer time.

**Capacitor**

![Capacitor Image]

A capacitor (originally known as a condenser) is a passive two-terminal electrical component used to store energy electrostatically in an electric field. The forms of practical capacitors vary widely, but all contain at least two electrical conductors (plates) separated by a dielectric (insulator). The conductors can be thin films of metal, aluminum foil or disks, etc. The "non-conducting" dielectric acts to increase the capacitor's charge capacity. A dielectric can be glass, ceramic, plastic film, air, paper, mica, etc. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy instead stores energy in the form of an electrostatic field between its plates.

**Ultrasonic Sensor**

![Ultrasonic Sensor Image]

“Ultrasonic” refers to very high-frequency sound – sound that is higher than the range
of human hearing. Sound Navigation And Ranging (Sonar) is an application of ultrasonic sound that uses propagation of these high frequency sound waves to navigate and detect obstacles. Ultrasonic sensors (also known as transceivers when they both send and receive, but more generally called (transducers) work on a principle similar to radar or sonar, which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. The ultrasonic sensor determines the distance to a reflective surface by emitting high-frequency sound waves and measuring the time it takes for the echo to be picked up by the detector.

Active ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object. Passive ultrasonic sensors are basically microphones that detect ultrasonic noise that is present under certain conditions.

**Arduino Nano**

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.0) or ATmega168 (Arduino Nano 2.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. The
Nano was designed and is being produced by Gravitech. It includes TX/RX, power and test LED’s, reset button, analog and digital pins, ICPS Header and voltage regulator.

**Six-legged Robot**

It is commonly called as hexapod robot which is a mechanical vehicle that walks on six legs. Since a robot can be statically stable on three or more legs, a hexapod robot has a great deal of flexibility in how it can move. Its feet are typically pointed, but can also be tipped with adhesive material to help climb walls or wheels so the robot can drive quickly when the ground is flat.

**Procedure**

1. Place the Arduino Nano on your breadboard where it most suited.
2. Connect the positive supply of the battery (6 V) to the input of the voltage regulator (LM7805) together with a 1 µf capacitor while the negative supply to the ground together with a 22 µf capacitor. (Note. Use a common ground to the whole circuit.)
3. Connect the output of the voltage regulator to the Vcc of the Arduino Nano.
4. Ultrasonic sensor (HC-SR04) trigger pin is connected to the input pin number 2 of the Arduino Nano, echo pin to the input pin number 4 and supply to the Vcc.
5. Connect pin number 2 of Relay 1 to input pin number 7 of the Arduino which responsible to the six-legged robot forward motion and Vcc for the supply.
6. Connect pin number 2 of Relay 2 to input pin number 9 of the Arduino which responsible to the six-legged robot right motion and Vcc for the supply.
If all steps are done the circuits must look like this. Program is made at Arduino software language.

**Schematic Diagram**

![Schematic Diagram](image)

**Program**

```cpp
const int trigPin = 2;
const int echoPin = 4;
int turnright = 9;
int forward = 7;
void setup()
{    Serial.begin(9600);
    pinMode(turnright,OUTPUT);
    pinMode(forward,OUTPUT);
}
```
void loop()
{
  pinMode(trigPin, OUTPUT);
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  pinMode(echoPin, INPUT);
  duration = pulseIn(echoPin, HIGH);
  inches = microsecondsToInches(duration);
  cm = microsecondsToCentimeters(duration);
  //Serial.print(inches);
  //Serial.print("in, ");
  //Serial.print(cm);
  //Serial.print("cm");
  //Serial.println();
  //delay(100);
  if(cm>=0&&cm<=50)
  {
    digitalWrite(forward,LOW);
    digitalWrite(turnright,HIGH);
    delay(300);digitalWrite(turnright,LOW);}
  else
  {digitalWrite(forward,HIGH);}
}

long microsecondsToInches(long microseconds)
{
  return microseconds / 74 / 2;}

long microsecondsToCentimeters(long microseconds)
{return microseconds / 29 / 2;}
