


Arduino Robot Designing And Troubleshooting

Arduino Development Board

- Arduino UNO
 - Arduino Pro Micro
 - Arduino Nano
 - Arduino Leonardo
 - Arduino Mega
 - Arduino MKR Zero
 - Arduino Nano 33 BLE Sense
 - Arduino 33 IOT
 - Digi Spark At Tiny 85
 - Protona H7
- 



Common Communication Pheperials Of Arduino Dev Boards

SPI (Serial parallel Interface)

Popular between the displays and modules LCD and TFT displays , SD card Module , RFID MFRC modules uses this.

I2C (inter-integrated-circuit,)

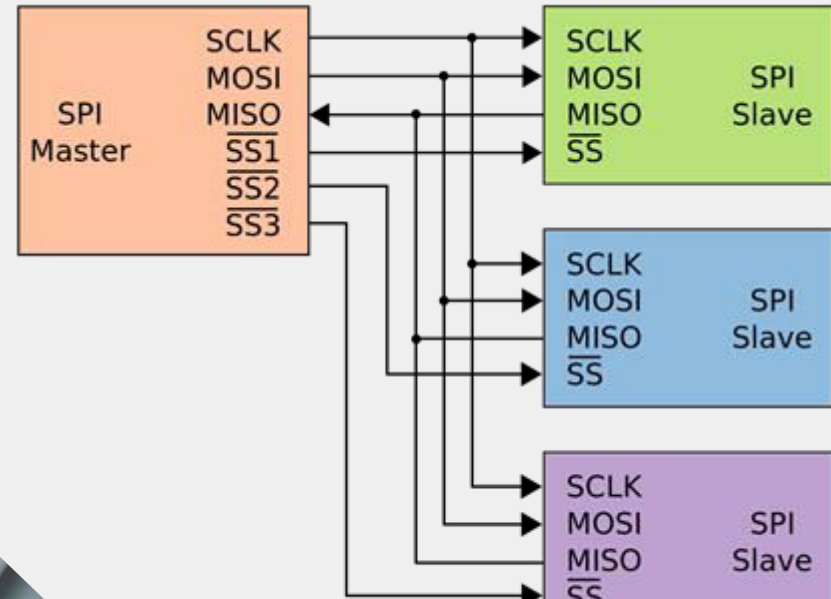
Popular between sensors. A lot of sensor like MPU6050, MAX30100, BMP280, RTC Modules , OLED Displays

UART(Universal Asynchronous Reception and Transmission)

GSM Modules like SIM800I , GPS modules , Bluetooth Hc 05 Work on this

SPI(Serial Parallel Interface)

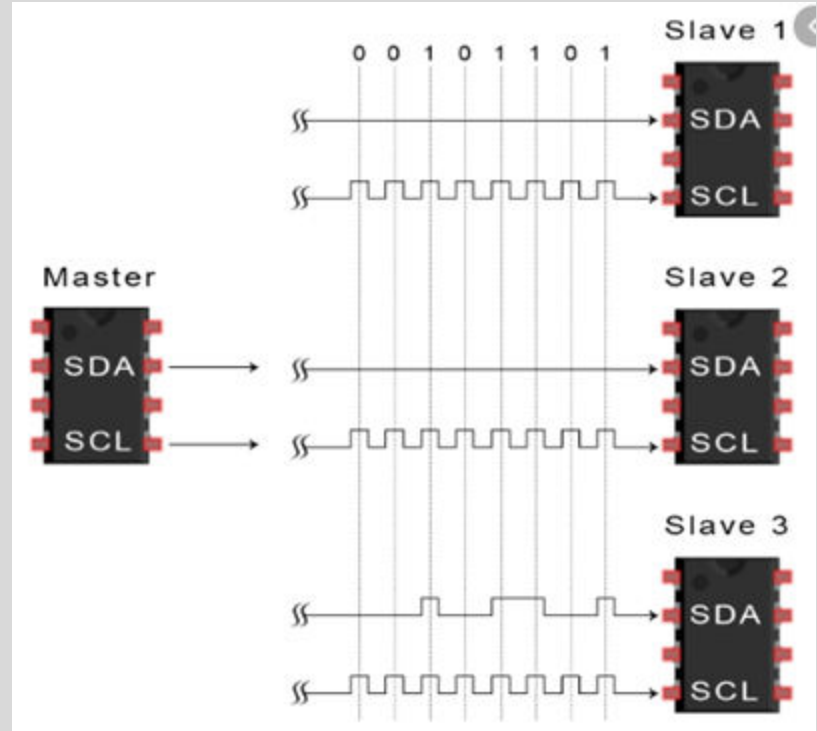
- It has separate lines for data bus and a “clock” bus to keep both sides in perfect sync
- Master is one who generates the clock and other side is “slave”
- Data is sent using a separate line called MISO(Master IN / Slave OUT)
- 25 Mbps
- 4 wire
- Multi slave



I2C

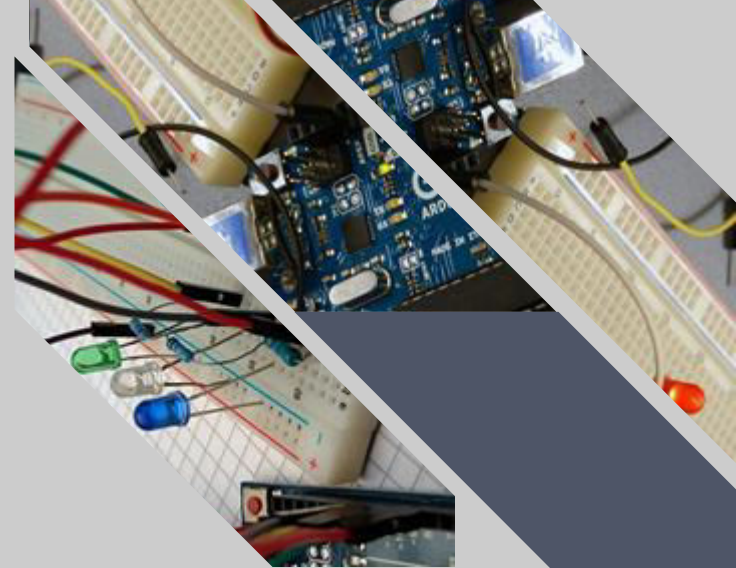
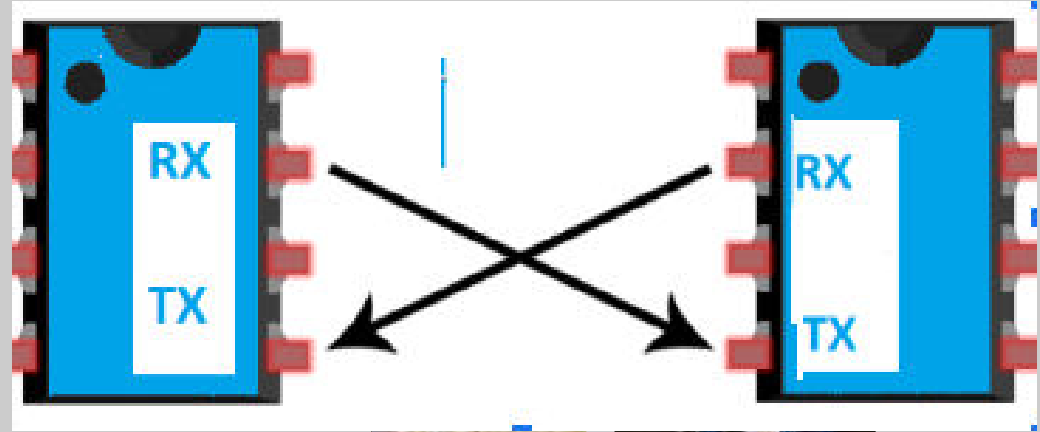
I2C is a serial **communication** protocol, so data is transferred bit by bit along a single wire (the SDA line).

- Can have Multi-master and Multi-slave
- 2 wires
- 1Mbps
- Multi master



UART

- **UART** stands for Universal Asynchronous Receiver/Transmitter.
- It has two pins Rx and TX to receive and transmit data
- The Modules Like GPS, GSM and Bluetooth HC 05 Communicate using this
- One to one communication





Interfacing Sensors using Arduino

```
#include <Wire.h>
#include "MAX30100_PulseOximeter.h"

#define REPORTING_PERIOD_MS      1000

PulseOximeter pox;

uint32_t tsLastReport = 0;
```

Interfacing Sensors using Arduino

```
void setup()
{Serial.begin(115200);
Serial.print("Initializing pulse oximeter..");
if (!pox.begin()) {
    Serial.println("FAILED");
    for(;;);} else { Serial.println("SUCCESS");
    }}
void loop()
{pox.update();
    Serial.print("Heart rate:");
    Serial.print(pox.getHeartRate());
    Serial.print("bpm / SpO2:");
    Serial.print(pox.getSpO2());
    Serial.println("%");

    delay(100);
}
```




Using Analog Sensor

Some sensor give the analogue value and we need to read that that and convert that value for our use.

So for that we use the arduino analog pin

```
int senpin=A0;
```

```
void setup(){
```

```
senpin=(A0,INPUT);
```

```
}void loop(){
```

```
analogRead(senpin);
```

```
}
```



Basics Of Robotic Design Using Arduino

- Purpose
- Features needed to fulfill that purpose
- Hardware mechanism required to get features
- Selecting sensors ,actuators ,motors need to run that mechanisms
- Planning Coding For robot



Designing Basic Motion controlled Robotic Arm

- Purpose:-
Need to pick and place object from one place to another
- Features
 - Can capture hand motion in real time
 - Can control angle of movement of arm
- Hardware and mechanism required to get that features
Need development board here I am using using Arduino Nano
Can move upto 180 degree
- Selecting Sensors ,Actuators ,and Motors
Our Robot need high torque and controlled angle movement .Servo Motor is fit for this work we can control angle and it can give high torque. For getting the motion of hand movement MPU6050 will be great.It is I2c based sensor

Coding

```
#include "Wire.h" // Adding the libraries for sensors and motors
#include "I2Cdev.h"
#include "MPU6050.h"
#include <Servo.h>

MPU6050 mpu;
int16_t ax, ay, az;
int16_t gx, gy, gz;

Servo arm1;
Servo arm2;
Servo arm3;
```

Defining Functions

```
void setup()
{
  Wire.begin();
  Serial.begin(38400);
  Serial.println("Initialize MPU");
  mpu.initialize();
  Serial.println(mpu.testConnection() ? "Connected" : "Connection failed");
  arm1.attach(9);
  arm2.attach(6);
  arm3.attach(11);
}
```

Giving Motion to ROBOT

```
void loop()
{
  mpu.getMotion6(&ax, &ay, &az, &gx, &gy, &gz);
  Serial.print("\t");
  Serial.print("ax= ");
  Serial.println(ax);

  arm1.write(map(ax, -17000, 17000, 0, 179));
  arm2.write(map(az, -17000, 17000, 0, 179));
  arm3.write(map(ay, -17000, 17000, 0, 179));

  delay(60);
}
```



Troubleshooting

- Problem during the UART or serial communication
Swap the RX-TX pins and try . Check the Logic level use logic shifter
- Not getting the value from serial based modules like bluetooth HC05, SIM800I
check their default baud rate and try changing their baudrate
- How to power the motors while arduino 5v pin can't take such load
Use external power source or battery and then make a common ground with arduino
- Not getting the results and output in serial monitor of a Arduino
Check the baud rate and change according to the set baud rate
- Arduino board have limited number of hardware serial .What to do when need more serial for devices
Use software serial for that



Thank You