Communication protocols b/w arduino

- $I_2C \rightarrow$ Inter-Integrated circuit
- $SPI \rightarrow$ Serial peripheral Interface

Difference b/w I_2C and SPI

I_2C require only two communication lines : SDA (data line)
                                          : SCL (clock line)

SPI require More lines alteast four (MISO, MOSI, SCK and SS).

I_2C ip usually slower than SPI due to overhead of addressing

SPI ip faster than I_2C due to its synchronous nature.

I_2C tends to be simpler to implement in hardware due to less pin and less complex signaling.

Application:—

$I_2C \rightarrow$ used in slower-speed communication like RTCp (Real time clocks).

SPI → high speed communication like -flash memory, ADC, DAC and display Modules.

Ultra Sonic Sensor :—

it ip a device that measures the distance to an object using ultrasonic sound waves that are beyond the range of human hearing.

these wave have frequency above $20 kHz$.

Pins:—

Mainly two pins.

Echo Pin: (receiver pin): →

Trigger Pin: (Transmitter pin): → Transmits ways o' waves of range $20 kHz$ to $200 kHz$. acc to sensor model.

Distance:— $\frac{1}{2} \times$ speed of sound $\times$ Time.

speed of sound in Air 343 M/s at room temp.

Accuracy :-

depends on quality of the sensor, wave freq. environmental condition

- higher frequency of ultrasonic can detect small objects.

Range:- few centimeters to some meter.

Application:-

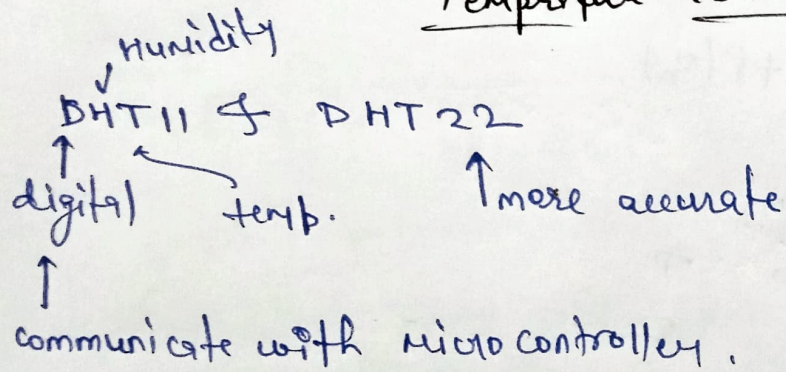widely used in automation, robotics, automotive parking System, security System,

Buzzer

An electromechanical device used to produce audible sound or tones.

two types of Buzzer

i) Peizoelectical Buzzer → pins tve & -ve → uses:- in low power appliation like alarm, timers doorbells, automotive indicators.

ii) Electromagnetic Buzzer → used for high sound wave control (some time) security devices industrial Machin-

↓ Pin

tve, -ve

Temprature sensor :—

Humidity
DHT11 & DHT22

digital   temp.   ↑ more accurate

communicate with Micro controller.

Pin Configuration :—

1. VCe
2. Ground
3. Data (out)
4. NC (Not connected)
   can be connected or left

Accuracy :— Moderate

for temp ±2°C
for humidity ±5%

operating voltage :— 3.3V to 5V

Response time :— slow response
typically every 2 sec.

Applications :—

1. Weather stations

2. HVAC System (Heating, ventilation and air conditioning)
   —system used DHT11 to monitor indoor environment.

3. Home Automation

4. IoT

IR Sensor :—

Infrared obstacles Sensor Module

- used to find obstacles and short & Medium range Communication.

- there is onboard a potentiometer to adjust the detection range.

- IR sensor transmits digital data (0 or 1)

Pin out :—

3 Pins :— vcc, GND & out

1 → potentiometer (Adjust dis)

IR receiver (black led)

IR Emitter LED (white led)

Power LED

obstacle led (illuminates when an obstacle is detected).

- for IR transmitting IR LED of wavelength 940nm to 950nm commonly used.

Application:—

- object detection
- line following Robots
- Gesture Recognition.

PWM:— Pulse width Modulation

it is a technique used in digital communication to simulate analog signals.

duty cycle:— ratio of time the signal is on (high) to time it's off

used to determine avg. power delivered to the load.

Adjusting the duty cycle PWM can effectively control the avg. power delivered to a load.

Higher duty cycle ⟹ on for more time (more power).

- PWM used
  - (i) Motor speed control,
  - (ii) LED dimming
  - (iii) audio synthesis.