

Task 1A - Basics Components

Major Components to build a Robot:

According to the functionality of the robot, the components are decided. In general, the major components needed to design a robot are as follows -

1. Sensors: For Sensing the environments
2. Actuators: For Movement of robots and its parts
3. Control: Controller/Processor as brain of Robot
4. Intelligence: User Written Command to perform desired set of action
5. Power: A necessity for making a system work
6. Communication: Robot can communicate to another robot/PC

Sensors:

Sensors are devices which sense the environment and gives input accordingly. Considering robots as analogous to we human being, sensors are devices that make robot feel the world as human do with help of their five senses. Few types of sensors are shown below.

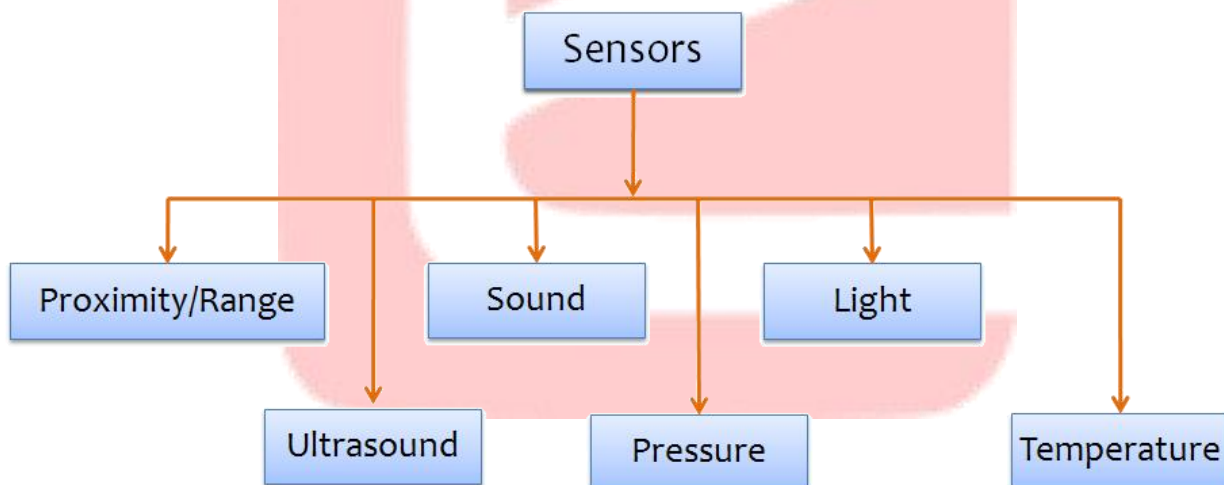


Figure 1: Types of Sensors

Let's take few examples of sensors,

Sharp IR Range Sensor:

- This sensor is used to measure the distance between the robot and the obstacle/object. Figure 2 shows sharp sensor.
- The range of this sensor varies. For example, range of Sharp GP2Y0A02YK IR Range Sensor is between 10 cm to 80 cm.
- It works on the principle of angle of reflection.



Figure 2: Sharp IR Range Sensor

IR Proximity Sensors:

- This sensor is used for detecting obstacles within small range. Figure 3 shows IR proximity sensor.
- The range of this sensor varies. For example, range of analog IR proximity sensors have about 10cm sensing range.
- This sensor works on the principle of reflected light intensity.



Figure 3: IR Proximity Sensor

White Line Sensor:

- This sensor is used for detecting white line or black line on the ground surface. Figure 4 shows white line sensor.
- The lines are used to give robot sense of localization.

For example, three segment line sensor consists of three pairs of sensors. Each pair has a transmitter and a receiver. Based on the phenomena of reflection this sensor works.

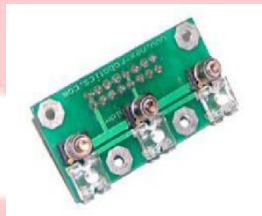


Figure 4: White Line Sensor

Color Sensor:

- A sensor which is used to identify the color of an object.
- This sensor can be used to identify four colors which are RED, BLUE, GREEN and BLACK.



Figure 5: Color Sensor

Actuators:

Actuators in robotic system are analogous to human feet and hand which help human beings in locomotion and performing all sorts of task.

In robot, actuators can be motors, which can be a DC or Servo or Stepper motor or can be a hydraulic or pneumatic systems which help robot to move, pick objects and perform many other such tasks.

A Motor is a device which converts electrical power into mechanical rotation using the principle of electromagnetism.

Types of Motors

The most widely used types of Motors include:

- DC Motors
- AC Motors
- Universal Motors

DC Motors

DC (Direct Current) Motors convert direct current into mechanical power. These Motors are powered by direct current; used in applications where the Motor speed needs to be externally controlled. There are different types of DC Motors such as Brushless, Geared DC Motor, etc.

Uses:

- a) DC Motors are particularly suitable for a wide range of traction applications in robotics.
- b) They find their use in various home appliances such as Air compressor, Hair drier, Sewing machine, etc.

AC Motors:

AC (Alternate Current) Motors are powered by alternate current. AC Motors work best in applications where power performance is sought for extended periods of time.

Uses:

- a) Used where regulated speed control is required in applications such as metering pumps and industrial process equipment.
- b) They are mainly used for heavy industrial applications and for machine tools.

Universal Motors:

Universal Motors are special type of Motors which can be powered by either direct current or alternate current. They are mainly designed to operate at higher speeds.

Uses:

- a) Universal Motors find their use in various home appliances like vacuum cleaners, drink and food mixers, domestic sewing machines, etc.
- b) Universal Motors are used in portable drills and blenders.

Geared DC Motor

A Geared DC Motor where a gear assembly helps in regulating its speed. Using the correct combination of gears, its speed can be adjusted to any desirable number. This concept where gears reduce the speed of the vehicle is known as gear reduction.

Servo Motors:

A servo motor allows a precise control in terms of angular position, acceleration and velocity, capabilities that a regular motor does not have. Its speed is slowly lowered by the gears.

Refer to link: <https://www.elprocus.com/servo-motor/>

Controller:

Microcontroller or processor is the major component of the robot. This is the brain of the robot, which take inputs from sensors or other medium and take decisions on task to be performed.

Intelligence:

The decision taken by the robot is the because of the intelligence of the robot. The robot is made intelligent by the code we write into its memory.

We will be using Embedded C to write the instructions for the robot.

Power:

This is the key component without which the robot can never start, just as we human can't do without food.

In general, two ways to power the robot are -

- Battery
- DC Adaptor

Communication:

The last major building block is the communication system. Just as human being can talk or use sign language for communication, robot also needs communicating devices so that it can send and receive signals from human or other robot. Communication can be done in two ways:

1. Wired Communication

For communication between robot and system we can use USB or serial cable.

2. Wireless Communication

We can achieve wireless communication between robot and system or between robot and other robots using Bluetooth, Zigbee, IR, etc.

Indicating devices:

LCD

- LCD(Liquid Crystal Display) is a device used to display data such as alphabets, numbers and special characters. It is shown in Figure 6
- There are different types of display devices - GLCD, Seven Segment Display, LCD, etc.



Figure 6: LCD

Buzzer:

- Buzzer is an indicating device used to beep for a particular duration. It is shown in Figure 7.



Figure 7: Buzzer