

A Research Paper On “A Study Of Different Types Of Sensors”- With Respect To Concept And Applications.

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Abstract :-

Sensors are nowadays very commonly used in various applications in Companies and industries including homes to perform various operations . The use of Information Technology in these years has added the applications of sensors in the Computer field . We live in a World of Sensors. You can find different types of Sensors in our homes, offices, cars etc. working to make our lives easier by turning on the lights by detecting our presence, adjusting the room temperature, detect smoke or fire, make us delicious coffee, open garage doors as soon as our car is near the door and many other tasks.

All these and many other automation tasks are possible because of Sensors. Before going in to the details of What is a Sensor, What are the Different Types of Sensors and Applications of these different types of Sensors, we will first take a look at a simple example of an automated system, which is possible because of Sensors (and many other components as well).

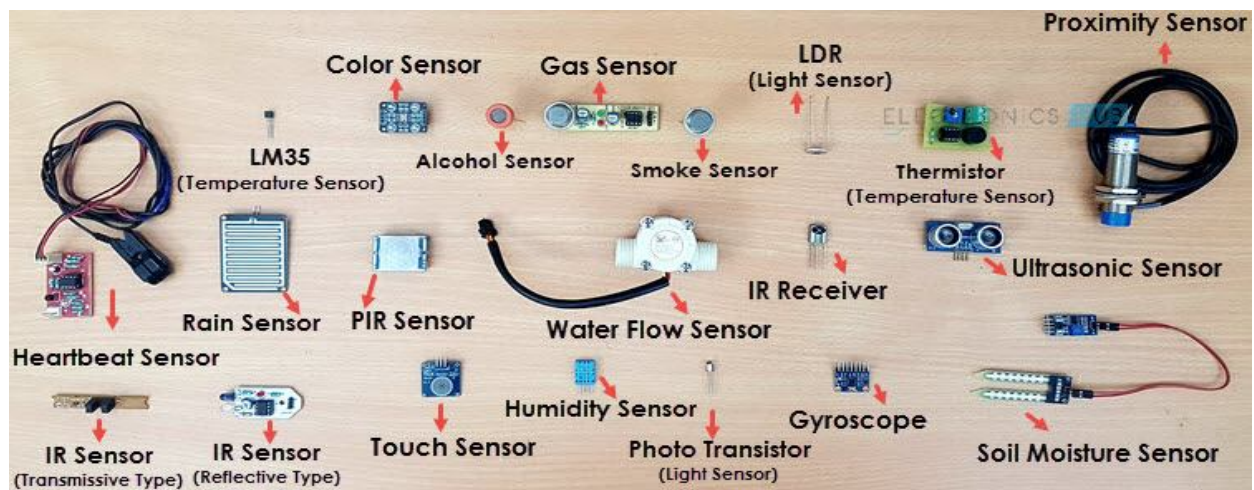
Keywords :- Sensor, Detection , Computer , Hardware, Fiber optics , Vision , Electromagnetic.

Introduction

Sensors are the most important component in any system and engineers in any field need to understand the fundamentals of how these components work, how to select them properly and how to integrate them into an overall system. This book has outlined the fundamentals, analytical concepts, modeling and design issues, technical details and practical applications of different types of sensors, electromagnetic, capacitive, ultrasonic, vision, Terahertz, displacement, fibre-optic and so on.

i. Basic concept of Sensor

A Sensor as an input device which provides an output (signal) with respect to a specific physical quantity (input). The term “input device” in the definition of a Sensor means that it is part of a bigger system which provides input to a main control system (like a Processor or a Microcontroller). Another unique definition of a Sensor is as follows: It is a device that converts signals from one energy domain to electrical domain. The definition of the Sensor can be understood if we take an example in to consideration.



Source: <https://en.wikipedia.org/wiki/Sensor/img>

The simplest example of a sensor is an LDR or a Light Dependent Resistor. It is a device, whose resistance varies according to intensity of light it is subjected to. When the light falling on an LDR is more, its resistance becomes very less and when the light is less, well, the resistance of the LDR becomes very high. We can connect this LDR in a voltage divider

(along with other resistor) and check the voltage drop across the LDR. This voltage can be calibrated to the amount of light falling on the LDR. Hence, a Light Sensor.

II. Different Types of Sensors and brief about some of the sensors widely used

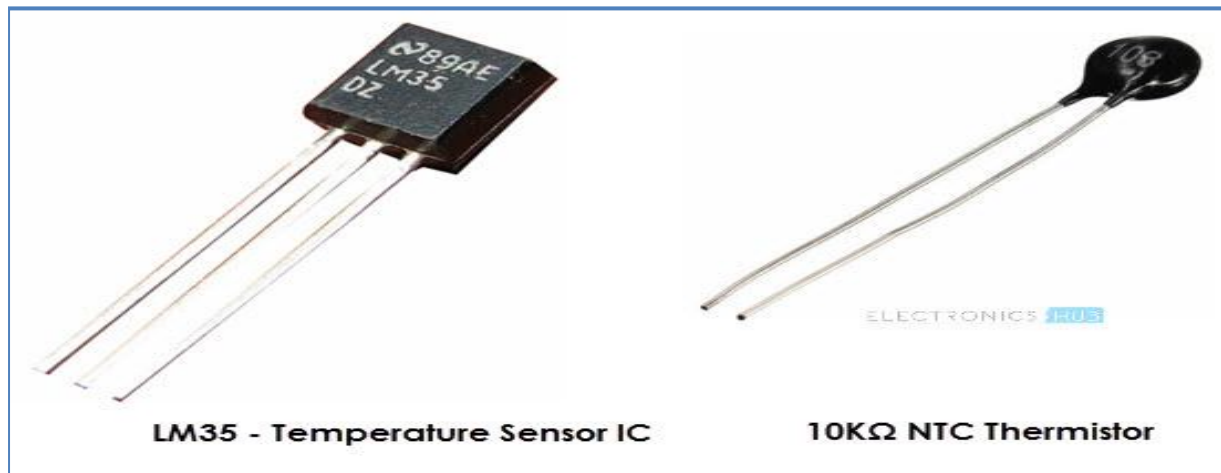
.The following is a list of different types of sensors that are commonly used in various applications. All these sensors are used for measuring one of the physical properties like Temperature, Resistance, Capacitance, Conduction, Heat Transfer etc.

- Temperature Sensor
- Proximity Sensor
- Accelerometer
- IR Sensor (Infrared Sensor)
- Pressure Sensor
- Light Sensor
- Ultrasonic Sensor
- Smoke, Gas and Alcohol Sensor
- Touch Sensor
- Color Sensor
- Humidity Sensor
- Tilt Sensor
- Flow and Level Sensor

We will see about few of the above mentioned sensors in brief. More information about the sensors will be added subsequently. A list of projects using the above sensors is given at the end of the page.

III. Temperature Sensor

One of the most common and most popular sensor is the Temperature Sensor. A Temperature Sensor, as the name suggests, senses the temperature i.e. it measures the changes in the temperature.



Source: <https://en.wikipedia.org/wiki/Sensor/img>

In a Temperature Sensor, the changes in the Temperature correspond to change in its physical property like resistance or voltage.

There are different types of Temperature Sensors like Temperature Sensor ICs (like LM35), Thermistors, Thermocouples, RTD (Resistive Temperature Devices), etc.

Temperature Sensors are used everywhere like computers, mobile phones, automobiles, air conditioning systems, industries etc.

A simple project using LM35 (Celsius Scale Temperature Sensor) is implemented in this project:

TEMPERATURE CONTROLLED SYSTEM.

IV. Proximity Sensors

A Proximity Sensor is a non-contact type sensor that detects the presence of an object. Proximity Sensors can be implemented using different techniques like Optical (like Infrared or Laser), Ultrasonic, Hall Effect, Capacitive, etc.



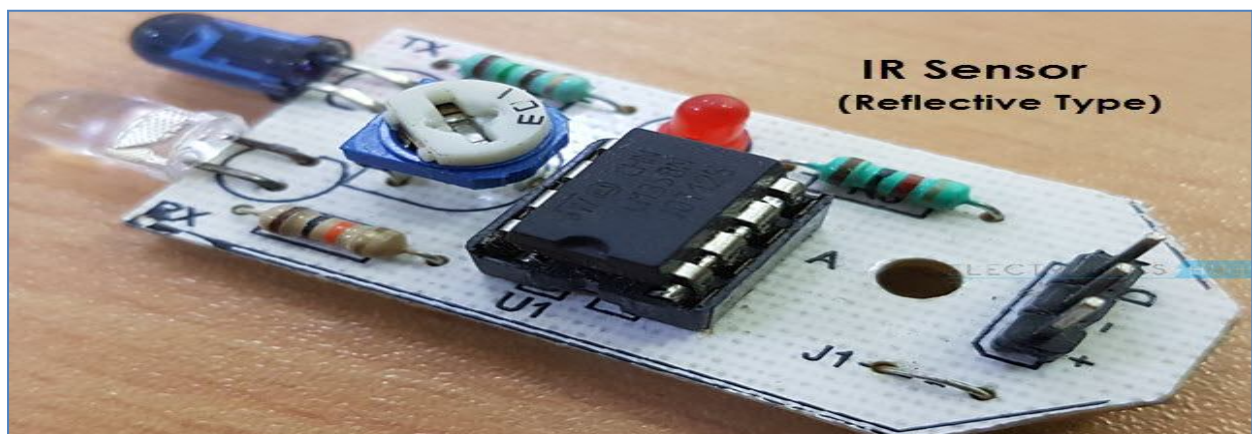
Source: <https://en.wikipedia.org/wiki/Sensor/img>

Some of the applications of Proximity Sensors are Mobile Phones, Cars (Parking Sensors), industries (object alignment), Ground Proximity in Aircrafts, etc.

Proximity Sensor in Reverse Parking is implemented in this Project: **REVERSE PARKING SENSOR CIRCUIT.**

v. Infrared Sensor (IR Sensor)

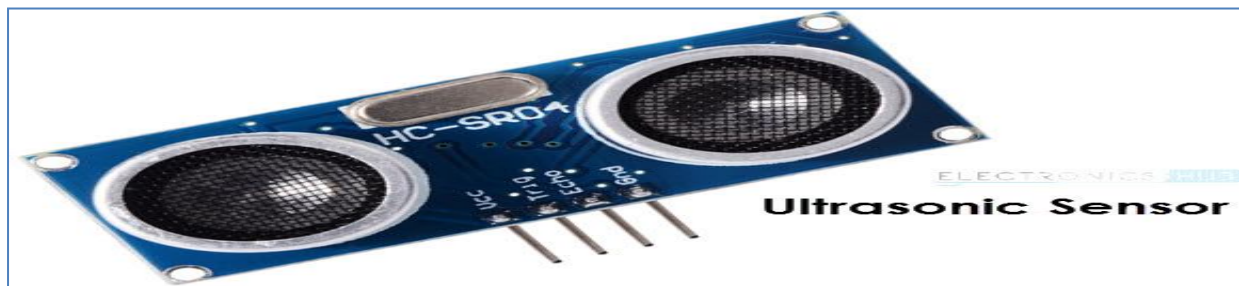
IR Sensors or Infrared Sensor are light based sensor that are used in various applications like Proximity and Object Detection. IR Sensors are used as proximity sensors in almost all mobile phones.



Source: <https://en.wikipedia.org/wiki/Sensor/img>

There are two types of Infrared or IR Sensors: Transmissive Type and Reflective Type. In Transmissive Type IR Sensor, the IR Transmitter (usually an IR LED) and the IR Detector (usually a Photo Diode) are positioned facing each other so that when an object passes between them, the sensor detects the object.

VI. Ultrasonic Sensor



Source: <https://en.wikipedia.org/wiki/Sensor/img>

An Ultrasonic Sensor is a non-contact type device that can be used to measure distance as well as velocity of an object. An Ultrasonic Sensor works based on the properties of the sound waves with frequency greater than that of the human audible range.

Using the time of flight of the sound wave, an Ultrasonic Sensor can measure the distance of the object (similar to SONAR). The Doppler Shift property of the sound wave is used to measure the velocity of an object.

VII. Real Time Application of Sensors

The example we are talking about here is the Autopilot System in aircrafts. Almost all civilian and military aircrafts have the feature of Automatic Flight Control system or sometimes called as Autopilot.



Source: <https://en.wikipedia.org/wiki/Sensor/img>

An Automatic Flight Control System consists of several sensors for various tasks like speed control, height, position, doors, obstacle, fuel, maneuvering and many more. A Computer takes data from all these sensors and processes them by comparing them with pre-designed values.

The computer then provides control signal to different parts like engines, flaps, rudders etc. that help in a smooth flight. The combination of Sensors, Computers and Mechanics makes it possible to run the plane in Autopilot Mode. These sensor are designed by electronics engineers as per the requirement form the companies.

Conclusion :-

Sensors are very useful input devices and are widely used in present age . The Sensor technology is shifting from pure engineering to application based engineering and these technologies can be very easily studied and implement by any company to perform various business applications . The above paper is a decent contribution in creating the awareness abut this technology to the common reader and make this technology applicable to wide business applications on nears future.

Acknowledge ment

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