



Review of techniques and methods for object detection

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ABSTRACT

Many Sensors are available for detection purpose in literature. Some of these are used to detect only warm bodies like human and animals these types of sensors are mostly used in home security systems, some of the sensors are used to detect objects/obstacles which are mainly used in robotics to avoid the obstacle and some of the sensors are used for a special purpose like methane gas detection sensors. Some sensors are not suitable for every type of environment like an infrared sensor. Which does not give good results in a dark environment. This paper critically reviews and summarizes techniques and methods of these sensors but mainly focused will be on techniques and methods for object detection.

Key words: Obstacle detection, warm bodies detection, gas detection sensor, Ultrasonic sensor.

1. INTRODUCTION

A detecting component could be a gadget/module that identifies and answer a type of contribution from the physical setting. That information could likewise be sound waves, IR waves, light and so on. There are 2 varieties of sensors. One is active sensors that need power supply to operate for example IR sensor and ultrasonic sensor [1]. IR detecting component fuses a transmitter source and collector source. The transmitter source sends IR signals and furthermore the receiver source gets that signals in on coming back after hitting any object in front of sensor. IR sensing element needs power to come up with and transmit IR signals. The second type of sensors is passive sensors that operate on surrounding variables/features for example the PIR sensing element [2], that detect heat radiation emitted by hot body like human and animals.

Verity of sensors are conventionally utilized for shrewd frameworks like smart vehicle parking system, industrial shrewd robots and blind assistance system. Meppurath, A., et al in [3] presented a sensible stick for visually impaired individual, that depends on ultrasonic sensors. This stick can guide user to safe path by sensing hindrance in front of him. Range of this smart cane is 4m and user is informed about

detected obstacle through vibration. Sekar, D., et al. in [4] built up a framework to help visual impaired individuals in walking. Three sensors are utilized in this venture ultrasonic, humidity and temperature sensor. In this framework ultrasonic sensor is utilized to recognize any hindrance before visually impaired individuals. Sainarayanan et al. in [5] present blind assistance system named as “navigation assistance for visually impaired (NAVI)”. This system consists of stereo earphone, single board processing system and vision sensor which is placed on headgear. Vision sensor is used to take image, then that image is processed through their algorithm to find obstacle in an image. R Ismail et al. in [6] built up a robot that detect obstacle in its path and follow obstacle free path. This robot depends on the infrared sensor and passive infrared sensor. These sensors check the front region of robot and teach robot to pursue hindrance free path. The program is written in C++ language and Arduino IDE 1.6.5 software is utilized to program Arduino microcontroller. Bagwan M et al. in [7] designed a robot with the goal of pick and place and surveillance of industry workers as appeared in Figure 2. IR and PIR sensor here are utilized to identify any thief. IR sensor work at day time while PIR sensor work during the evening time.

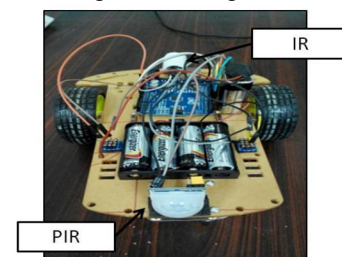


Figure 1: Obstacle Avoiding Robot [6]

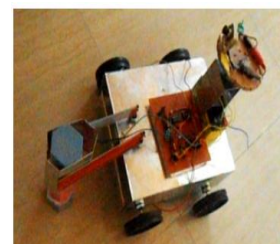


Figure 2: Industrial Robot [7]

2. TECHNIQUES AND METHODS

In segment 2.1 to 2.4 object/obstacle sensing elements are mentioned and in segment 2.5 and 2.6 different sensing elements are mentioned which might be combinedly utilized with other sensors to get extra keen outcomes.

2.1 Infrared Sensor

The infrared detecting component utilizes infrared signal for detecting reason. Infrared detecting component work on the principle of reflected light as appeared in Figure 3. Active infrared sensing element having transmitter source and recipient source. The transmitter source generates infrared signal and recipient source gets that IR signal (radiation) when ricochets over from a surface of the thing. The infrared detecting component can be utilized for obstacle/ hindrance finding, movement finding and may be used for detecting heat emission from an object. As during this analysis paper, the object detection is discussing, analysts are utilizing an IR detecting component for item/hindrance identification. There is disadvantage of using IR sensor as its outcomes are not fulfilling at the dim light environment, IR detecting component is sweet to locate bright surface items/objects then dim surface items/objects.

A. SARASWATHI, et al. in [8] designed obstacle detection robot that relies on IR sensing element. The IR sensing element scan the front atmosphere of the robot. Output of IR sensor is processed through Arduino microcontroller which enable the robot to pursue impediment free path.

Here simple infrared obstacle detection detecting component Module FC-51 [9] is referenced. It has IR signal generator source and recipient source on same board. The signal generator source sends IR signals and in this manner the recipient source gets that signal to locate the nearness of any obstacle in front of sensor. This module includes a potentiometer that empowers the client to change the set the range of sensor. The location scope of this IR detecting module is 2cm to 30cm. It has 3 pins VCC, GND, and OUT as appeared in Figure 4. VCC and GND are to provide power to sensor module and OUT pin is for giving output signals to microcontroller.

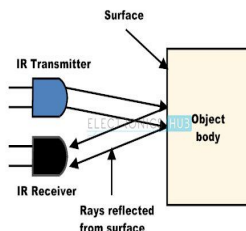


Figure 3: Infrared Sensing Principle [10]

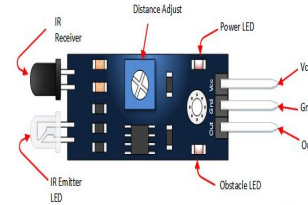


Figure 4: FC-51 IR Sensor [11]

2.2 PIR Sensor

PIR (Passive infrared) sensing element is used as motion detection sensing element. PIR consists of a photoelectrical sensing element as shown in Figure 5 that sense heat emitted by human or animal bodies or this sensing element can sense those objects that release infrared radiation. The drawback of using PIR sensing element is that it solely senses infrared radiation emitted objects.

HC-SR 501 is PIR sensing element Module as appeared in Figure 5 and 6. PIR sensor has photoelectric sensing element on board that can sense infrared radiation. It can sense the presence of humans or animals. This sensor can be utilized with IR sensor to get more good outcomes. Researchers use this sensing element largely for the house security system. PIR sensor has 3 pins as appeared in Figure 6, VCC, GND and OUT. VCC and GND pin are to provide power to sensor and OUT pin is for to allow a signaling to microcontroller regarding detection. PIR has 2 potentiometers, one for changing the sensitivity level of the sensing element and the other potentiometer is to set delay time of the signaling of the sensing element. This PIR sensing element range is 7 meters. The sensing element has different 3 pins associated with a jumper. One is termed repeatable trigger, when this pin is enabled the output pin of sensor module will remain enable until the sensed body is present in its range. The opposite pin is termed non-repeatable trigger, when this pin is enabled. The output pin of the sensor will remain high up to already set delay time.

Sanjana Prasad et al. in [12] developed surveillance monitoring system for the house. This strategy upheld Raspberry Pi, PIR sensor, camera and smartphone. This method enable user to monitor house remotely by means of 3G innovation and utilizing web application. PIR detecting component have the most critical job in this framework. When it identifies any movement, the camera begins recording and system notify the client through smartphone. The client may observe live streaming. Suk Lee et al. in [13] present smart home system. PIR sensors is here utilized to discover the area of occupants in a home to control lights and condition of home.

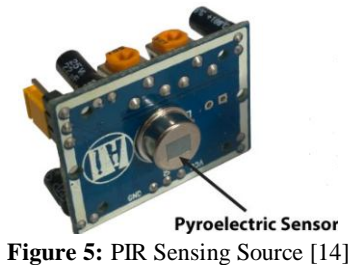


Figure 5: PIR Sensing Source [14]

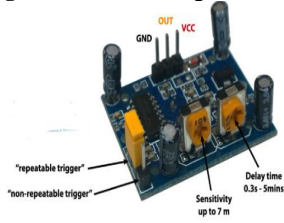


Figure 6: HC-SR501 PIR Sensor Module [14]

2.3 Laser Sensor

Laser detector works on the principle of infrared sensor but here instead of infrared light the laser sensor transmits laser light and on receiving side there is laser light receiver that receive that transmitted laser light when make a rebound from an object/obstacle. Laser sensor can sense a tinny item or object since laser light is tremendously focused. however, the drawback of this sensor is that it's harmful to human. It will injury human skin as well as eyes [15].

Laser sensor is object sensing sensor as appeared in Figure 7. It can detect object or thing by generating a beam of focused light on item/thing and recipient side get that mirrored laser light from the thing/item. This module includes laser light generating source and receipting source on board. The frequency of this sensor laser light is 180kHz. Range of this sensor is from 0.8 to 1.5 meters. This sensor has 3 pins as appeared in Figure 7 VCC, GND and DOUT/D5. VCC and GND pins to give control supply to sensor and DOUT/D5 which empower upon sensing of any item.

Dipl.-Ing et al. in [16] created framework for vehicle guidance and to maintain a strategic distance from crash. This strategy depends on LADAR DIGITAL An AF laser detector. This detector almost covers greater area of vehicle about 270°. There's a DSP primarily based pc within this optical maser detector that process distance measurement. This detector scans the surroundings of the vehicle and measures distance from a vehicle to object.



Figure 7: Laser Sensor [17]

2.4 Ultrasonic Sensor

The ultrasonic sensing element utilizes sound waves for detecting reason. Ultrasonic sensors generate sound waves having frequency of 40KHz that is unheardable to people. People hearing frequency is from 20Hz to 20KHz. Ultrasonic sensor has sound waves generator and collector, sound waves generator generates these waves while recipient side get these sound waves. Ultrasonic sensors can be used as distance measuring or for object detection in smart systems or robotics. HC-SR04 is a simple form of ultrasonic sensor that has sound generator and receptor onboard. The sound generator generates sound waves whereas the receptor side receives that sound waves. This sensor has four pins as appeared in Figure 8, VCC, GND, TRIG, ECHO. VCC and GND for to provide supply to sensor module. TRIG pin is for transmit sound waves. ECHO pin, is to enable receiver side of sensor to receive that transmitted sound signals.

Researchers mostly use ultrasonic sensors in obstacle detection and blind assistance system. Agarwal et al. in [18] designed blind assistance system. In this system ultrasonic sensor is used as obstacle detector.



Figure 8: Ultrasonic Sensor [19]

2.5 Dampness Sensor

Dampness sensors are the sort of sensors which can be utilized to quantify dampness level. Soil humidity sensing sensor is simple form of such sort of sensors. This device identifies wet measurement inside the soil. This sensing element comprises of 2 terminals. This device relies upon the resistance of soil between these terminals and furthermore the resistance of soil depends upon the water level inside the dirt. The device identifies that resistance of soil due to water and send output signals to the microcontroller through its pin AOOUT as appeared in figure 9. Two pins VCC and GND to give power to module.

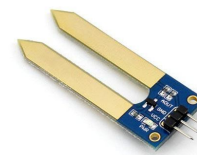


Figure 9: Dampness Sensor [20]

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