

A Design of Human Detection Robot using Sensors

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Abstract—There are lots of sudden Natural calamities like earthquakes, Floods, Storms etc., and Manmade disasters like robberies, Industrial and Transportation accidents and one of the most threatening is terrorists attacks. These disasters produce a devastating effect and they see no difference between human and material. Hence, many times humans are buried among the debris and it becomes impossible to detect them. A timely rescue can only save the people who are buried and wounded. Detection by rescue teams becomes time consuming and more difficult. Therefore, we propose a robotic vehicle that moves in the disaster prone area and helps in identifying the alive people and rescue operations. As the robot is used to detect humans, it is named Human Detection Robot.

Keywords—PIR sensor, IR sensor, Gas sensor, Fire sensor, Camera, Radio Frequency (RF) Transmitter and Receiver, Infrared signals.

I. INTRODUCTION

Nowadays the cities are growing faster and most of the people move into the cities which creates an enumerate increase in population. This high population increase causes any disaster natural or manmade into much more drastic accident. Indeed the disasters may destroy many huge infrastructures causing complexity and hazardous disaster sites, which alters the reliability and effectiveness of the rescue teams. The complex and hazardous nature of these accidental sites links a great threat and risk to the rescue workers and hostages trapped in the disaster. These disasters induces disruption in the social and economic balance of the society. Hence, in this paper, a new approach for detecting humans using specific set of sensors and 8051 Microcontroller is proposed.

Detecting the presence of humans can be done in different methodologies and techniques. In this proposed technology, we use a specific set of reliable sensors to detect the alive human body and a wireless mini camera to capture the live

scene of the surrounding environments continuously. The main aim of this system is to propose a wireless robot that is controlled through pc using RF interface, navigates around the areas, and find humans in need of help.

II. BLOCK DIAGRAM

A. Transmitter side

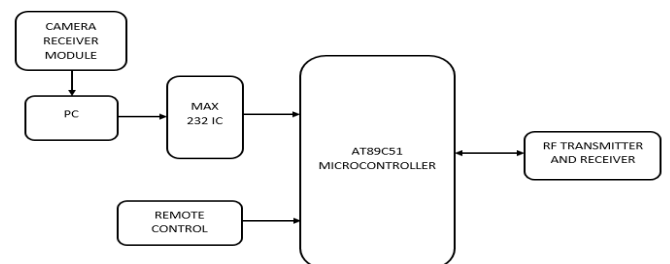


Fig 1. Block diagram of Transmitter Side

B. Receiver side

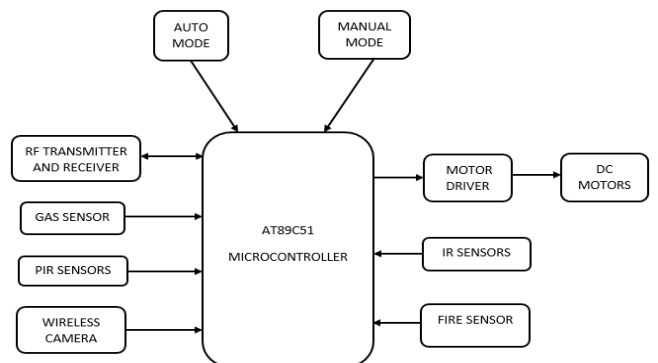


Fig 2. Block diagram of Receiver Side

III. WORKING PRINCIPLE

The Robot can be considered as two sections, Transmitter section, and Receiver section.

The Transmitter section consists of PC, MAX232 IC, AT89C51 Microcontroller, RF Transmitter and Receiver, 4 push buttons (Remote control) and camera receiver module.

The Receiver section consists of AT89C51 Microcontroller, L293D motor driver IC, DC motors, camera, RF Transmitter and Receiver, and sensors.

A. Transmitter Section

The robot can be controlled using a PC or a remote control, which helps in reliable controlling of robot even if any one of the control fails, the robot can be controlled by another method. Using a PC the robot can be operated both in automatic and manual modes.

In manual mode the commands to the robot is given using HyperTerminal. These commands are in RS232 logic, which is converted into TTL (Transistor-Transistor Logic) and given to a port of the microcontroller. These inputs obtained at one port of microcontroller are given to the RF Transmitter. The RF Transmitter transmits these bits of data to the RF receiver at the receiver end.

In Automatic mode, the robot navigates on its own which is guided by the signals obtained from the IR sensors, which helps in avoiding the obstacles in the debris. The IR sensor produces a 5v output when any obstacle is detected.

B. Receiver Section

The RF Receiver receives the bits sent from the transmitter. These bits are given to the microcontroller. Based on the received bits, the microcontroller gives input to the motor driver IC. The motor driver IC in turn drives the motors in the required direction. Based on the various combination of bits given the robot moves in various directions.

When a human is detected, the PIR sensor produces a voltage output, which is given to the microcontroller. On receiving an input from the PIR sensor, the microcontroller triggers a buzzer. In case, if there is any fire or leakage of LPG the Fire and Gas sensors respectively detect this and a signal is sent to the Transmitter section, where a message is displayed on the PC (Hyper Terminal).

A wireless camera is mounted on the robot, which continuously captures video of the disaster area, and it is displayed live on the PC at the Transmitter section.

IV. COMPONENTS

A. PIR Sensor

PIR sensors are used to detect any living thing that radiates IR radiations due to heat. It can detect humans and animals. Fresnel lenses are used in PIR sensors, which increase the range and accuracy of detection. These lenses are made up of translucent material, which capture the radiation from visible spectrum of light.

B. IR Sensor

The robot has obstacle sensor, which can detect obstacles and helps in navigating without crashing. These sensors produce Infrared signals, if these signals hit any obstacles, the signals bounces back to the IR receiver, indicating it has found an obstacle.

C. Gas Sensor

This is simple to use LPG gas sensor suitable for sensing LPG concentrations in air.

D. Fire Sensor

It is a sensor designed to detect and respond to the presence of flame or fire.

E. Radio Frequency Transmitter and Receiver

The Radio Frequency Transmitters modulates and transmit the radio frequency signals.

The Radio Frequency Receivers receives the radio frequency signals and demodulates it.

Both operate at 433MHz frequency. It is an asynchronous device and provides an ability for data encryption.

RESULT

The robot has to be tested under closed environment where the presence of sunlight is less. The testing phase has two parts, the first one is testing for detecting a human, and the second test is detecting any obstacle.

To test the robot for detection of human, it has to succeed the test conditions. The robot should be tested for its range by placing 5-10ft away from the human and the robot should detect the presence of the human. Hence, the first test will be completed. The second test is checking the boundary conditions by placing the robot at 11ft and 12ft away from the human. It has to detect the presence of human being in both the ranges. The final test is to place the robot 13ft away from the human, where detecting is not possible. Hence, the phase of checking the range is completed. Second phase is to test the obstacle sensor. The robot is made to move in a room. If it senses any obstacle in front of it, the robot must move in backward direction about 1ft and chooses to move in left or right direction. If any obstacle is sensed in right side then the robot changes its direction to left side and vice versa.

APPLICATION

1. In military applications to detect the presence of intruders.
2. In rescue operations where human reach is impossible.
3. In disaster and crisis management.
4. This equipment can be used at mines, earthquake prone place etc.

ADVANCEMENT

1. The usage of IR sensors for avoiding obstacles and to operate in automatic mode.
2. Usage of 3 PIR sensors to increase the accuracy.
3. Use of Gas and Fire sensors.
4. Use of Wireless Camera.

CONCLUSION

Human Detection Robot is to provide more security for the users to protect their belongings from robbers. By this system, it will be a great help indeed to rescuers in detection of the human beings at the disaster sites. This is also user friendly, economical, semi-autonomous, and efficient device for detection of humans.

This proposed model system will be a combination of a stationary and a mobile robot system especially for the disaster affected chaotic areas. The robot can move in all directions by both PC and remote control and also automatically, which makes the system more effective to use. As the robot can move, it covers lot of distance that reduces the use of many robots or sensors. When the robot finds a human it can notify the users by producing continuous beeps.

The robot can be modified further by attaching a SONAR (Sound Navigation and Ranging) it can determine the distance between the human and can detect the IR image of the object.

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