

# Alive Human Detection Robot in Rescue Operation

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**Abstract**— Many areas of the world get affected by natural calamity. Disasters are unstoppable and leave behind a great loss of life. Disasters like earthquake, floods, etc. cause mass destruction and often lives get buried or trapped in debris. In such situations detection by rescue workers becomes time consuming and due to the vast area that gets affected it becomes more difficult. Hence, we are proposing a human detection robot which can detect alive humans in debris so that timely help can be made available to the victims. The robot is equipped with a PIR sensor to detect live human, a robotic arm to remove any obstacles in its way, a camera to send images to control unit. Microcontroller SST89E516RD is used to control the robot and is the core of robot. The robot consists of a three wheel geared drive with DC motors attached to perform forward and reverse movements.

**Index Terms**— Calamity, debris, PIR sensor, robotic arm, control unit, DC motor.

## I. INTRODUCTION

A timely rescue can only save the people who are buried and wounded due to a disaster. In such situations, rescue system must take fast decisions under pressure, and try to get victims to safe location at their own risk. The rescue system must collect the location information and status of victims as quickly as possible so that medication and fire-fighters can enter the disaster prone area and save people. All these works are performed mostly in very dangerous and risky situations by human and trained dogs. Detection by rescue workers becomes time consuming and due to the vast area that gets affected it becomes more difficult [3]. So the project proposes a mobile rescue robot that moves in a disastrous area and helps in identifying the live people and rescue operations. A robot is a reprogrammable, multifunctional manipulator designed to move materials, parts, tools or specialized devices through variable programmed motions for the performance of a variety of tasks. Basically a robot consists of a mechanical structure, such as a wheeled platform, arm, or other construction, capable of interacting with its environment. Sensors are used to sense the environment and give useful feedback to the device. Systems to process sensory input in the context of the current situation and instruct the

device to perform actions in response to the situation [2]. The main aim of the paper is to implement a Wireless Robot which can be controlled through PC using Ride and Flash magic interface and navigates around the disastrous area and tries to find the humans who need help. The Robot can detect the live human based on the IR radiation emerging from the humans. It is provided with a Proximity IR sensor for detecting live humans and for obstacle avoidance the robot is equipped with a robotic arm.

## II. PROPOSED SYSTEM HARDWARE

The project proposes a mobile rescue robot that moves in the disaster prone area and helps in identifying the live people those are injured and performs rescue system operations. Hence due to the timely detection of victims precious life can be saved without the help of large number of rescue operators. The hardware system consists of a transmitter section and a receiver section. Figure below shows the block diagram of alive human detection robot.

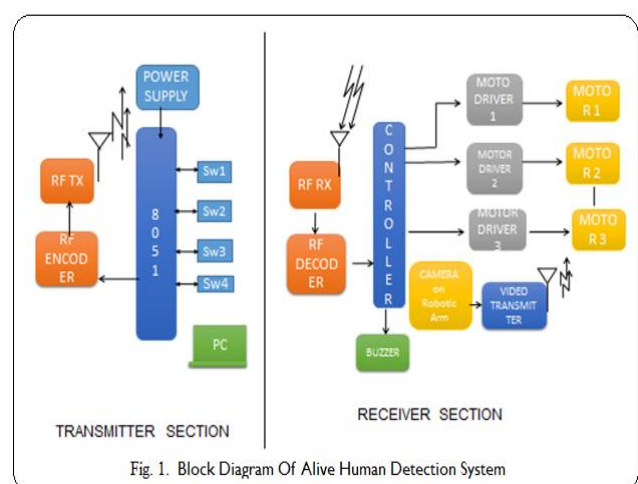


Fig. 1. Block Diagram Of Alive Human Detection System

### A. Microcontroller

The microcontroller that is been used is the SST89E516RD controller. The microcontroller is used to gather the data from the sensor unit in real time and transfer the corresponding information data to the CPU of control room.

It also receives commands from the CPU and transfers it to the robot unit for its movement. The microcontroller is the core of the surveillance robot [2]. It has an 8K Bytes of In-System Programmable (ISP) Flash Memory. Operates at a range of 4.0V to 5.5V and has 256 x 8-bit Internal RAM.

### B. Passive Infrared Sensor

A Passive Infra-Red sensor (PIR sensor) is an electronic device which measures infrared light radiating from objects in its field of view. Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall [1].

#### • Design

Infrared radiation enters through the front of the sensor, known as the sensor face. At the core of a PIR is a solid state sensor or set of sensors, made from approximately 1/4 inches square of natural or artificial pyro electric materials, usually in the form of a thin film, out of gallium nitride (GaN), caesium nitrate (CsNO<sub>3</sub>), polyvinyl fluorides, derivatives of phenylpyrazine, and cobalt phthalocyanine. Lithium tantalate (LiTaO<sub>3</sub>) is a crystal exhibiting both piezoelectric and pyroelectric properties [1].

#### • Features

- a. Single bit output
- b. Jumper selects single or continuous trigger output
- c. Mode, 3-pin SIP header ready for breadboard or through whole Project.
- d. Small size makes it easy to conceal
- e. Compatible with BASIC Stamp, Propeller, and many other microcontrollers [1].

### C. Camera module

The camera module consists of a web camera and it is mounted on the robot and the video signal is transmitted to the receiver at control room. The camera module will transmit the video coverage of the paths and thus helping in easier mapping of the path to be taken by the rescue team. For real time applications, camera of high range is to be used to get good clarity and good coverage of area. The function of camera also help the robot from getting stuck in a pit as the obstacles lying in path is foreseen and required action can be taken, thus improving the life of robot in the disaster area. Due to which we can observe the robot & we can see live vision [2].

### D. Motor and motor driver

The robot driver unit is primarily concerned about the movement of the robot in x-axis and y-axis.

The robot is of conveyor belt type as it helps to manoeuvre over debris and rugged terrain. Two DC motors of 200rpm will run the wheels of mobile rescue robot. When both the wheels are given with positive pulse edge, then robot moves in forward direction. When the supply is reversed mean both the wheels are given with negative pulse edge, then it goes in backward direction and similarly by varying the negative and positive edge, left and right turn can be achieved successfully. The selection of supply given to each motor, L293D IC is used. This will drive the robot to move in forward, reverse and turn left and right [2].

#### • Features

- a. Wide supply-voltage range: 4.5V to 36V.
- b. High-Noise-Immunity input.
- c. Peak output current 2 A per channel (1.2 A for L293D)

### E. RF Module

An RF module (radio frequency module) is a small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system like this it is desirable to communicate with another device wirelessly. This wireless communication may be accomplished through radio frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and/or receiver.

#### • RF transmitter

The encoder IC HT12E acts as a RF transmitter. HT12E is an 18 pin IC. It is capable of encoding 12 bits of information (4 data bits and 8 address bits). TE (transmission Enable) pin in the IC is responsible for transmission of data. Encoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding information which consists of N address bits. Each address/data input can be set to one of the two logic states. The programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal. The HT12A additionally provides a 38 kHz carrier for infrared systems.

#### • RF receiver

The decoder IC HT12D acts as a RF receiver. It is a 18 Pin DIP. Operating at a voltage of 2.4V~12V. It has low power and high noise immunity and low stand by current. It is capable of decoding 12 bits of information. It also converts the serial input into parallel outputs. These decoders are a series of

CMOS LSIs for remote control system applications. For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from a programmed series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. These decoders are capable of decoding information that consists of N bits of address and data. Of this series, the HT12D is arranged to provide 8 address bits and 4 data bits.

### III. SOFTWARE TOOLS

Software tools being used to interface the hardware system to software system are:

- RIDE
- FLASH Magic

#### A. RIDE ( Raisonance 8051 Integrated Development Environment)

Ride is a full featured integrated development environment that provides seamless integration and easy access to all development tools. From editing to compiling, linking, debugging and back to start, with a simulator, ROM monitor or other debugging tool, RIDE conveniently manages all aspect of the embedded system development with a single user interface.

#### B. FLASH Magic

Flash Magic is a tool which is used to program hex code in EEPROM (Electrically Erasable Programmable Read Only Memory) of microcontroller. It supports the microcontroller of Philips and NXP. We can burn a hex code into those controllers which support ISP (in system programming) feature. If a device supports ISP then hex code can be easily burn into EEPROM of that device

### IV. ADVANTAGES

- This system is an effective and a safe system to ensure that there are no humans left behind in a rescue operation.
- The system is safe even for the user because of the use of robotics and no manual work in field.[1]
- The design of this robot is simpler to understand.

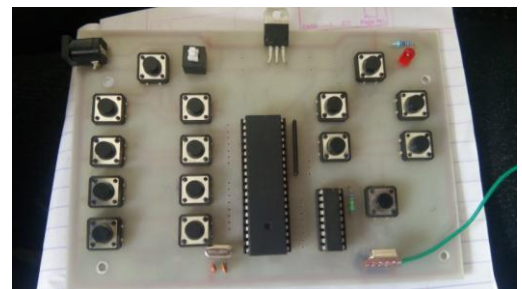
- This system provides high reliability.
- They work efficiently in environment where it might be dangerous for humans.
- Precise positioning and repeatability of movement since good stepper motors have an accuracy of 3-5% of a step and this error is non-cumulative from one step to next.

### V. CONCLUSION

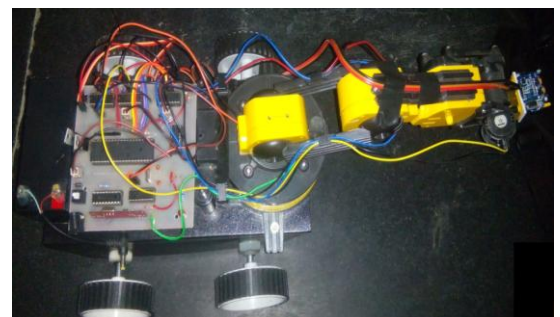
Hence many lives can be saved by using this autonomous vehicle during a disaster in a short duration which becomes time consuming and unaffected if done manually. The application of wireless sensor network will improve the saving of many lives by using mobile rescue robot in disaster prone area. In this paper we design an effective & safe system to ensure that there is no human left behind in rescue operation.

### VI. HARDWARE OF ROBOT

#### A. Transmitter



#### B. Receiver



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