



Mobile Rescue Robot for Human Body Detection in Rescue Operation of Disaster

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ABSTRACT: Many areas of world are getting affected due to natural calamity. Disasters are exceptional & unstoppable events that are either man made or natural, such as terrorist attacks, earthquakes, wildfires and floods etc. [1]. Disasters create emergency situations to provide basic services to the victims must be coordinated quickly. Many times we observe that many people dies by trapping in these disasters but the people also dies on large scale just because they didn't get help at instant time or the help provided to them is late. This paper propose an mobile robot based on Wireless Sensor Network (WSN) which is designed for human existence & detection in an unmanned area can be done only by an automated system. This system proposed a monitoring system using sensors unit and camera module to recording, analyze conditions of human body and transmit data [3]. Mobile robots perform cooperative Simultaneous human body localization function and communicate over the WSN. The main objective of this Paper is to rescue more & more number of people from the adverse condition.

KEYWORDS: body detection, Natural calamity, Mobile rescue robot, Wireless sensor network, Disaster.

I.INTRODUCTION

This article design a mobile rescue robot system based on wireless sensor network technology to help the people on time which are trapped in natural calamity like disaster, earthquake, floods etc. It gives timely & accurately reflect dynamic situation of human in disaster region like in the underground regions to control room, so that rescue team of Experts & doctors can be sending to the victim's location for primary treatment and can be sent to the safe place or hospital. Wireless sensor network can solve the key issue of communication bandwidth, data transmission, real-time detection & so on. Wireless sensor network is composed of a large number of micro-sensors nodes which have small volume, low cost, good compatibility & battery powered. At the same time due to the special nature of the wireless network is that it can spread the wireless signal, we can easily locate human. By sensors like humidity, temperature, visibility we will get all the weather reports

Existing System: Natural calamities do occur and they are exceptional and unstoppable event which disturb both economic & social balance of society. Now awareness about concept of intelligent rescue operations in such calamities are becoming increasingly in the people, so that precious life and material can be saved though calamities which are cannot be stopped [1,3]. Still there are lots of disasters occurs recently disaster occur at uttarakhand on date 16th July 2013. Disasters produce a devastating effect and they see no difference between human and material. This leads to great loss of possession & life. Human's detection is difficult when they are buried among the debris.

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Fig 1: Conventional Rescue System

A timely rescue can only save the people who are buried and wounded. Figure 1 shows conventional rescue system, to identify live or injured human beings as quickly as possible to provide primary service & save its life. 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, stability of the structures as quickly as possible so that medics and firefighters can enter the disaster area and save people. All these works are performed mostly in very dangerous and risky situations by human and trained dogs [5]. Detection by rescue workers becomes time consuming and due to the vast area that gets affected it becomes more difficult. This is why since some years mobile robots have been proposed to help them and to perform tasks that neither humans, dogs nor existing tools can do. So the project proposes a mobile rescue robotic that moves in the Disasters area and helps in identifying the alive people and rescue operations.

II. RELATED WORK

In this section, a brief discussion of some of the related work is presented; focusing on the used approach and its advantages and disadvantages. Remote Operated and Controlled Hexapod (ROACH): ROACH is a design that provides significant advantages in mobility over wheeled and tracked designs. It is equipped with cameras which transmit live audio and videos of the disaster site, as well as information about locations of objects with respect to the robot's position to the interface on the laptop. Kohga: University of Tokyo - The most complicated task for most of the USAR robots has been working on a rough terrain. Specialized robots have been designed for these types of environments such as KOHGA the snake like robot. The robot is constructed by connecting multiple crawler vehicles serially, resulting in a long and thin structure so that it can enter narrow space.

System for disasters made up of four parts sensor, mobile rescue robot, transmission network, monitoring center. When victims are trapped inside debris, it will be difficult to search and rescue them quickly. At this situation Mobile robots are use that can go inside the building and detect if any victim is present and then signal the crewmembers for recovery. The purpose of using mobile rescue robots is to track the victims in disaster area. Disasters come with many obstacles for the rescue team that makes it hard for them to reach the victims, for example rainstorms, collapsed buildings, obstructions and dangerous substances. The rescue team must fast and securely find information of the disaster areas, so disaster area is covered by mobile rescue robot to rescue people which are injured survivor, unconscious survivor etc.

III. PROPOSED SYSTEM HARDWARE

The project proposes a mobile rescue robot that moves in the disaster, earthquake prone area and helps in identifying the live people, injured people, location and rescue system operations. Hence due to the on timely detection in natural calamities this can save precious life & great loss even without the help of large number of rescue operators. The proposed system consists of a mobile rescue robot, PC control Module.

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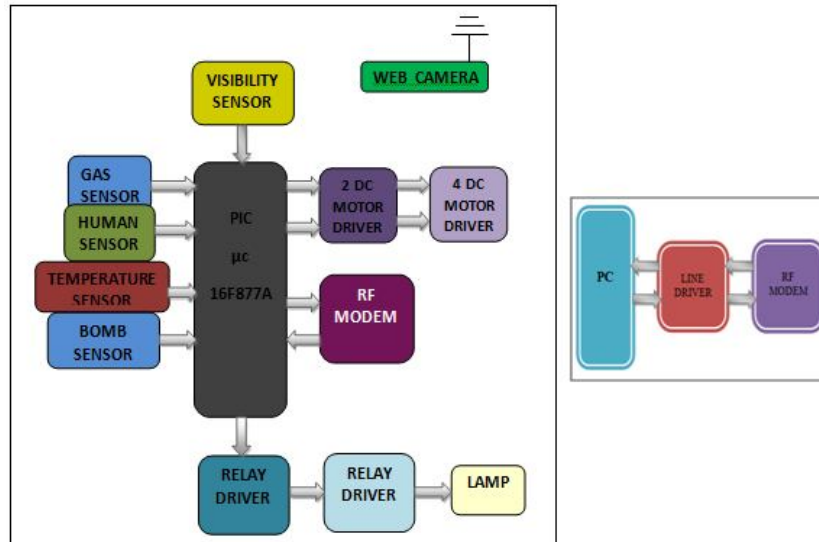


Fig 2: Hardware Design of Mobile rescue robot & Control Room.

The mobile rescue robot consists of four units that are namely Sensor unit, Micro-controller, Camera unit, Motor driver unit, Transmission unit [2]. The sensor unit must be directly interfaced to the micro-controller. The sensor devices monitor current readings and sends data to the Micro-controller. The controller circuit is responsible for transmitting this information. Controllers are designed at hardware level. The 2.4GHz RF module is interfaced with the micro-controller via the standard serial port. These data's are updated by the PC/SERVER So that rescue team can view the readings real time and camera is used to detect motion & live visualization of critical situation of the disaster.

Microcontroller unit: The microcontroller that is been used is the PIC 16F877A controller. PICs are popular with both industrial developers and hobbyists alike due to their cheap, easily available, large user base, easy to program according to application, free development & low cost tools availability, and serial programming (and re-programming with flash memory) capability. The microcontroller is used to gather the data from the sensor unit in real time and compare it with the set point (safer level of temp) 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.

Sensor Unit: A sensor (also called detector) is a converter that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument. Four sensors are used in the project. They are visibility sensor, Human sensor, and Gas sensor, Temperature sensor & Bomb sensor for which LDR (Light Dependent Register), PIR (Passive Infra-Red), MQ-7 and LM35 sensors, and A Bomb (Metal) sensor to detect the presence of suspected material in Rescue operations. are used respectively. The LDR detect visibility if visibility is less after going under the ground then lamp consist by mobile robot will glows. The LM 35 has a range of 0-110 degree Celsius. The real-time values observe by the sensors are transmitted to a PIC 16F877A wherein it compares the measured value with that of the set points. This data information provide by sensor helps in having good knowledge about the environment in disaster area.

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.

Robot driver unit: 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 maneuver over debris and rugged terrain. Two DC motors of 200rpm

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will run the wheels of mobile rescue robot. When both the wheels are given with positive pulse edge, then robot will 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 achieve 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.

Transmission unit: The transmission unit is used to transmit data. For free bandwidth the 2.4GHZ RF modem is used. To improve the security of system, other secure frequencies can be used. Transmitter is mounted on the mobile robot unit; its function is gets information data from the micro-controller and transmits to the receiver placed in the control room.

At the control room these weather parameters along with real time footage of concerned area is displayed on TV screen. By using wireless communication exact location of human we will get from our mobile robot to control room. The rescue team of Experts & doctors can be sending to the victim's location for primary treatment and can be sent to the safe place or hospital in case of emergency

IV. SOFTWARE IMPLEMENTATION

When the PIR sensor detects a motion signal in its surrounding, then control program will orders the camera to display the surrounding area .If a human is detected in disaster area covered by mobile robot, then proposed system sends its current location & shows live vision to the rescue team. Figure 6 shows the flowchart of the propose system operation.

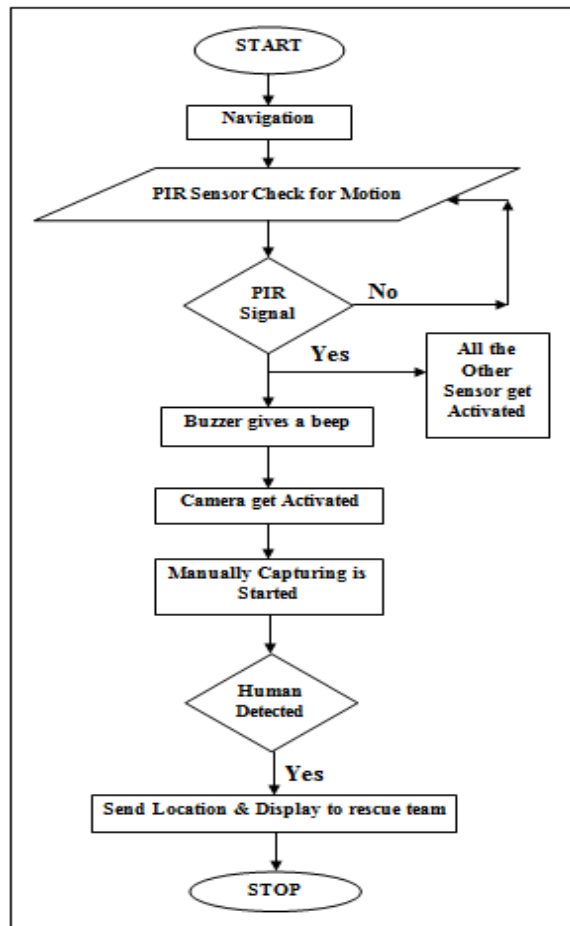


Fig 3: Flowchart of Proposed System

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In the fig 3, it shows complete path of program & along with working of robot. When Mobile robot starts moving then continuously PIR sensor check for motion if motion is detected then buzzer gives a beep & then all the other sensors get ON & camera get activated else mobile rescue robot keep moving to check motion. If human is detected then its live vision we can see in control room.

V. RESULT AND DISCUSSION

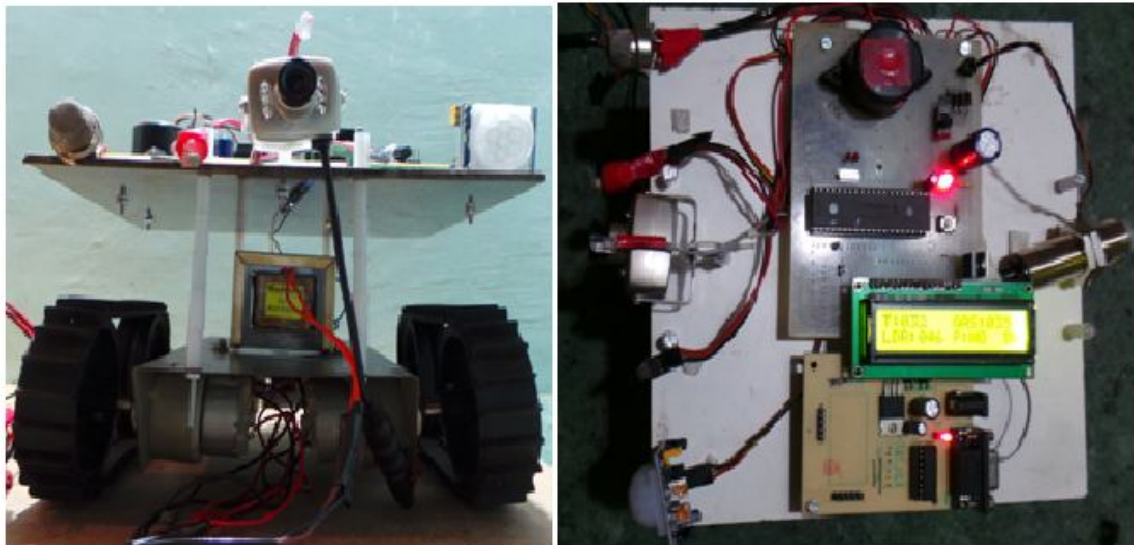


Fig 4: Mobile Rescue Robot

In the fig 4, it shows structure of mobile rescue robot & assembly of hardware on the top of conveyer belt mobile robot. Hardware contains LCD which shows real time data of the entire sensor.

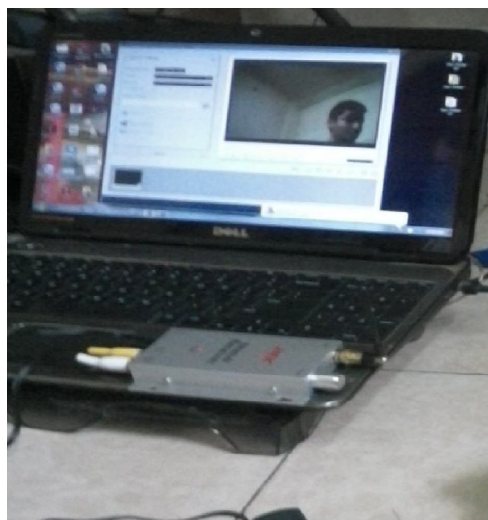


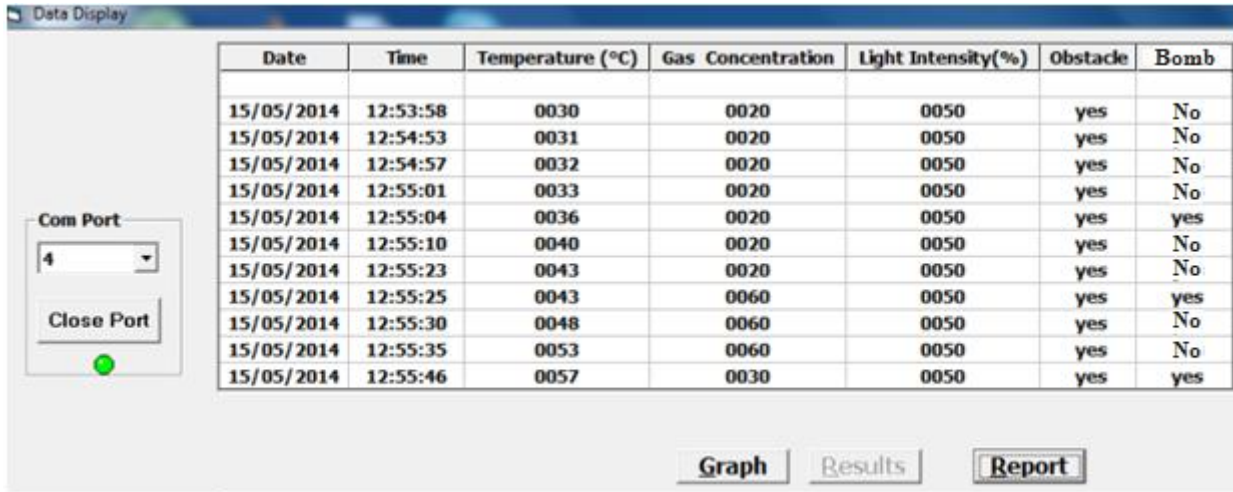
Fig 5: Video Footage

In the fig 5, it shows live video footage of the area covered by mobile rescue robot on laptop which is placed in control room

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Date	Time	Temperature (°C)	Gas Concentration	Light Intensity(%)	Obstacle	Bomb
15/05/2014	12:53:58	0030	0020	0050	yes	No
15/05/2014	12:54:53	0031	0020	0050	yes	No
15/05/2014	12:54:57	0032	0020	0050	yes	No
15/05/2014	12:55:01	0033	0020	0050	yes	No
15/05/2014	12:55:04	0036	0020	0050	yes	yes
15/05/2014	12:55:10	0040	0020	0050	yes	No
15/05/2014	12:55:23	0043	0020	0050	yes	No
15/05/2014	12:55:25	0043	0060	0050	yes	yes
15/05/2014	12:55:30	0048	0060	0050	yes	No
15/05/2014	12:55:35	0053	0060	0050	yes	No
15/05/2014	12:55:46	0057	0030	0050	yes	yes

Fig 6: Real Time Sensor Data

In the fig.6, it shows the Real time data of all the sensor like temp(°c) ,Gas concentration, Light Intensity(%), Obstacle, Bomb with information of Date & Time.By using Vb software Real time data is collected at control room & according to real time data proper security action will be taken.



Fig 7: Temp & Gas Real Time Graph

In the fig 7, it shows the graph of Real time data of temperature & Gas sensor Vs Time in second. The real time data of temperature & Gas sensor is converted into graphical format.

VI.CONCLUSION

The application of wireless sensor network will improve the saving of many lives by using mobile rescue robot in disaster. In this paper we design an effective & safe system to ensure that there are no human left behind in rescue



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operation. This system can detect existence of human, temp, humidity, visibility in order to monitor weather report & trace the location of victim in disaster area. It will greatly improve the performance & efficiency of data transmission. It is convenient to expand & reduce the cost of extending system. The application of wireless sensor network can realize the real-time monitoring of affected area by the natural calamities.

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