

Human Detection Robot in Rescue Operations

¹B.V.Subbayamma, ²T.Sushma

^{1,2}Assistant Professor, P.V.P Siddhartha Institute of Technology, Andhra Pradesh, India

Email: subbayamma@pvpsiddhartha.ac.in tsushma@pvpsiddhartha.ac.in

Abstract - This paper proposes a novel approach for the detection of human in calamity environment using an autonomous mobile robot. The autonomous system proposes surveying, detection of live human victims with the help of ultrasonic sensors, motion sensor cameras, live transmission of data and analysis of victims condition in that particular scenario. The detection of any victim is quite difficult for the autonomous system as compared to humans in any calamity situations. Hence, the autonomous system has to be properly equipped with sensors like motion detection & thermal imaging to identify the victims as efficient as humans. This paper proposes a detailed methodology of work for an autonomous robotic system for physical body detection. The detection system uses ultrasonic sensor & thermal imaging to detect a live victim, which triggers the camera for actual visuals and determination of victim condition. This autonomous system is further equipped with a thermal sensor for detection of fire to alert and provide locations to the rescue personals. The autonomous system automatically triggers the live feed camera whenever a victim or fire is detected for the rescue personal to assess the situation. The approach mentioned above is a very cost-effective and rapid action method because only a limited amount of information is required on a real-time basis to process the information to detect victims in highly sensitive situations. The victim detection depends upon various factors such as luminous intensity, the orientation of victim and other external parameters which are discussed.

Keywords: multipurpose mobile robot, ultrasonic sensor, web camera, fire sensors.

I. INTRODUCTION

Disasters can influence the social balance and economy of society. Disasters include Natural disasters and human-induced disasters. Cyclones, floods, earthquakes are Natural disasters and Human disasters are road accidents, industrial accidents, fire accidents because of short circuits. Victims of such occurrences are humans and they lose their lives for not being treated on time. The likelihood of saving a victim is high within the initial hours of the rescue operation. After that, it becomes negligible. To avoid such losses robot for detection of human is required. Human Detection Robot uses ultrasonic sensors to detect humans in disasters environment. An

Ultrasonic sensor is utilized to search for the existence of living humans. To capture the video of the scene, a low-cost camera is used. When motion of human is detected, the ultrasonic sensor will trigger camera to a video of the scene. The robot finds the location of alive human and communicates with the rescue team.

The status and location information about the trapped victims is stored even when the communications link is disconnected. There may be some obstacle on the way of robot while detecting human. An ultrasonic detection sensor is used to identify the obstacle and to have an alternate path. Robots are used to identify them and to perform task. That neither human, dogs nor can existing tools do. In this paper, a human detection robot that will work in a disaster environment is focused.

II. LITERATURE SURVEY

The social impact of urban destruction was explained by Pissokas[1] that has given rise to Urban Search and Rescue Robotics(USAR). Various sensors are designed and developed in this paper. Sensor suitable for detection of humans in USAR robots is discussed in Burion[2]. Greer, Kerrow and Abrantes [3] presented about urban disaster environment and rescue techniques. This paper also describes the applications of robots in search and rescue environment. Centre for Robot-Assisted Search and Rescue (CRASAR) [4] used millimetre wave radar to measure distance, CCD camera for vision and a forward-looking camera for detection of human and heat. Remote Operated and Controlled Hexapod (ROACH)[5] is a six-legged design that has advantages in mobility over wheeled and tracked designs. Kohga: the University of Tokyo is working on USAR robots that are implemented in rough terrain. Bahadori[6] examines the issues arising in identification of humans from visual activity and different techniques for rescue operations.

III. BLOCK DIAGRAM

Human Detection Robot is a rotational unit which consists of Ultrasonic Sensors, Fire Sensors and a Raspberry PI3 as shown in Fig: 1. Camera in the receiver unit captures images when the ultrasonic sensor identifies the movement of human and when buzzer gets a signal. LCD is used to show temperature and the motion of a person.

V. HARDWARE SETUP

Human body detection system hardware setup is shown in Fig. 3.

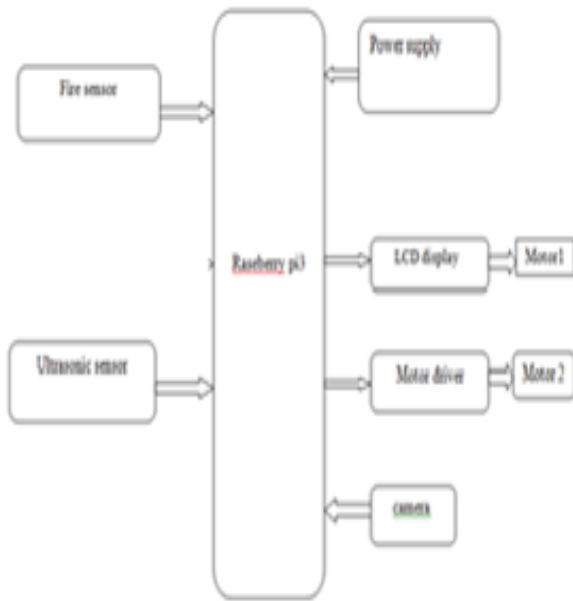


Figure 1: Block diagram of the Human Detection Robot

The camera captures the image and sends the image to Raspberry Pi for pre-processing. Accordingly, DC motors connected to Raspberry Pi are rotated. The extracted characters are displayed on the LCD.

IV. SCHEMATIC DIAGRAM

Schematic Diagram representing the whole process of the proposed system is shown in Fig.2. Robocar navigates in disaster areas. If ultrasonic sensor detects the motion of a person then buzzer sends a signal to activate camera and sends its current location and video to the rescue team. If motion of a human is not identified then Robocar navigates checks again for a motion of alive human.

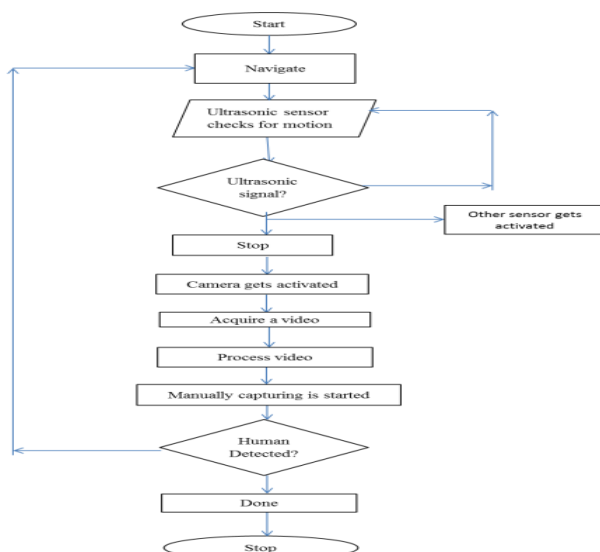


Figure 2: Schema of the Human detection system

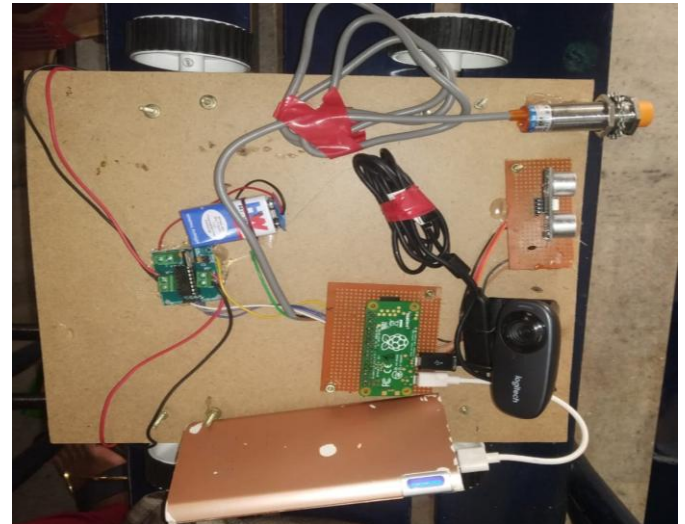


Figure 3: Hardware schematic of the Human body detection system

VI. SOFTWARE

VNC software and Python.

VII. IMPLEMENTATION

Open VNC viewer and enter the user name and IP address of the raspberry pi which is connected to a particular network as shown in Fig 4.

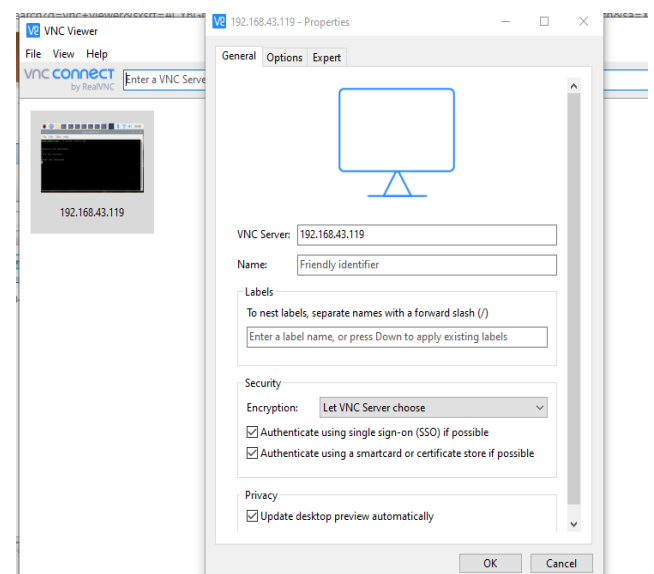


Figure 4: VNC Viewer

A new terminal is opened after typing user name and password of the raspberry pi. In that type ls and also python robo.py as shown in Fig 5.

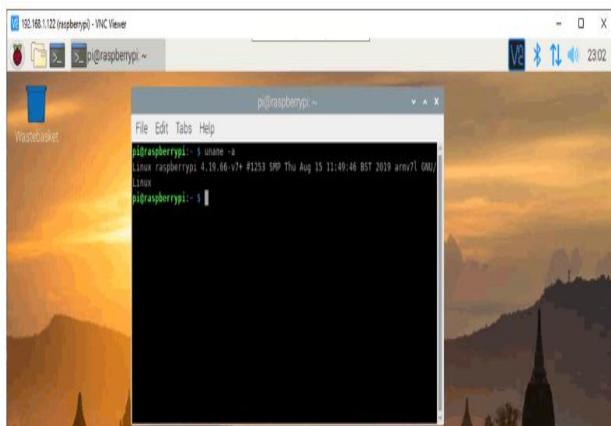


Figure 5: VNC Terminal 1

Again open a new terminal and enter python sensor.pyc shown in Fig. 6.

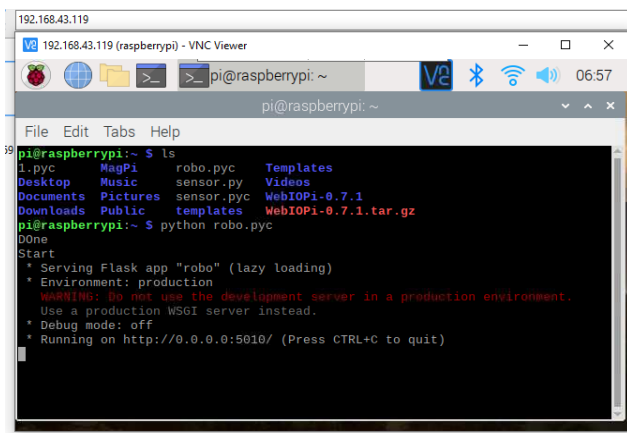


Figure 6: VNC Terminal 2

VIII. RESULTS & CONCLUSION

Whenever an obstacle enters within the range of robot then a message is displayed on the monitor as shown in Fig 7. Then automatically web camera is on and shows the live situation as shown in Fig. 8.

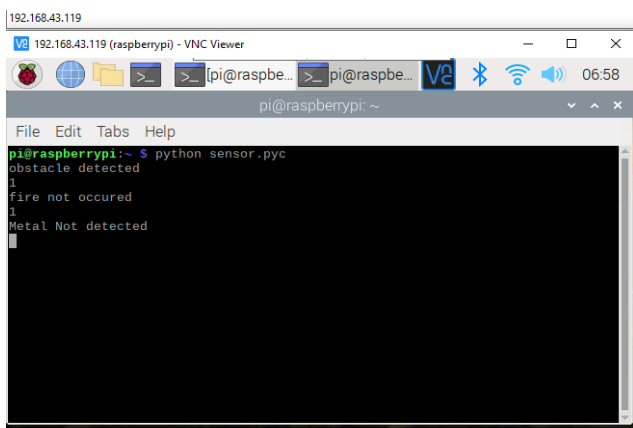


Figure 7: Object detection displayed on the screen

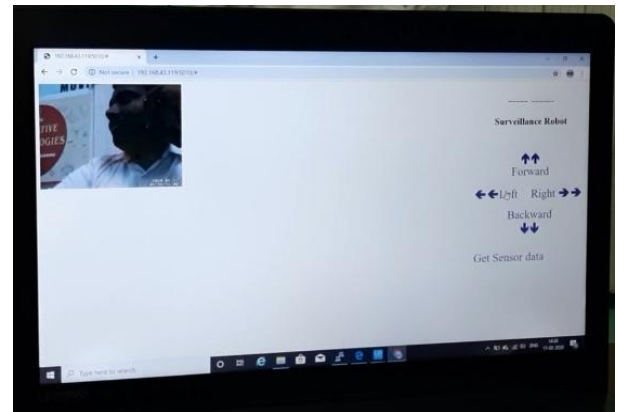


Figure 8: Video displayed on the screen

Fig. 9 shows the detection of the fire whenever there is fire occurred within the range of robot on the screen.

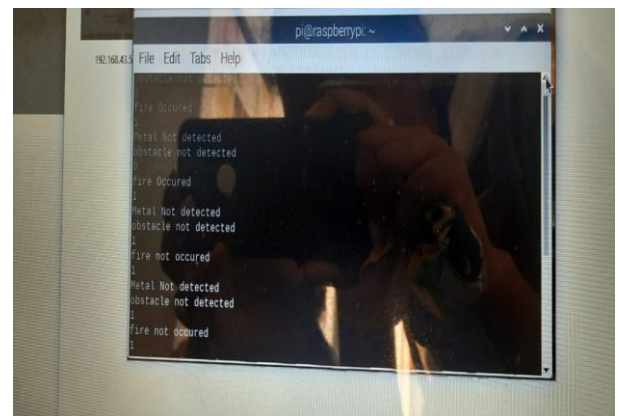


Figure 9: Fire detection displayed on the screen

IX. CONCLUSION

Simulated Autonomous Robot with low cost is developed for the detection of humans in a calamity environment. The current USAR Robot is costly and is equipped with various sensors. The ultrasonic sensor is used to detect the presence of human. When the motion of a person is detected by Robot the web camera is automatically on and shows the live situation. The Robot is also equipped with a Fire sensor to detect fire in Rescue situation.

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