Survivor Seeker - A Real Time Human Surveillance Bot for Rescue Operation

Mrs. Priscilla Sophia P, Assistant Professor, Department of ECE.

Sri Shakthi Institute of Engineering and Technology, L&T Bypass, Coimbatore, priscillasobhiaece@siet.ac.in

Sherene Patricia T, Sowntharya S, Subikshaa H, Priyanka K Department of ECE,
Sri Shakthi Institute of Engineering and Technology, L&T Bypass, Coimbatore.

Abstract

This project introduces a real-time human surveillance bot designed for applications in disaster recovery, security, and healthcare monitoring. The system employs an ESP32 microcontroller to integrate multiple sensors, including an IR sensor for detecting body heat, a PIR sensor for motion detection, a DHT11 sensor for environmental monitoring, and a contactless radiation-based heartbeat sensor for vital sign assessment. These sensors work together to enhance accuracy in detecting human presence and health conditions. An RFID tracker is incorporated to enable individual identification and location tracking. Sensor data is processed and transmitted to the cloud using Thing Speak, which facilitates real-time monitoring and visualization via a mobile app. This ensures easy access to crucial information from remote locations. Alerts are generated when a living human is detected, enhancing responsiveness in critical scenarios. The bot offers a versatile and efficient solution for ensuring safety and situational awareness, combining IOT technology with reliable sensor integration for seamless operation in various environments. It can be deployed in various environments, including disaster zones, hospitals, and high-security areas, making it an essential tool for modern surveillance applications.

Keywords: *human surveillance bot, ESP32 microcontroller, sensor data acquisition, RFID tracker, real-time monitoring, and visualization, IOT technology.*

1. INTRODUCTION

The SURVIVOR SEEKER is a state-of-the-art real-time human surveillance bot designed to enhance rescue operations in disaster-stricken areas. In emergency situations such as earthquakes, floods, fires, and building collapses, timely detection and response are critical for saving lives. This intelligent robotic system leverages advanced sensors and IoT connectivity to detect, monitor, and assist survivors in hazardous environments where human access is challenging or life-threatening.

Equipped with live video streaming, motion detection, and thermal imaging, the bot efficiently identifies human presence, even in low-visibility conditions, including debris- covered zones, dark spaces, and

extreme weather conditions. It integrates multiple sensors, such as infrared (IR) and passive infrared (PIR) sensors, to accurately detect body heat and movement. Additionally, an RFID tracking system allows identification of missing individuals, while environmental sensors monitor conditions like temperature and humidity to assess survivor safety.

The SURVIVOR SEEKER transmits real-time data to rescue teams via cloud-based platforms and mobile applications, providing enhanced situational awareness and enabling quicker decision-making. By autonomously navigating unsafe areas, it reduces the need for human rescuers to enter dangerous zones, thereby minimizing risk and maximizing efficiency. This intelligent system is a breakthrough in modern rescue operations, combining robotics and IoT to improve disaster response and save lives.

1.1. Objectives

1. **Enhance disaster response:** Provides real-time surveillance and survivor detection.
2. **Improve rescue efficiency:** Enables automated tracking and monitoring.
3. **Minimize human risk:** Deploys the bot in hazardous environments, reducing rescuer exposure.
4. **Facilitate real-time communication:** Transmits live data between the bot and rescue teams.
5. **Ensure adaptability**: Functions effectively in various disaster scenarios, including earthquakes, floods, and remote search-and-rescue operations.

2. BLOCK DIAGRAM

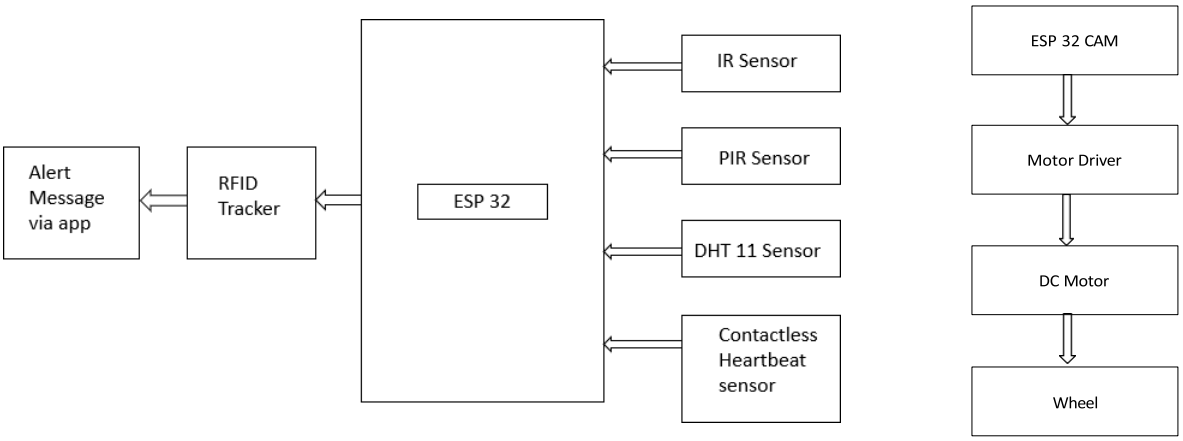

Figure 1: BLOCK DIAGRAM OF THE PROPOSED SYSTEM

The block diagram represents the functional architecture of the Survivor Seeker Bot, which is designed for

real-time human surveillance in disaster recovery and rescue operations. At the core of the system is the ESP32 microcontroller, which integrates multiple sensors to detect human presence and environmental conditions. The IR sensor detects body heat, while the PIR sensor identifies motion. The DHT11 sensor monitors temperature and humidity, and the contactless heartbeat sensor measures the survivor's heart rate. The RFID tracker plays a crucial role in verifying human presence and, upon confirmation, triggers an alert message via a mobile app to notify rescuers for immediate action. Additionally, the system incorporates an ESP32-CAM module, which provides live video streaming, aiding in real-time monitoring. For mobility, the bot uses a motor driver that controls DC motors, enabling movement through wheels for autonomous navigation in hazardous environments. This integration of IoT, sensor-based detection, and automation enhances the efficiency of search-and-rescue missions, ensuring a faster response while minimizing human risk.

3. WORKING

The SURVIVOR SEEKER bot is an advanced real-time human surveillance system designed for disaster recovery and rescue operations. It utilizes an ESP32 microcontroller to integrate multiple sensors, including an IR sensor for body heat detection, a contactless

heartbeat sensor to measure heart rate, a PIR sensor for motion detection, a DHT11 sensor for temperature and humidity monitoring, and an RFID tracker to verify human presence. These sensors continuously collect data, which is processed by the ESP32. If a living human is detected, an alert message is sent to rescuers through a mobile app, enabling a quick response. The bot also features an ESP32 CAM module for live video streaming and a motor driver-controlled DC motor system, allowing it to autonomously navigate hazardous environments. The bot's mobility ensures efficient exploration of disaster zones, minimizing human risk and enhancing search-and-rescue efficiency. It is particularly useful in earthquakes, floods, and remote search operations, as well as in security surveillance and healthcare monitoring. By combining IoT and sensor-based detection, the SURVIVOR SEEKER bot accelerates response times, reduces human casualties, and provides real-time situational awareness, making it an invaluable tool for rescue and safety applications

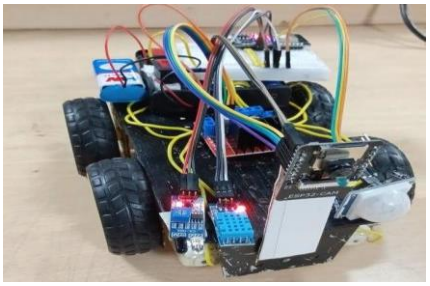

Figure 2. HARDWARE MODEL

4. RESULT AND DISCUSSION

In conclusion, the integration of a real-time human surveillance bot into rescue operations represents a groundbreaking advancement in disaster management. Equipped with cutting-edge technologies such as thermal imaging, motion detection, and machine learning, the bot enhances the efficiency, accuracy, and safety of rescue missions. Its ability to navigate challenging terrains, provide real-time monitoring, and autonomously detect survivors significantly reduces risks to human rescuers and accelerates response times. While challenges such as high costs and maintenance remain, the advantages of improved decision- making, predictive analysis, and adaptability far outweigh these limitations. The continuous evolution of technologies like AI and machine learning promises to further refine the bot's capabilities, making it an indispensable tool for saving lives in disaster-stricken areas. This innovation not only marks a leap forward in rescue operations but also underscores the potential of robotics and AI to address humanity's most pressing challenges.

Overall Purpose:

i. Enhance disaster response by providing real-time human detection and situational awareness.
ii. Integrate multiple sensors, IoT technology, and automation for efficient monitoring.
iii. Minimize risk to human rescuers by deploying an autonomous bot in hazardous environments.
iv. Improve response times and facilitate effective decision-making in critical situations.

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REFERENCES

[1] Satishkumar, D., and M. Sivaraja, eds. *Internet of Things and AI for Natural Disaster Management and Prediction.* IGI Global, 2024.

[2] Damaševičius, Robertas, Nebojsa Bacanin, and Sanjay Misra. "From sensors to safety: Internet of Emergency Services (IoES) for emergency response and disaster management." *Journal of Sensor and Actuator Networks* 12.3 (2023): 41.

[3] Tsiompra, Maria. *Early Warning System for monitoring air pollution using an IoT Platform.* Diss.

Aristotle University of Thessaloniki, 2023.

[4] Betts, Sean A. "THE INTERNET OF THINGS (IOT) IN DISASTER RESPONSE." (2022).

[5] Mileti, Dennis S., and John H. Sorensen. *Communication of emergency public warnings: A social science perspective and state-of-the-art assessment.* No. ORNL-6609. Oak Ridge National Lab. (ORNL), Oak Ridge, TN (United States), 1990.

[6]Cannon, Terry. "Vulnerability analysis and the explanation of 'natural' disasters." *Disasters, development and environment* 1 (1994): 13-30.

[7] Krichen, Moez, et al. "Managing natural disasters: An analysis of technological advancements, opportunities, and challenges." *Internet of Things and Cyber-Physical Systems* 4 (2024): 99-109.

[8] Zschau, Jochen, and Andreas N. Küppers, eds. *Early warning systems for natural disaster reduction.* Springer Science & Business Media, 2013.

[9]Gunasekara, Don, et al. "Natural disaster mitigation: Role and value of warnings." *Economic value of fire weather services* 3 (2005).

[10] Shi, Kaize, et al. "Application of social sensors in natural disasters emergency management: A review." *IEEE Transactions on Computational Social Systems* 10.6 (2022): 3143-3158.

[11] Said, Naina, et al. "Natural disasters detection in social media and satellite imagery: A survey." *Multimedia Tools and Applications* 78 (2019): 31267-31302.

[12] Visser, Stephen J., and Anwar S. Dawood. "Real-time natural disasters detection and monitoring from smart earth observation satellite." *Journal of Aerospace Engineering* 17.1 (2004): 10-19.

[13] Ramesh, Kumar, et al. "IoT-based disaster management systems: A technological perspective." *International Journal of Disaster Risk Reduction* 45 (2021): 102486.

[14] Patel, Anuj, and Ravi Teja. "Human detection using IoT for rescue operations in disaster-struck areas." *Sensors and Actuators A: Physical* 317 (2022): 112510.

[15] Hernandez, Carlos, et al. "Machine learning approaches for disaster response and human detection using IoT sensors." *IEEE Access* 9 (2023): 10532-10547.