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# Life Detection for Rescue Operations Under Collapsed Buildings

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**ABSTRACT:** This study proposes a life detection system for efficient rescue operations in collapsed buildings, utilizing a car chassis as the mobile platform. Cost-effective sensors, including discreet thermal sensors, are integrated onto the chassis for optimal data collection. As the vehicle navigates the environment, sensors monitor for body heat signatures of potential survivors. Upon detection, instant notifications are generated for rescue teams, enhancing the effectiveness of search and rescue efforts in emergency scenarios.

**KEYWORDS:** Life Detection System, Rescue operations, Collapsed buildings, Car chassis, Mobile platform, Thermal sensors, Instant Buzzer.

## I. INTRODUCTION

In search and rescue operations conducted in collapsed structures, a formidable challenge arises from the inherent difficulty in rapidly and accurately determining the precise locations of survivors. This challenge is compounded by a variety of factors, including structural instability, compromised visibility, and the unpredictable formations of debris. These obstacles collectively impede the expeditious detection and extraction of individuals who may be trapped beneath the rubble. Structural instability poses a significant risk to both rescuers and survivors alike, necessitating cautious and strategic approaches to avoid exacerbating the precarious conditions. The compromised integrity of the collapsed structure can limit access to certain areas and complicate the implementation of traditional search methods. Addressing these challenges requires innovative approaches and advanced technologies to enhance the speed and precision of search and rescue operations. Solutions may include the development of specialized sensors capable of penetrating debris, advanced imaging technologies, and robotics to navigate and access difficult-to-reach areas. Moreover, training and coordination among rescue teams are crucial to adapting to the dynamic and unpredictable nature of collapsed structures, ensuring a swift and effective response to save lives in the face of adversity.

## II. RELATED WORK

Ukay Etal [5], has given in the suggestion of a microcontroller operated robotic based totally on the integrated operation of PIR sensors, camera, RF module, motor and 3 wheeled gear drives. robotic is geared up with a PIR sensor to hit upon stay human, a robot arm to eliminate any obstacles in its manner, a digital camera to send pics to control unit. Microcontroller SST89E516RD is used to manipulate the robot and is the middle of robot. S Bhatia Etal [2], had proposed a system the use of an ultrasonic sensor a good way to come across the lifestyles of residing humans and a low-fee camera if you want to gather a video of the scene as needed. additional, other sensors include temperature, hearth and steel detector works as bomb sensor to hit upon the presence of bomb in Warfield and in rescue operations. Aravind Sasikumar Etal [1], proposed an embedded layout of a laptop controlled robotic that can detect stay humans and transmit the region information wirelessly. The PIR sensor is used to stumble on the movement in any kind and could inform to micro controller. GSM primarily based wi-fi machine is proposed for the efficient conversation. S Chowdhury Etal [3], had put forth the layout initiative inspiration for developing a rescue robotic that encompass a PIR sensor, so as to help to come across the alive people, it additionally consists of an IR based totally human radiation sensor, which selections up signals from human body radiations and offers a signal output. The robot might be prepared with a Wi-Fi RF transmitter and sends the message to the far off location whenever it unearths any alive human. Naem Farooq Etal [4] suggested the notion of alive people detection integrated with a rescue robot specifically created for this purpose. To detect the presence of a living human, they used an OMRON D6T-44L IR thermal sensor, which detects thermal radiations emitted by objects and then calculates the object's temperature to determine whether or not the victim is alive. An MQ-6 Gas sensor is also installed on the robot to monitor the various gases in the operating

environment. Aside from these, the team chose a Wireless IP camera with built-in night vision capabilities and an audio transceiver to establish voice communication between the victim and the robot operator. Mr. Albert W. Y. Ko and Mr. Henry Y. k. Lau had constructed a low-fee autonomous mini robot prepared with thermal sensor, accelerometer, sonar, pin-hollow digital camera, microphone, extremely-vibrant LED and wireless communicate module is advanced to have a look at the manipulate of a group of decentralized mini seek and rescue robots. The robot can navigate autonomously among voids to search for dwelling body heat and might send again audio and video records to allow the operator to decide if the discovered object is a residing human.

### III. METHODOLOGY

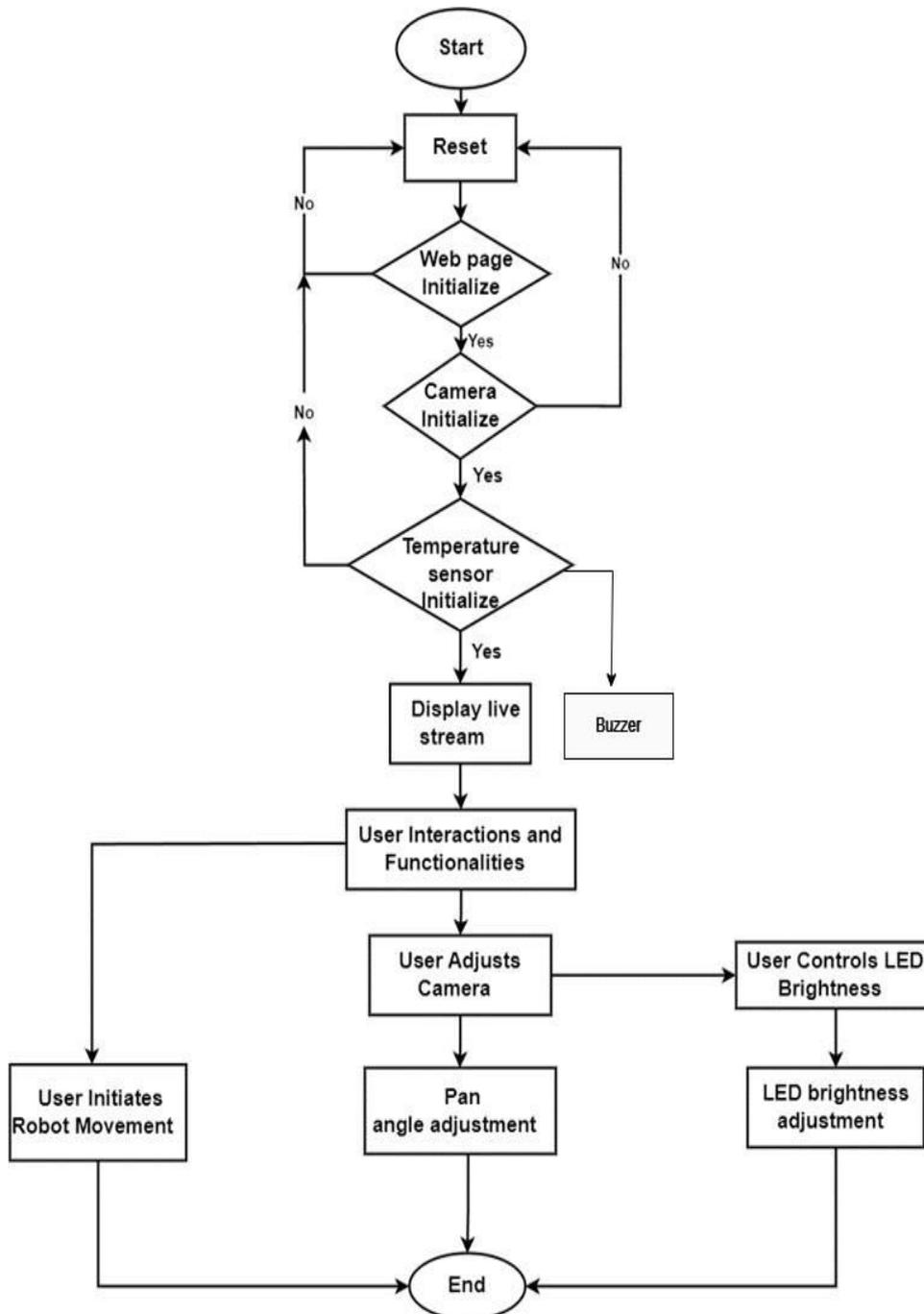


Fig. 1. Flow Chart of the project

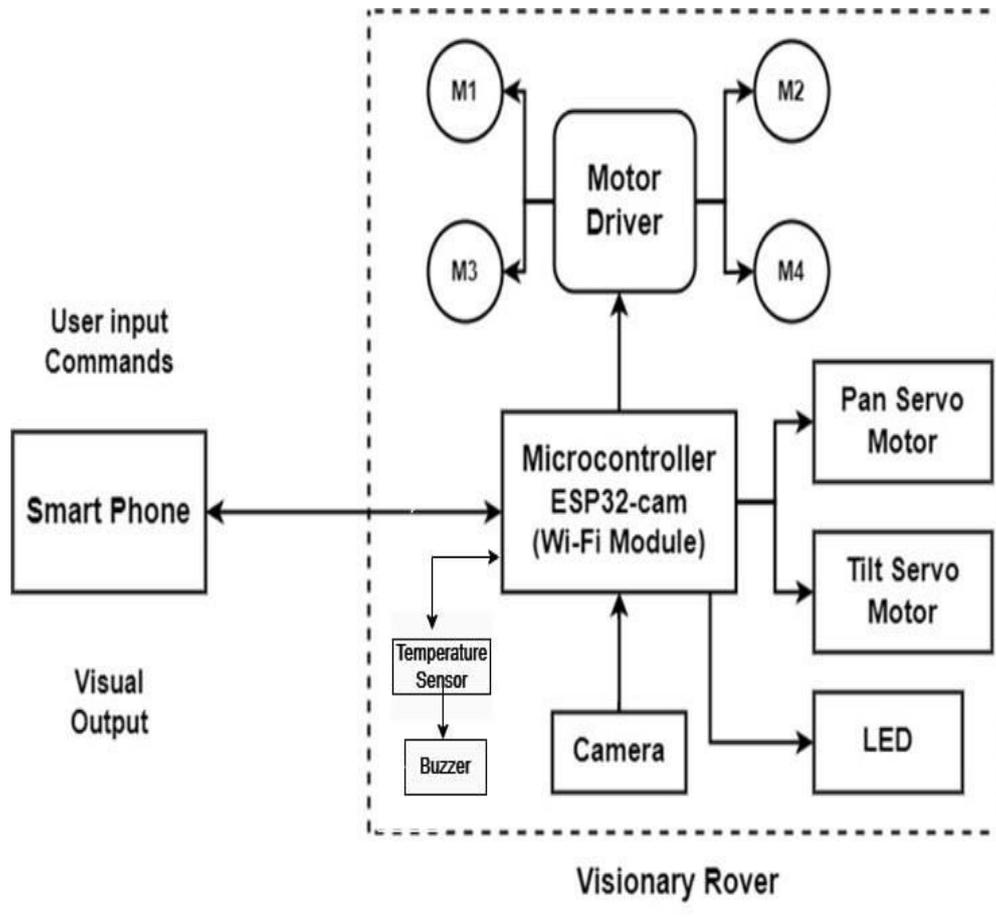


Fig. 2. System design of Project

#### IV. SYSTEM DESIGN

**Initialization:** Power up the components and establish connections (e.g., Wi-Fi for the ESP32-CAM).

**Control Setup:** Use the smartphone interface to send commands to the microcontroller. For example, you can send movement commands to the motor driver to drive the robot in specific directions.

**Sensor Monitoring:** The microcontroller continuously reads data from the temperature sensor. Based on predefined conditions, it can take actions such as adjusting the robot's behavior or sending alerts.

**Camera Control:** Use the smartphone to control the pan servo motor, adjusting the camera's view as needed. The camera captures images or streams video, which can be processed onboard (using the ESP32) or transmitted to the smartphone for analysis or display.

**Feedback Loop:** The smartphone receives feedback from the robot, such as sensor data or video streams. This feedback can be used for real-time monitoring or making decisions for the robot's operation.

By integrating these components and setting up the interactions between them, you can create a versatile robot system capable of various tasks such as remote exploration, surveillance, or automation based on environmental conditions.

#### V. SYSTEM ARCHITECTURE

The development process of a smart car system encompassing motor and servo control, camera capture, temperature sensor interface, WebSocket server setup, web application development, temperature display, testing. The system utilizes an ESP32 microcontroller for its versatility and capabilities. Motor and servo control enable precise movement control and camera panning, while the ESP32 camera facilitates image capture. Integration of a temperature sensor allows for environmental monitoring. A WebSocket server on the ESP32 enables real-time communication with the web application, providing controls for the car and a live camera feed. Rigorous testing of individual components and integration ensures functionality and reliability, followed by optimization for enhanced performance. This framework

provides a comprehensive solution for smart car systems, offering both control and monitoring capabilities.

### VI. EXPERIMENTAL RESULTS

The implementation of a camera module with an ESP32-CAM microcontroller for a life detection system under collapsed buildings presents a promising solution for rescue operations. The streamlined setup process and live video streaming capability offer crucial insights into potentially life-saving situations. However, challenges such as setup complexity and dependency on internet connectivity may impact deployment in emergency scenarios. Despite these considerations, the system's versatility and real-time monitoring capabilities underscore its potential as a valuable tool for search and rescue teams. Further refinement and testing are necessary to optimize its effectiveness in critical situations, ultimately contributing to enhanced disaster response efforts and improved outcomes for those in distress. The system should allow users to remotely control the car's movement, utilizing the motors on the chosen chassis.

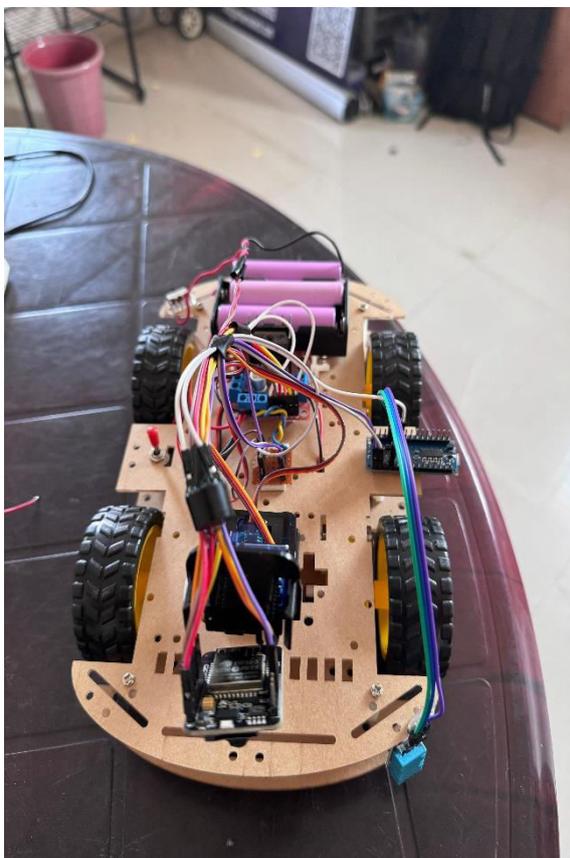


Fig.4. Snapshot1

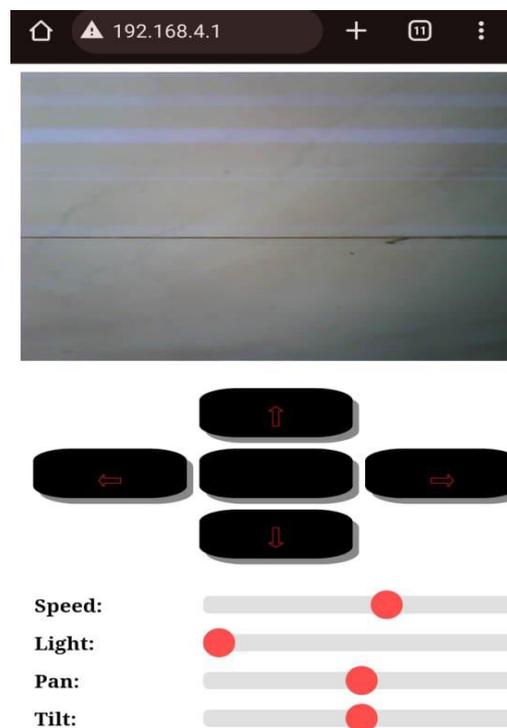


Fig.5. Snapshot2

### VII. CONCLUSION

A viable option for rescue operations is the installation of a camera module with an ESP32-CAM microcontroller for a life detection system beneath collapsed structures. The live video streaming feature and simplified setup process provide vital information on possibly life-saving circumstances. The system's adaptability and capacity for real-time monitoring highlight its potential use as an instrument for search and rescue operations. Its effectiveness in high-stress scenarios will need to be further tested and refined, which will ultimately lead to better disaster response operations and better results for individuals who are in need. Using the motors on the selected chassis, the system should enable users to remotely control the movement of the vehicle.



## REFERENCES

- 1] "Life detection system using heartbeat sensor for search and rescue operations" by A. R. Katore et al. (2019) in the Journal of Engineering and Applied Sciences.
  - 2] "Robot-assisted Search and Rescue Techniques in Disaster Response: A Survey" by D. Scaramuzza et al. (2019) in the IEEE Transactions on Robotics.
  - 3] "Advanced Signal Processing Techniques for Vital Sign Monitoring in Search and Rescue Scenarios" by B. S. Aftab et al. (2020) in the Signal Processing journal.
- Conference Papers:
- 4] "Development of a wireless life-detection system for search and rescue operations" by C. Sun et al. presented at the IEEE International Conference on Robotics and Automation (ICRA) (2018).
  - 5] "Robotic Technologies for Urban Search and Rescue Operations: Review of Current Trends" by M. Hasan et al. presented at the International Conference on Robotics and Automation for Humanitarian Applications (RAHA) (2022).
- Books and Book Chapters:
- 6] "Robotics for Search and Rescue" by F. Amigoni and N. Basilico (2018) provides comprehensive coverage of robotic systems and techniques used in search and rescue operations.
  - 7] "Signal Processing for Life Detection Systems" edited by S. Mukhopadhyay (2021) includes chapters on various signal processing techniques applicable to life detection systems.



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