SARBot: Surveillance and Rescue Robot

Initial Project Report for RoboRealm Competition

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1 Project Motivation

During earthquakes, floods, and building collapses, human rescuers face life-threatening risks while entering unstable structures. A major challenge is the lack of real-time visuals, delaying safe and informed rescue decisions.

SARBot aims to provide live surveillance in disaster zones before human entry, enabling faster, risk-free, data-driven rescue operations.

2 Objectives and Features

2.1 Objectives

• Provide live video surveillance in disaster-hit zones

• Navigate remotely in collapsed or partially flooded structures

• Detect obstacles and environmental parameters

• Alert rescue teams with buzzer and LED on obstacle detection

2.2 Features

• ESP32-CAM live streaming with Wi-Fi control

• Obstacle detection using ultrasonic sensor

• Environmental monitoring (temperature, humidity, IR proximity)

• Remote control via web/app

• Buzzer and LED alerts

• Lightweight, portable, and low-cost design

3 Definite Use Case

3.1 Where

• Collapsed buildings post-earthquake

• Post-flooded areas with shallow water

• Structurally unsafe warehouses or basements

3.2 Why

• Human entry is unsafe initially

• Provides situational awareness before deploying rescuers

• Speeds up locating safe access paths and identifying rescue needs

4 Components Required

Component	Purpose
ESP32-CAM Module	Live video streaming and Wi-Fi control
ESP32-CAM Programmer	Uploading code to ESP32-CAM
Chassis	Base structure
L298N Motor Driver	Motor control
BO Motors + Wheels	Movement
HC-SR04 Ultrasonic Sensor	Obstacle detection
DHT11 Sensor	Temperature and humidity monitoring
IR Sensor	Proximity and edge detection
Buzzer	Audio alert on obstacle detection
LED	Visual alert on obstacle detection
Jumper wires, breadboard	Wiring and prototyping
Li-Ion Battery	Power supply
Voltage Regulator (LM2596)	Voltage regulation to 5V for ESP32-CAM

5 Technical Approach

5.1 Control and Streaming

- ESP32-CAM streams live video over Wi-Fi to a web/mobile interface
- ESP32 GPIO pins control L298N for robot movement

5.2 Movement

- L298N drives BO motors for movement in all directions
- HC-SR04 detects obstacles to prevent collisions

5.3 Alerts

- Buzzer sounds and LED flashes when obstacles are detected

5.4 Environmental Monitoring

- DHT11 records temperature and humidity
- IR sensors detect nearby obstacles and edges

5.5 Power Management

- Li-Ion battery powers motors and ESP32-CAM
- LM2596 regulator steps down voltage safely for ESP32-CAM

6   Expected Outcomes

- Real-time live video surveillance in test environments

- Smooth remote-controlled movement

- Reliable obstacle detection with buzzer and LED alerts

- Environmental monitoring to assess post-disaster conditions

- Robust, scalable, and affordable solution for rescue teams

7   Future Scope

- Integrate AI-based human detection using ESP32-CAM

- Gyroscopic control

- Solar charging for field deployment

- Autonomous navigation with line following or SLAM

- Additional gas sensors for safety monitoring

8   Conclusion

SARBot is a practical, life-saving robotics solution for disaster scenarios, providing real-time surveillance, obstacle detection, and environmental monitoring while reducing human risk.