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RF Controlled Robot For Human Detection

[1]Anupriya T,[2]Deeksha T S,[3]Gehena B S,[4]Inchara C,[5]Dr Anita P

[1,2,3,4] Students,[5]Assistant professor

[1]Department of Electronics and Communication Engineering,
[1]K.S. Institute Of Technology,Bengaluru, Karnataka,India.

Abstract : This study proposes an RF-controlled robotic system equipped with a heartbeat sensor, designed to enhance rescue operations during natural disasters. The system utilizes RF communication for wireless navigation, enabling the robot to access challenging terrains such as debris and flood zones. Integrated with a heartbeat sensor, it detects survivors by measuring pulse rates, providing real-time health data for condition assessment and prioritization of medical aid. Built on a microcontroller-based architecture, the system ensures reliable operation, data transmission, and robust performance in disaster-stricken regions. By integrating robotics with biomedical sensing, the proposed design significantly improves the efficiency and effectiveness of rescue efforts.

Keywords:RF technology, robotics, heartbeat sensor, rescue robot, navigation in all terrains

I. INTRODUCTION

Natural disasters such as earthquakes, floods, and cyclones, along with manmade calamities like nuclear accidents, cause significant loss of life and property. Many victims remain trapped under debris, undetected by rescue teams, resulting in delayed assistance and tragic outcomes. While trained rescue dogs have traditionally been used, their deployment is time-consuming and limited in scope.

The critical 48-hour window after a disaster requires rapid and accurate victim detection. Robotic systems have shown promise in addressing these challenges, with technologies like ultrasonic and PIR sensors, thermal imaging, and environmental detection tools enhancing rescue operations.

This study presents an RF-controlled robotic system equipped with a heartbeat sensor for locating survivors. Operated remotely via RF communication, the robot navigates hazardous environments, reducing risks to human rescuers. The integrated heartbeat sensor detects survivors by measuring pulse rates, offering a reliable and efficient solution to improve disaster response and save lives.

II.LITERATURE SURVEY:

"Deliberation for autonomous robots"Autonomous robots have seen an increasing penetration across multiple domains in the last decade. In industrial environments, collaborative robots are being utilized in the manufacturing sector, and fleets of mobile robots are swarming in logistics warehouses. Nonetheless, their utilization within civil applications presents additional challenges owing to the interaction with humans and their deployment in potentially unknown environments. Among civil applications, search and rescue (SAR) operations present a key scenario where autonomous robots have the potential to save lives by enabling faster response time, supporting in hazardous environments,or providing real-time mapping and monitoring of the area where an incident has occurred , among other possibilities.[3]

"Remote Multi-Person Heart Rate Monitoring with Smart Speakers" In this paper, we aim to achieve multiple heart rate monitoring in such practical scenarios using a commodity smart speaker, the MiniDSP UMA-8-SP USB mic array, which has the same layout as the Amazon Echo Dot. A smart speaker is considered as an appealing platform for contactless and acoustic-based heart rate monitoring for two key reasons. First, smart speakers have become increasingly prevalent in home environments, where they provide various voice-based services. Second, commercial smart speakers usually incorporate a microphone array design to deliver high-quality audio services. These microphone arrays offer high-resolution signals for active acoustic sensing that have been demonstrated to improve heart rate detection performance.However, detecting and differentiating heart rates poses challenges when multiple people are in close proximity, as their acoustic reflection signals interfere with one another due to increased multipath interference. In this paper, we present an acoustic-based system that can extract multiple heart rates as well as their location with no separation requirement.[4]

"RoboFI: Autonomous Path Follower Robot for Human Body Detection and Geolocalization for Search and Rescue Missions using Computer Vision and IoT"This paper outlines the development of an intelligent robotic system tailored for search and rescue operations. The robot integrates multiple technologies to detect humans in disaster-struck areas and geolocate their positions for efficient rescue. The system utilizes ultrasonic sensors for obstacle detection and path finding, enabling autonomous navigation even in complex environments. For human detection, a Raspberry Pi camera coupled with OpenCV identifies motion through image processing, while a Passive Infrared (PIR) sensor validates the presence by detecting body heat. The robot's GPS module transmits the geolocation data of detected individuals to a cloud server, which can then be visualized on a web interface integrated with Google Maps, allowing rescuers to locate survivors effectively. The paper demonstrates promising results in ensuring reliable human detection and efficient data transmission, making it a valuable asset in critical rescue scenarios. [5]

"An Embedded Autonomous Search and Rescue Mobile Robotic System for Alive Human Detection"presents a robotic solution aimed at enhancing rescue operations in disaster scenarios. The system employs an Intel Edison microcontroller to process inputs from a thermal sensor, ultrasonic sensors, and an IP camera. These components work together to detect living humans through body heat and relay real-time video and geolocation data to rescue teams. Wireless communication is facilitated by ZigBee modules, enabling remote monitoring and control. The robot autonomously navigates hazardous areas, avoiding obstacles and efficiently scanning for survivors. Additionally, the use of graphical simulation tools like Fritzing and Arduino IDE aids in system development and performance optimization. The research demonstrates the system's ability to reliably detect humans in diverse environmental conditions, proving its potential for practical use in life-threatening scenarios. [6]

"Live Human Detection and Streaming using IoT" this paper proposes a robotic system designed for live human detection during search and rescue operations. The system employs a combination of sensors, including a PIR sensor for human detection, an ultrasonic sensor for obstacle avoidance, and a pulse rate sensor to confirm the presence of a living individual. The robot is powered by an ATMEGA1608 microcontroller, with a wireless communication setup using an IoT dashboard for real-time monitoring. It integrates a microwave radar sensor to detect human presence even under debris or soil and uses an ESP camera for live video streaming. The data from the sensors and camera are transmitted to a cloud server, which enables remote monitoring and control, making it possible to operate the robot from anywhere in the world. This IoT-based system enhances the efficiency of rescue missions by enabling quick detection and geolocation of survivors in disaster scenarios. [7]

"DronAID: A Smart Human Detection Drone for Rescue" focuses on the development of a drone-based system aimed at enhancing rescue operations in disaster-stricken areas. The DronAID system uses infrared technology to detect human presence through passive infrared (PIR) sensors, which can sense the body radiations emitted by humans. This makes the drone especially useful for locating survivors buried under rubble in events like earthquakes. The paper highlights that drones are more effective than ground robots in disaster zones, as they can access areas that may be difficult or impossible for robots to reach. The DronAID system has been tested to demonstrate its capabilities in detecting humans from up to 8 meters away and providing real-time data, which can potentially save lives during critical rescue missions.[8]

"Alive Human Detection System for Rescue Operations in Hazardous Areas"This paper discusses the development of an autonomous robot designed to detect live humans trapped under rubble in hazardous environments, such as those affected by natural calamities like earthquakes. The system incorporates several sensors to enhance the detection capabilities, including PIR (Passive Infrared) sensors to detect human presence through thermal radiation, vibration sensors for sensing physical disturbances, and cameras for real-time video analysis. Additionally, the robot is designed to work in coordination with communication technologies like GSM to send alerts to rescue teams, enhancing the efficiency of search and rescue missions. The

robot is capable of manual and autonomous operation, and it provides a quicker and more effective way to locate and assist survivors in disaster-stricken areas. The system's goal is to reduce the time spent on locating victims, thereby saving lives that might otherwise be lost due to the delay in rescue operations. [9]

"Alive Human Body Detection System Using an Autonomous Mobile Rescue Robot" paper presents a robotic solution for locating living humans in disaster-stricken or hazardous environments. The research focuses on utilizing an autonomous mobile robot equipped with ultrasonic sensors for detecting movement, a low-cost camera for live video capture, and additional sensors such as temperature and metal detectors to enhance functionality. The robot is designed to operate efficiently in areas like collapsed buildings or war zones, where human involvement may be too dangerous.The system operates by detecting signs of life using its ultrasonic sensors, which then trigger the camera to capture and stream real-time visuals to a control center. [10]

III.METHODOLOGY

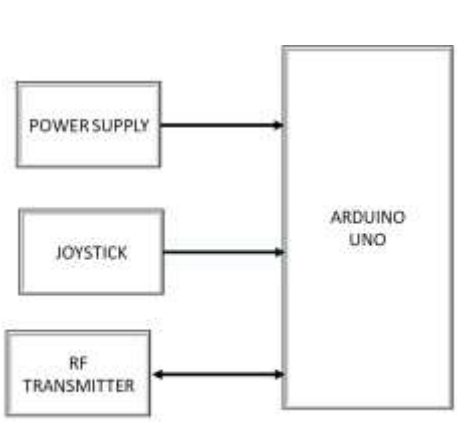


Fig1 a.:-Block Diagram for Transmitter

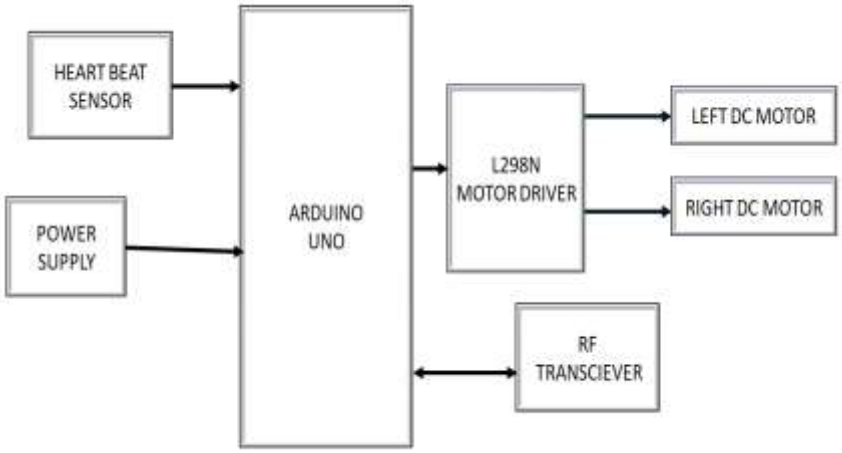


Fig1 b.:-Block Diagram for Receiver

A. BLOCK DIAGRAM

Block Diagram of RF Controlled Robot For Human Detection using Heartbeat Sensor,Joystick ,RF Trans Recevier ,Motor Driver, DCmotor

B.WORKING

The RF-controlled robot for human detection integrates remote navigation and biomedical sensing to aid in disaster response. The system is built around a microcontroller that coordinates the robot's movements and processes data from integrated sensors. RF communication facilitates wireless control, with a transmitter operated remotely and a receiver on the robot, enabling it to traverse hazardous and uneven terrains. Equipped with a heartbeat sensor, the robot detects survivors by identifying pulse signals through contact or proximity, providing critical information about their presence and condition. Real-time data is transmitted wirelessly to the operator, ensuring timely feedback for rescue efforts. The compact design allows the robot to access confined spaces where human rescuers or traditional methods, such as trained dogs, might be ineffective. Additionally, the system can be enhanced with environmental sensors to gather data on temperature, gas levels, or structural hazards. This approach significantly reduces risks for rescue personnel while providing accurate and efficient victim detection, improving the overall effectiveness of life-saving operations.

C.FLOWCHART

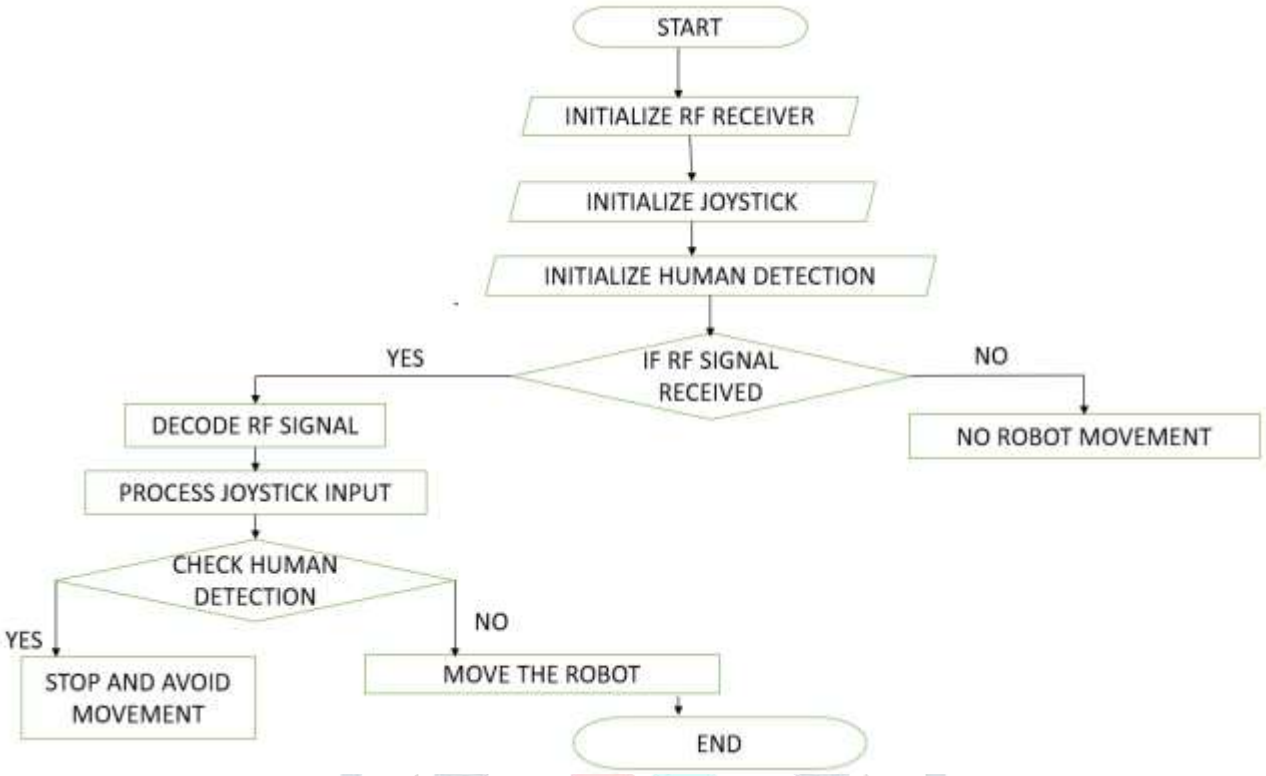
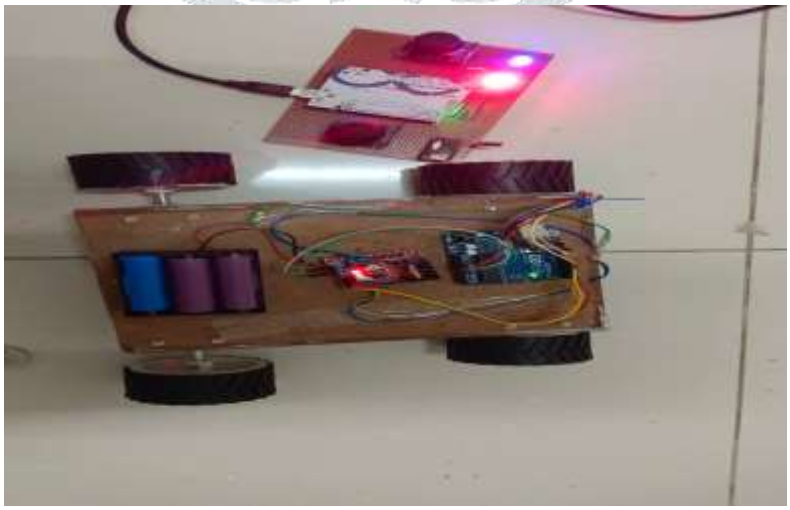
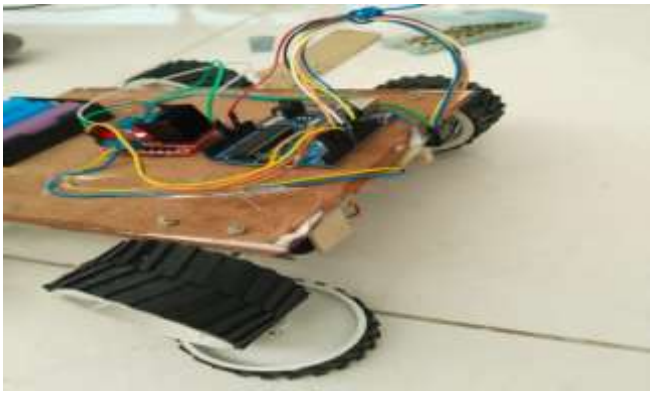


Fig 2. Flowchart of RF controlled robot for human detection

IV.DEMONSTRATION



V.RESULT



An RF-controlled robot designed for human detection would be the successful identification and tracking of human presence in its environment. This involves using sensors like Heartbeat sensor to detect humans and then the robot would respond by moving towards the detected individual or performing specific actions such as sending alerts. Overall, the robot should be able to navigate effectively while avoiding obstacles and accurately recognizing human shapes or movements.

VI.APPLICATION:

- Disaster Response
- Manmade Calamities
- Military and Defense
- Fire fighting
- Exploration
- Research and Training

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