AI based - Rescue Rover: Human Locator for Earthquake Rescue

M.Rajesh [1] , V.Naveen[2], C.Naveen Kumar [3], R.Raghupathi[4],
[1234] Department Of Electronics and Communication Engineering,
AVS Engineering College , Military Road , Ammapet,Salem- 636003.
[1] Assistant professor, Department of Electronics and Communication Engineering,
AVS Engineering College, Military Road, Ammapet, Salem- 636003.

ABSTRACT - Increasing climate change is leading to a greater number of natural disasters. As is expected, the possibility of the occurrence of droughts, increased intensity of storms, a sharp incline in the number of forest fires and a lot more will be seen by the upcoming generations. Natural disasters affect human life in unexpected ways. We can never be fully prepared for what is to happen. In this paper, we devise a robot that can help people in cases of disaster management and prevention. The robot will successfully be able to detect the presence of humans under debris or in regions where it is difficult and time consuming for people to reach during rescue operations. In case of incidences like earthquakes, collapse of buildings, airplane crashes, forest fires, tsunamis and many more, this robot will help make timely rescue and sense the presence of people in places where the human eye cannot spot a person. The robot will also be a boon in case of spotting places where certain causalities begin to erupt. Forest fires can be prevented by sensing the fire at the very instant it erupts in the forest. Robots can be left to cover a certain amount of area in each forest to ensure that no region is left uncovered. The proposed robot can also be a great help in ensuring that no unwanted presence exists in restricted military areas or banks.

KEYWORDS. Microcontroller, , sensors, IOT, Artificial intelligence

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I. INTRODUCTION

Natural disasters such as earthquakes often result in widespread devastation, including collapsed buildings and trapped individuals. In such scenarios, the timely and efficient deployment of rescue operations is crucial for saving lives. Traditional search and rescue methods may face limitations in accessing hazardous or inaccessible areas. To overcome these challenges, the integration of sensors, robotics, and Internet of Things (IoT) technology offers a promising solution. In this context, the development of an earthquake rescue robot equipped with sensors and IoT capabilities emerges as a vital innovation to enhance disaster response efforts.

The Internet of Things, also known as Internet of Objects, a wireless network between objects, the network is wireless and self-configuring. IoT is a major component advances which links internet with sensors and working devices.

-smart objects are a key in IoT vision, since embedded communication and information technology would have potential utilize these objects. Using sensors, perceiving the context, built-in networking capabilities help in communication with each other, accessing internet services and interaction with people. Digitally upgrading objects enhancing the physical function by adding the capabilities of digital objects, thus generating added value. Development are apparent today- more and more devices including sewing machine, exercise bikes, electric toothbrush, washing machines, electric meters and photocopies are computerized and equipped with network.

LITERATURE SURVEY

IoT Based Earthquake Rescue Robot

Authors: J. Madhumitha, R. Aarthi, S. Vijayalakshmi

Publication: International Journal of Engineering Research & Technology (IJERT), Volume 8, Issue 11, November 2019: This paper presents an IoT-based earthquake rescue robot designed to assist rescue teams in locating and rescuing survivors in disaster-stricken areas. The robot is equipped with various sensors such as ultrasonic sensors, gas sensors, and temperature sensors to detect survivors, hazardous gases, and temperature variations respectively. The IoT aspect allows for remote monitoring and control of the robot's operations via a web interface. The system is tested in simulated earthquake scenarios, demonstrating its effectiveness in rescue missions.

The integration of IoT enables real-time monitoring and control, enhancing the robot's efficiency and adaptability during rescue operations.

An Earthquake Rescue Robot Based on IoT

Authors: Jianlong Zhou, Haifeng Li, Shuaishuai Zhu
Publication: 2018 IEEE 3rd Advanced Information Technology, Electronic and Automation Control Conference (IAEAC):This paper presents the development of an earthquake rescue robot utilizing IoT technology. The robot is equipped with various sensors including infrared sensors, gas sensors, and obstacle avoidance sensors. The integration of IoT enables remote control and monitoring of the robot's movements and sensor data. The system architecture is designed to facilitate real-time communication between the robot and a central control platform, allowing for efficient coordination during rescue missions.The IoT-based approach enhances the scalability and adaptability of the rescue robot system, enabling seamless integration with other IoT devices and platforms for comprehensive disaster response.

Design of an Earthquake Rescue Robot System Based on IoT Technology

Authors: Zhijun Cai, Mingxing Zheng.2017 International Conference on Computer Network, Electronic and Automation (ICCNEA):This paper proposes a design for an earthquake rescue robot system leveraging IoT technology. The system architecture incorporates various sensors including temperature sensors, gas sensors, and vibration sensors to detect environmental conditions in disaster areas. Additionally, the robot features a camera module for visual inspection and a GPS module for location tracking. The IoT infrastructure enables real-time data transmission and remote control via a web-based interface, facilitating efficient rescue operations.The integration of IoT technology enhances the robot's functionality and enables seamless communication with rescue teams and command centers, improving coordination and response effectiveness during earthquake disasters.

Development of IoT Based Earthquake Rescue Robot

S. Arul Murugan, A. Sankara Narayanan, S. Sarath Kumar, R. Karthik,2019 International Conference on Recent Advances in Electronics and Communication Technology (ICRAECT): This paper describes the development of an IoT-based earthquake rescue robot equipped with various sensors including temperature sensors, gas sensors, and ultrasonic sensors. The robot is designed to navigate through disaster-stricken areas, detect survivors, and transmit real-time sensor data to a central control station using IoT communication protocols. The system is evaluated through simulation and experimental studies, demonstrating its effectiveness in earthquake rescue missions.The IoT-based approach enables seamless communication and coordination between the rescue robot and control stations, facilitating efficient decision-making and resource allocation during disaster response operations

EXISTING SYSTEM

Communication systems such as two-way radios, satellite phones, and mobile networks are utilized to coordinate rescue efforts, share information, and request additional resources. However, communication infrastructure may be disrupted or overloaded during earthquakes, hampering response efforts. hey have limitations in terms of efficiency, speed, and safety, particularly in accessing hazardous or hard-to-reach areas. The introduction of earthquake rescue robots equipped with sensors and IoT technology represents a significant advancement in disaster response capabilities, enabling more precise and efficient search and rescue operations, real-time data monitoring, and remote control functionalities.

PROPOSED METHOD

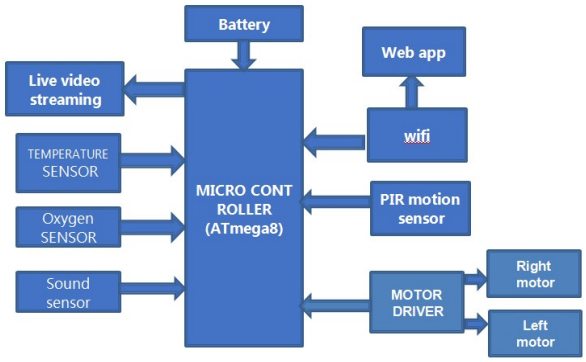

Fig. Proposed Block diagram

PROPOSED SYSTEM

- The project proposes an autonomous robotic vehicle that moves in the earthquake prone area and helps in identifying the live people and rescue operations. Hence precious life can be saved by timely detection in natural calamities even without the help of large number of rescue operation.
- Here we are going to use IOT technology and sensors like temperature , motion detection , sound sensor, oxygen sensor
- sensors will observe the change in environment parameters and they will give the information to micro controller .
- Then micro controller will Verify this values up to date, if any of the value exceeds than rated it will alert to person through the buzzer.
- This information is passed to the base station through the IOT module.
- Then the department at the base station will control the robot using wireless technology and take precautions to safe the persons who are want to rescue during earthquake disaster.

MICROCONTROLLER

Description

The ESP32 is a low-solar power CMOS 8-bit microcontroller based on the AVR RISC architecture. By executing solar powerful instructions in a single clock cycle, the Esp32 achieves throughputs approaching 1 MIPS per MHz, allowing the system designed to optimize solar power consumption versus processing speed. The AVR core combines a rich instruction set with 32 general-purpose working registers. All the 32 registers are directly connected

to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

The device is manufactured using Arduino's high-density non-volatile memory technology. The Flash Program memory can be reprogrammed In-System through an SPI serial interface, by a conventional non-volatile memory programmer, or by an On-chip boot program running on the AVR core. The boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash Section will continue to run while the Application Flash Section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self- Programmable Flash on a monolithic chip, the Arduino ESP32 is a solar powerful microcontroller that provides a highly flexible and cost-effective solution to many embedded control applications. The ESP32 AVR is supported with a full suite of program and system development tools, including C compilers, macro assemblers, program debugger/simulators, In-Circuit Emulators, and evaluation kits.

LIVE STREAMING

Video transmission and display process on most systems are very important. In this study, it is aimed to make a secure video or image transfer system. To achieve this goal, the image must first be taken by ESP32-CAM module. This module acts as a data provider. The feature has been installed when customizing the module for this usage. To display the image taken from the module, it joined to a common network. When the ESP32-CAM module is connected to a common network, it provides an Internet protocol (IP) address to broadcast. This network is a common network, including the Web Server. Within the scope of this study, the ESP32-CAM module and the desktop computer where the Web Server is installed are connected to the same access point. The user that we assume as an observer, connects to an access point via his/her computer. This access point is the same device that the ESP32-CAM and Web Server Provider Device connects to. In this way, both the observer and the camera module are connected to the same network. Once this partnership is achieved, the logs are observed in the web browser with the IP address provided by the ESP32-CAM.

CONCLUSION

The integration of sensors and IoT technology into earthquake rescue robots represents a significant advancement in disaster response capabilities. By leveraging a combination of sensors such as temperature, motion, voice, and others, along with IoT-enabled communication and control systems, these robots can effectively navigate disaster-stricken areas, detect survivors, assess environmental conditions, and facilitate coordinated rescue operations.

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