ROBOTIC DEVICE FOR BOREWELL RESCUE OPERATION

A SYNOPSIS

Submitted by

ABHISHEK DIPAK RAKATE (2021000516)

NIKHIL ANANDA PATIL (2021000420)

SOURABH SURESH YEJARE (2021000498)

VIVEKANAND VISHWANATH TANAWADE (2021000238)

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Under the guidance of

PROF. MRS. A. A. SHINDE

Department of Electronics and Telecommunication Engineering

KIT's College of engineering, Kolhapur

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PROBLEM STATEMENT

Develop a specialized robotic device for borewell rescue operations with a primary focus on real-time monitoring parameters like video, audio surveillance to track the victim's condition and monitor vital environmental factors such as temperature, atmospheric pressure, humidity, oxygen levels, and hazardous gas detection.

RELEVANCE

In many places, there are accidents where people, especially children, fall into uncovered borewells, which can be really dangerous. These accidents can happen in different types of borewells, whether they're shallow or deep.

Right now, when these accidents happen, rescue teams like the National Disaster Response Force (NDRF) use manual methods, which can take a long time and can be risky. They have to dig parallel holes next to the borewell and make tunnels to reach the person trapped inside. But our project, the "Robotic Device for Borewell Rescue Operation," can make this process much safer and faster.

There is need of special device that can go inside the borewell and monitor what's happening inside. It will also check the air and dangerous gases and keep track of parameters like temperature and pressure. This will help the rescue teams to know condition of victim and how to save the person trapped inside.

LITERATURE REVIEW

In study [1], Nitin Agarwal, Hitesh Singhal describes the rescue operations without human intervention. The Systems legs can be changed to fit the pipelines dimensions. This proposal is built on a rescue system, where a CCTV camera and a light source are employed to save lives. This project uses low power LEDs, and a human controls the system.

In study [2], Kavi Anand describes the designing a system for rescue child from inside borewell. This system has the ability to move within the borewell. PIR sensors are used in this Smart Rescue System to detect just people, regardless of the environment. The Raspberry Pi, which is more expensive than an Arm microcontroller, is employed in this setup. More accessories are needed.

In study [3], K Saran, S. Vignesh, Marlon Jones Louis have done servo motors to hold the child and safety balloons beneath the child to provide further protection to the child have been employed in a human-controlled computerized machine to rescue the youngster. The project process development includes everything from hand-drawn sketches to computer generated artwork.

In study [4], B. Bharathi, B. Suhitha Samuel have implemented project of prototype that uses a PIC 16F877A microcontroller and wirelessly controlled system that uses Zigbee technology and dc motor-based gripper operation for systemic arm to rescue a child.

PRESENT THEORIES AND PRACTICES

There is no proper rescue technique to rescue victims of such accidents. When they make shift local arrangements do not work, army is called in such methods some kind of hook is employed to hold the sufferer clothes and body. This may cause wound on the body of the trapped object.

Vertical and Horizontal Drilling: Create a parallel hole next to the bore well. When the vertical hole reaches the depth of the trapped child, drill a horizontal hole to reach them. Ensure the vertical drilling is slanted towards the bore well to save time in horizontal drilling.

Techniques Adopted by NDRF: NDRF teams employ various techniques, including Rope rescue, Magic ball, Umbrella tool, Cloth bucket, Iron rods in "L/J/U" shapes, Aluminium wire with hooks, Life jackets made of plastic sheets with wires.

OBJECTIVES

- To interface audio, video surveillance system to controller for tracking victim's condition.
- To interface sensors to controller for monitoring environmental factors like temperature, atmospheric pressure, oxygen concentration, and hazardous gas levels within the borewell.
- To collect and transmit data quickly and accurately to the NDRF (National Disaster Response Force) team in real-time.

SCOPE OF THE PROJECT

Emergency Response Enhancement: The project aims to significantly enhance the capabilities of emergency response teams, particularly in the context of borewell accidents. By providing a technologically advanced and efficient system, the project contributes to improving the speed and effectiveness of rescue operations.

Safety and Efficiency: The primary scope is to enhance the safety of both trapped individuals and rescue personnel during borewell rescues. This includes the development of tools and systems to detect hazardous gases and optimize rescue strategies in real-time.

Future Advancement in Navigating Confined Spaces: Involves looking at how we can make it easier for devices to move around in tight and narrow spaces. We want to find better ways for them to go where humans can't easily reach. This could include improving their ability to turn, go up and down, and avoid obstacles. The goal is to make these devices more effective in rescue operations and other tasks in confined spaces.

METHODOLOGY

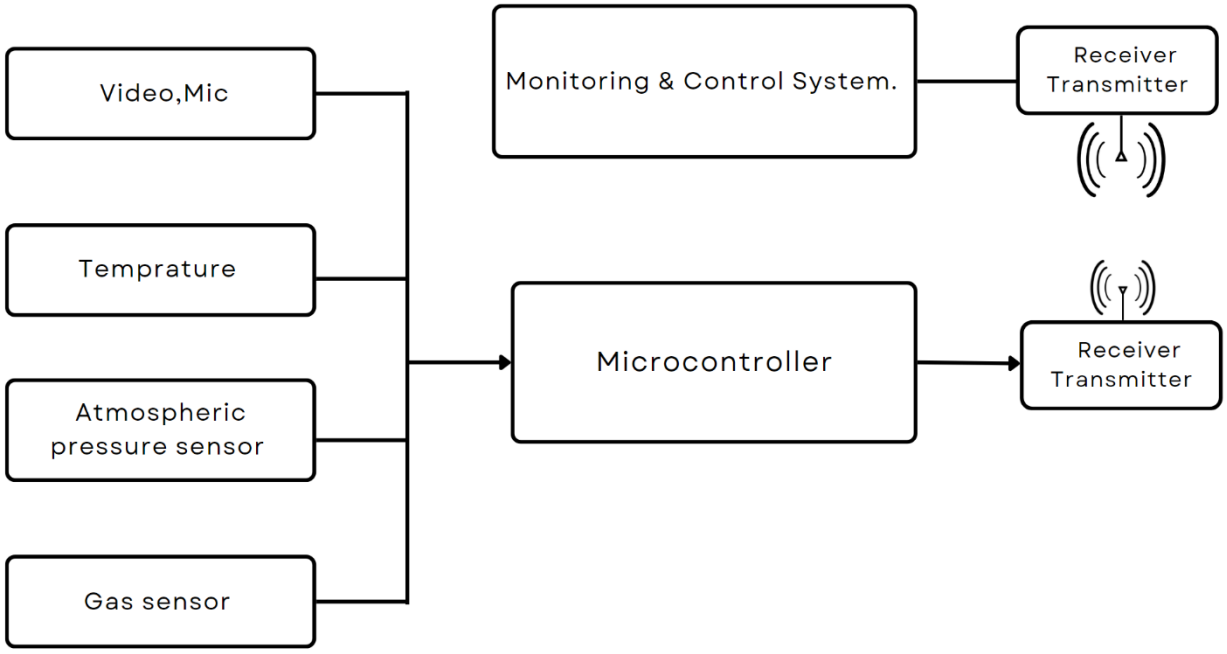
Requirement Analysis: Conduct a comprehensive analysis of the requirements for the borewell rescue system. Identify the technical specifications, including sensor types, communication protocols, and robotic device capabilities.

System Design: Develop a detailed system architecture that includes hardware and software components. Specify the types and specifications of sensors required for environmental monitoring (gas, temperature, humidity, etc.). Design the robotic device, including its mobility, and reach.

Hardware Integration: Select and procure the necessary hardware components, including microcontrollers, sensors, actuators, and power systems.

Robotic Design and Implementation: Design and fabricate the robotic device with the required specifications. Integrate the device with the robotic platform and ensure it can perform victim condition, through camera module and attached sensors.

BLOCK DIAGRAM



PROJECT REQUIREMENTS

Sensors:

1. **Gas Sensors**: To detect hazardous gases such as methane or carbon dioxide.
2. **Temperature Sensors**: For monitoring the environmental temperature inside the borewell.
3. **Humidity Sensors**: To measure humidity levels within the borewell.
4. **Infrared (IR) Sensors**: For proximity detection and obstacle avoidance.
5. **Accelerometers**: For vibration and motion sensing.
6. **Atmospheric Pressure Sensors**: To monitor air pressure and changes in depth.
7. **Camera Systems**: For visual inspection and remote operation.
8. **Microphones**: To capture audio for communication and detection.

CPUs and Hardware:

1. **Microcontroller:** To monitor Environmental parameters and transmit the data to rescue team.
2. **Graphical User Interface (GUI)**: To enable user interaction and data visualization.
3. **Mechanical Components**: Including motors, wheels, and arms for mobility and manipulation.

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GROUP MEMBERS	PRN	SIGNATURES
Abhishek Dipak Rakate	(2021000516)	
Nikhil Ananda Patil	(2021000420)	
Sourabh Suresh Yejare	(2021000498)	
Vivekanand Vishwanath Tanawade	(2021000238)	

PROJECT GUIDE — SIGNATURE

Prof. Mrs. A. A. Shinde