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ROBOTIC DEVICE FOR BOREWELL RESCUE OPERATION

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Abstract: An evaluation of the design, development and performance of a robotic device specifically designed for borewell operations is presented in this paper. In this project, traditional methods are used to monitor the live demonstration of the robotic arm with the help of advanced technologies such as Blynk 2.0 software, Camera, UltraSonic Sensor, which reduce manual work and pose inherent safety risks. The proposed robotic device is designed to increase the efficiency, safety and precision of drilling operations.

Keywords - Blynk 2.0, IOT (Internet of Things), Sensor Technology, Camera, Robotic Arm, Ultra Sonic Sensor, Motor Driver, DC Motor, ESP 32

I. INTRODUCTION

The "Robotic Device For Borewell Rescue" which using ESP 32 is a technology solution designed to improve the safety and efficiency of rescues in cases where people fall into open borewells, a common problem in rural areas. This system utilizes the ESP32 microcontroller and Internet of Things (IoT) technology to monitor borewells, collect data, transmit it to a central platform, and provide real-time alerts, location tracking, and automation for faster and more effective rescue operations. It is energy-efficient and scalable for monitoring multiple borewells, contributing to enhanced safety and potentially saving lives The traditional way to rescue the child is to dig a parallel pit t adjacent to the bore well. This method is difficult, lengthy and also risky to rescue the trapped child. In the proposed method mechanical system moves inside the borewell channel and moves its gripper arm in accordance with the user commands given.

II. LITERATURE SURVEY

[1] The research paper discusses the design and construction of a portable Borewell Rescue Robot aimed at providing a cost-effective, quick, and accurate solution to the common problem of children falling into borewells. The robot is equipped with a robotic arm, circular disk, airbag, and IR device to ensure the safety and successful rescue of the child. The paper highlights the lack of efficient and reliable instruments for rescuing children stuck in borewells and proposes the use of the Borewell Rescue Robot as a solution.

[2] The research paper discusses the design and fabrication of a Mini-Size Borewell Rescue Robot to address the critical issue of children falling into abandoned bore wells in India. The robot aims to provide a safe and efficient rescue operation by autonomously navigating through the bore well and retrieving the trapped victim without causing harm. The paper highlights the challenges of current rescue methods and emphasizes the need for a technical solution. It also mentions the use of pneumatic cylinders, grippers, and batteries in the robot's design. Additionally, the paper references previous studies on child rescue systems from bore wells, including the use of Arduino micro-controllers and IoT technology.

[3] The Bore well Rescue Robot project addresses the distressing issue of children falling into uncovered bore holes. The robot is designed to swiftly and economically rescue the trapped child, providing continuous monitoring, necessary supplies for survival, and a safe handling system to ensure the child's well-being. The use of a robotic arm and foldable seat allows for the safe extraction of the child without causing harm, making it an innovative and life-saving solution to a critical problem.

table no 1 literature survey

Paper.no	Title	Technology /Methodology	Hardware Devices	Results
[1]	"Borewell Rescue Robot"	A Robotic arm, Circular disk, airbag, IR sensor, and Camera with high-powered LED.	Pulley system for lifting, CCTV camera, IR sensor, pneumatic valve.	The robot's design ensures no possibility of failures during the rescue operation, and its cost efficiency makes it accessible to those in need. The robot is controlled easily and is operated through live monitoring using a CCTV camera.
[2]	"DESIGN AND FABRICATION OF MINISIZE BOREWELL RESCUE ROBOT"	Pneumatic cylinders, Grippers, Batteries for the design, Night vision cameras, Torchlights, Oxygen pipes with Cylinders, Vacuum pipes,	pneumatic cylinders, grippers, batteries, and night vision cameras.	The robot incorporates pneumatic cylinders, grippers, batteries, and night vision cameras to facilitate the safe and efficient retrieval of trapped victims. The study emphasizes the need for a technical solution to improve current rescue methods and highlights the use of advanced technology to enhance the rescue operation.
[3]	"Artificial intelligence for waste management in smart cities"	Rubber grip motors, BLDC Motors, ZIGBEE, computer-controlled monitors, Arduino, Bluetooth, clipper systems, IR sensors, DC metal gear motors, and Non-vision sensors.	rubber grip motors, BLDC motors, ZIGBEE modules, computer-controlled monitors, Arduino microcontrollers, Bluetooth modules, clipper systems, IR sensors, DC metal gear motors, and non-vision sensors.	The result of the study indicates that the clipper mechanism is identified as the most effective and safe method for rescuing children within a rapid timeframe, minimizing the potential risks and challenges associated with borewell rescue operations.
[4]	"Robotic device for borewell rescue operation"	Blynk 2.0, IOT (Internet of Things), Sensor Technology, Camera, Robotic Arm, Ultra Sonic Sensor, Motor Driver, DC Motor, ESP 32	Blynk 2.0, IOT (Internet of Things), Sensor Technology, Camera, Robotic Arm,UltraSonic Sensor, Motor Driver, DC Motor, ESP 32	Robotic device for borewell operation involves designing and constructing a specialized machine capable of efficiently drilling and extracting water from deep underground wells. This robotic device should be equipped with advanced sensors and imaging technology to accurately locate and assess the water source, ensuring optimal drilling and extraction.

III SYSTEM ARCHITECTURE

3.1 BLOCK DIAGRAM

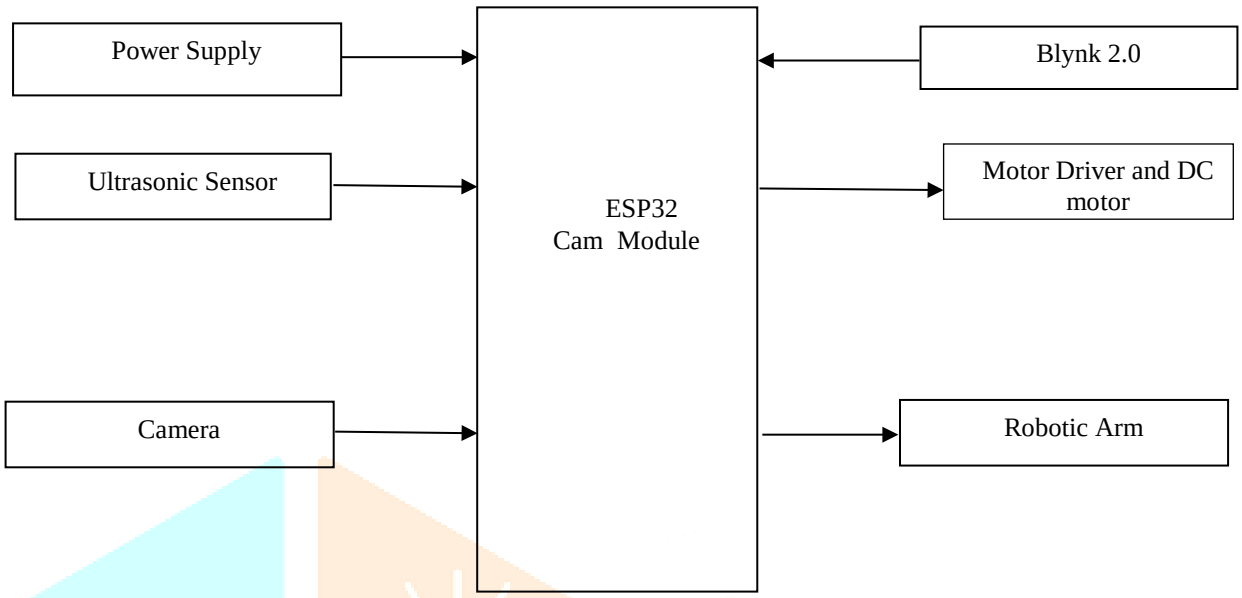

fig3.1: Proposed block diagram of Robotic Device For Borewell Rescue Operation

3.1.1 BLOCK DIAGRAM EXPLAINATION

1. Power Supply:
   The power supply block provides the necessary voltage and current to all the components of the system. It typically includes a power source, voltage regulators, and any necessary conditioning circuitry to ensure stable power delivery.
2. ESP32:
   The ESP32-CAM is a small size, low power consumption camera module based on ESP32. It comes with an OV2640 camera and provides onboard TF card slot.
   The ESP32-CAM can be widely used in intelligent IoT applications such as wireless video monitoring, WiFi image upload, QR identification, and so on.
3. Ultra Sonic Sensor:
   The ultrasonic sensor is an electronic device used to measure distances.
4. Blynk 2.0:
   Blynk 2.0 is a cloud-based platform for IoT applications. It provides a user-friendly interface for controlling and monitoring IoT devices.
5. ROBOTIC ARM:
   A robotic arm, also known as a robot manipulator, is a mechanical device designed to imitate the movements and functions of a human arm.

IV. FUTURE SCOPE

Sensors: IoT sensors are placed inside and around the borewell to monitor various parameters, such as water level, temperature, flow rate, and the condition of the pump and motor. These sensors continuously collect data and transmit it to a central server.

- ➢ Connectivity: Data collected by the sensors is transmitted using wireless communication protocols like Wi-Fi, cellular, or satellite to ensure remote access to the information.
- ➢ Data Analysis: The collected data is analyzed in real-time using cloud-based or on-premises software. Machine learning algorithms can be applied to predict future trends and possible issues, such as water level depletion or pump failures.
- ➢ Alerts and Notifications: When an issue is detected, the system can send alerts and notifications to relevant stakeholders, such as the well operator, maintenance personnel, or local authorities. These alerts can be sent via SMS, email, or smartphone applications.
- ➢ Remote Control: In some cases, the borewell rescue system may include the ability to remotely control the pump and motor. This allows operators to adjust the pumping rate, start or stop the pump, or change other settings as needed to prevent over-pumping or damage to the borewell.

V. CONCLUSION

The development and utilization of robotic devices for borewell rescue operations represent a significant advancement in search and rescue technology. These devices offer a multitude of advantages, including enhanced safety, quicker response times, remote operation, and the ability to access confined and hazardous spaces while reducing the risks to human rescuers. The real-time data feedback, adaptability to challenging environments, and the potential for data collection and analysis further underscore their value.

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