



## ROBOTICS DEVICE FOR BOREWELL RESCUE OPERATIONS

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**Abstract:** India is a developing country where people are based on natural resources like water, air, land etc. This project is based on the rescue of children from uncovered bore well systems in many places. Due to the uncovered bore well young children fall into the open bore wells. But only a few children are being rescued while others lose their lives. The actual purpose of the bore well is to provide sufficient water but it takes the lives of so many innocent children. In this project, a sensor and safety plate is used. The sensor detects if any victim falls into the borewell and closes the safety plate, this ensures the victim will not go deeper any further. The sensor will also send the notification to the concerned owner so that the child can be saved. In case the victim falls through the borewell, further than the safety plate we use a Robotic device to save the child.

**Keywords – Gripper, Pulley, Borewell, Camera, Arms, Ultrasonic Sensor, DC Motor, Arduino.**

### I. INTRODUCTION

In India many borewells are being drilled everyday, either for water, gas, petroleum or for other resources. Due to certain reasons of not obtaining what they intended to get, adequate safety measures are not espoused and the borewells are left open most of the times. Due to this, many have lost their lives unable to notice the danger in front of them. Particularly kids are losing their lives not only while playing, but also in diverse ways due to open borewells which are usually unnoticed. This project titled as 'Child Rescue System In Open Borewells' has been undertaken with the aim to save lives. Open borewells are always a trap and the accidents cannot be avoided timely. These accidents and the expenses to rescue the victims are escalating day by day. Therefore a practical, safe, cost effective and efficient rescue system becomes necessary. From past few years there have been several accidents of children falling into abandoned borewells that are left uncovered. These borewells have started to take many innocent lives. Saving lives are not guaranteed by using existing systems. Thereby, the proposed system aims at safe rescue of children from open borewells. This system brings out a new design which has a sensor kept at top of the bore hole which helps to sense the child when he/she falls inside. If the system senses the child, the DC motor automatically gets activated and the child gets rescued. It also alerts by giving a buzzer sound and messages will be sent to nearby hospitals, police stations etc.

### II. LITERATURE REVIEW

**P. Sumathy.** [1] a wheeled leg mechanism is designed to go inside the pipe and the legs are circumferentially and systematically spaced out apart. It consists of power supply, switch pad and gear motor. The child's position is captured with the USB camera and monitored on the PC. The LM35 temperature sensor and 16\*2 LCD are interfaced with PIC 16F877A microcontroller to sense and display on LCD.

**Aravind N Kaimal** [2] the manipulator parts are assembled and the fixed system is connected to a rope which runs inside a narrow hole through pulleys. The entire set up is supported by a tripod stand on the ground with an oxygen concentrator aside.

**Ramesh S.** [3] the mechanical support structure with four legs is first placed over the borewell opening. This support structure has a motor fixed on it with a pulley assembly, then the robotic arm setup is tied up to a cable or a rope with desired length and is then coupled to the pulley of the up down motion control motor.

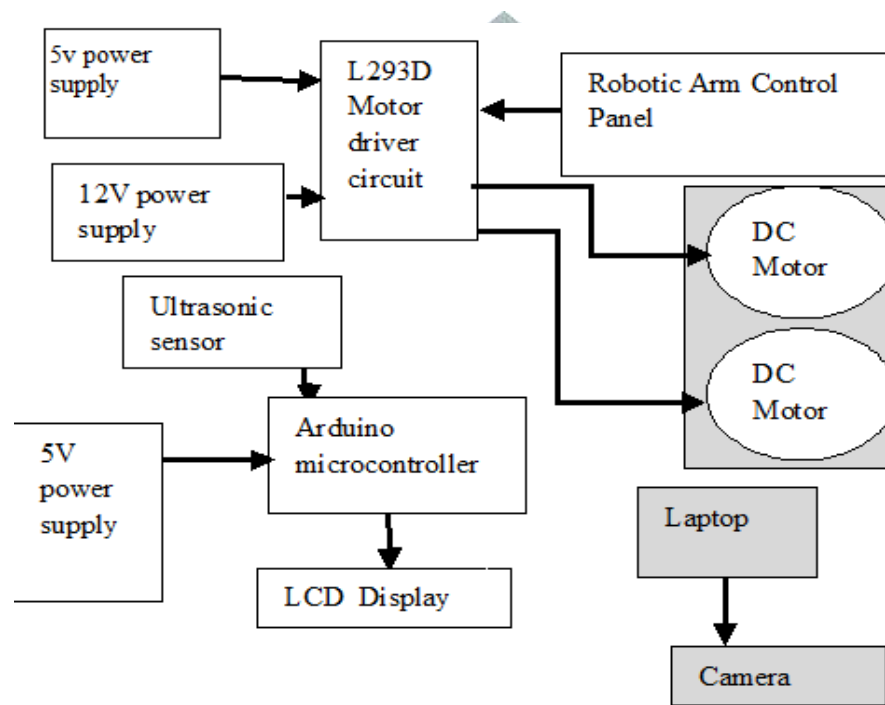
**Navya** [4] the project uses RFID technology, embedded systems and a mechanical unit for the rescue. Special graspers are used to lift the child from the pits or bore-well. Pulling of child is made possible by special graspers, which can grasp the shoulder or the wrist or the ankle of the child. These have been specially designed and fabricated to provide open and close control at one end and facility to extend it by adding pipes.

**Sanket Arun Talekar [5]** the working mechanism of this projected system is a combination of pick and place mechanism, data acquisition system and the safety mechanisms for dealing with a human life.

### III. PROPOSED SYSTEM

This support structure has a motor fixed on it with a pulley assembly, then the robotic arm setup is tied up to cable.

#### BLOCK DIAGRAM



#### Gas sensor:

Gas sensors are devices that help us understand the amount of gas in the environment and the natural state of its movement. Gas sensors reveal the amount of gas in the environment and the nature of the gas composition with electrical signals and can provide its change.



#### LCD Display:

An LCD (Liquid Crystal Display) is a flat-panel display technology commonly used in TVs, computer monitors, smartphones, and other electronic devices. It works by using the light-modulating properties of liquid crystals to display images.



**Camera:**

The use of cameras in borewell projects can serve several purposes, particularly in the context of monitoring and inspection. Here's how cameras are often employed in borewell projects.

**Arduino microcontroller:**

Using Arduino microcontrollers in borewell projects can offer several advantages, particularly in terms of automation, data collection, and remote monitoring. Here's how Arduino microcontrollers can be utilized in such projects:

1. **Automation of Pump Control:** Arduino microcontrollers can be programmed to automate the control of pumps used in borewell systems. By integrating sensors to measure water levels or pressure, the Arduino can activate or deactivate the pump as needed, ensuring efficient water management and preventing over-pumping or dry-running situations.
2. **Data Logging and Analysis:** Arduino boards equipped with sensors such as pressure sensors, flow meters, or water quality sensors can collect data on various parameters related to the borewell operation, such as water level, flow rate, temperature, and pH. This data can be logged onto an SD card or transmitted wirelessly to a central database for analysis and monitoring of borewell performance over time.
3. **Remote Monitoring and Control:** Arduino-based systems can be connected to the internet or a wireless network, allowing for remote monitoring and control of borewell operations. Engineers or stakeholders can access real-time data and receive alerts or notifications in case of anomalies or emergencies, enabling timely intervention and troubleshooting.
4. **Energy Efficiency Optimization:** By integrating Arduino-based control systems with renewable energy sources such as solar panels or wind turbines, borewell operations can be optimized for energy efficiency. The Arduino can intelligently manage the use of energy based on demand and environmental conditions, thereby reducing reliance on grid power and minimizing operational costs.

**Battery:**

In borewell projects, batteries serve various purposes, primarily as a backup power source or for powering equipment in remote locations where grid power is unavailable. Here are several ways batteries are used in borewell projects:

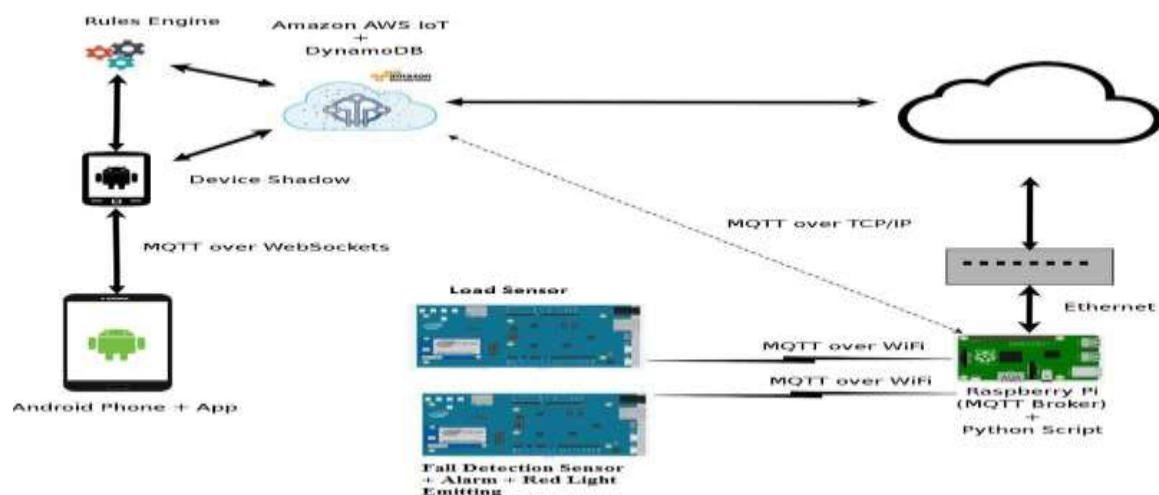
1. **Backup Power:** Batteries are often used as backup power sources for borewell pumps and control systems. In areas with unreliable grid power or frequent power outages, batteries can ensure continuous operation of the borewell system, preventing disruptions in water supply.
2. **Off-Grid Power:** In remote locations where grid power is unavailable, batteries combined with renewable energy sources such as solar panels or wind turbines can provide off-grid power for borewell operations..



### Working Flow:

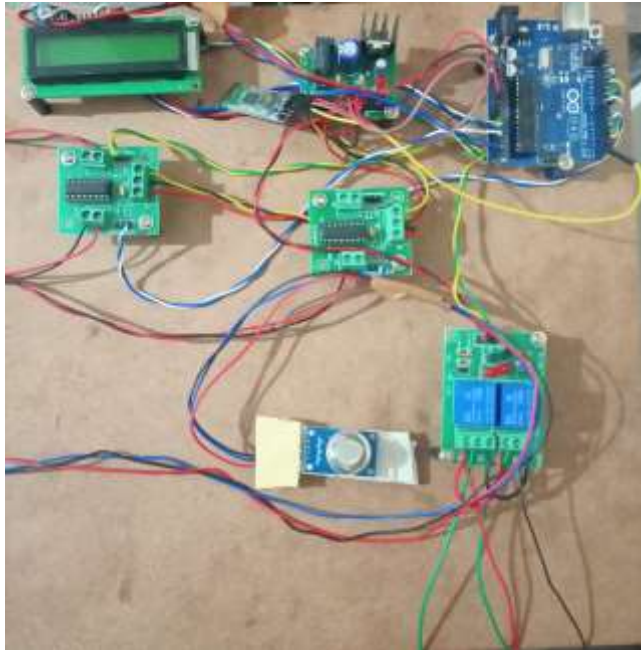
A robotics borewell system introduces automation and robotics into the process of drilling and maintaining boreholes. Here's how the working flow of such a system might look like:

1. **Site Survey and Planning:** Similar to traditional borewell systems, the process begins with a site survey to identify the optimal location for drilling the borehole. Robotics and sensors may be used to gather data about the geological composition of the area and the depth of the water table.
2. **Robotic Drilling:** Instead of manual drilling, a robotic drilling rig is deployed to bore the hole. This drilling rig may be equipped with sensors and actuators to adjust drilling parameters in real-time based on the geological conditions encountered.
3. **Autonomous Operation:** The robotic drilling system operates autonomously or under minimal human supervision. It navigates the drilling process, adjusting drilling angles and depths as necessary to optimize the borehole's performance.
4. **Continuous Monitoring:** Throughout the drilling process, sensors monitor various parameters such as drilling speed, torque, pressure, and geological characteristics. This data is transmitted in real-time to a control center for analysis and decision-making.
5. **Casing Installation:** Once the borehole reaches the desired depth, robotic arms or mechanisms may be employed to install the casing. The casing helps to stabilize the borehole and prevent collapse while also protecting the water source from contamination.
6. **Incorporation of AI and Machine Learning:** The robotics borewell system may utilize artificial intelligence (AI) and machine learning algorithms to analyze the data collected during drilling and optimize future drilling operations. These algorithms can help improve drilling efficiency, reduce costs, and enhance overall performance.
7. **Integration with Remote Monitoring Systems:** The robotics borewell system may be integrated with remote monitoring systems that allow operators to monitor and control the drilling process from a centralized location. This enables real-time adjustments and troubleshooting, improving operational efficiency and safety.
8. **Pumping Equipment Installation:** After the borehole is drilled and cased, pumping equipment is installed to extract water. While this may involve manual installation, future advancements may see the integration of robotic systems for pump installation and maintenance.
9. **Remote Maintenance and Servicing:** Robotics borewell systems may incorporate remote maintenance and servicing capabilities, allowing for proactive monitoring of equipment health and timely intervention when maintenance or repairs are required. Robotic arms or drones could be deployed for onsite inspections and maintenance tasks.
10. **Data Analysis and Optimization:** Data collected from the robotics borewell system, including drilling parameters, geological data, and equipment performance metrics, are analyzed to identify trends and patterns. This analysis informs future drilling operations and helps optimize the efficiency and effectiveness of the borewell system.



**Result:**

Robotics borewell systems are innovative solutions that integrate robotics and automation into the process of drilling and maintaining borewells. Here are some potential outcomes and benefits of using robotics in borewell systems. Overall, robotics borewell systems have the potential to revolutionize the way borewells are drilled and maintained, offering numerous benefits in terms of efficiency, safety, cost-effectiveness, and environmental sustainability.

**Conclusion:**

Each and every life in this world counts. One life supports the other in some or other ways. It is a moral duty of the society to save the innocent lives at risk. As an Engineer, it is our responsibility to develop various systems and machines to help these struggling lives from danger. These young children are the future of our society. Instead of letting them suffer and lose their life, it is our duty to save them by some means. This approach provides a way in which a life can be saved, whether it may be of a human or an animal, from the open bore wells in a shorter span of time. All the objectives of the project are fulfilled. The design for a rescue system is complete with the entire separate life supporting instruments involving the video surveillance to monitor the child's motion, a communication system to interact with the trapped child to know its situation thus, forming an entire Rescue system. This design dominates over the other old rescuing methods as, this has all the individual instruments used to monitor and support the child assembled together, with arms to lift the child up to the surface.

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