



Fabrication and Analysis of Borewell Victims Rescue Robot

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ABSTRACT

The India is an agriculture-based country, ranchers or farmers basically rely generally upon ground water for their basic water framework requirements. Subsequent to the basic requirement yielding of the water, the bore wells would have generally left revealed. So that, most by far of kids coincidentally moves toward the well and falls into it, which is the main purpose for these distress disasters by and by in recent years, many cases have been reported of children getting trapped in bore wells which take life of the children and are a nightmare for parents.

There is a definite need for developing a security and rescue system for children to rescue from bore well. The current rescue systems are time taking, and are not at all accurate as involve manual help where there are many chances of human error. The bore well cases have taken many lives of innocent children while playing in that area. Here we are proposing a robotic system which will attach a harness to the child using mechanical arms for picking up. A Camera also is attached to the robot for understanding position and condition of the child. The mechanical system moves inside the uncontrolled bore well accordance with the user command given to the Arduino, the mechanical setup is controlled by The hardware is attached to the PC to stimulate the DC motor, This system can release trapped baby from the bore well securely and successfully within lesser time.

Keywords: Bore well rescue robot, Arduino, Camera, Mechanical arm, etc.

I. INTRODUCTION

Bore well accidents are common due to uncovered openings of bore well. It is very difficult and risky to rescue the trapped children. A small delay in the rescue can cost the child his or her life. Lifting the child out of the narrow hole of the bore well is not easy. The child who has suffered the trauma of the fall is confined to a smaller area where with the passage of time, the supply of oxygen reduces. Bore wells are left unclosed after identifying that ground water is not abundant at the place. These bore wells in turn have started to take many innocent lives. There is no proper technique to rescue victims of such accidents. So used a morphological analysis, is a method for representing and exploring all the relationships in multidimensional problems.

The word morphology means the study of shape and form and a way of creating new forms. The process was developed into a technique for generating solutions of design. In most cases reported a parallel hole is dug up and then a horizontal path is made to reach to the trapped object. Various cases are being encountered where people especially children are accidentally falling and trapped in the bore wells. Taking them out safely is one of the most difficult challenges which involve risk and lot of human effort and time. Sometime the bore well is so deeper that a human cannot enter leaving the victim helpless to inside the bore well. 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 for the rescue.

The bore wells are sometimes left open without any proper covering. The rescue operations in many cases are more risky even to the rescue team members. A small delay in this whole process may reduce the chances of saving the child. If the area near the bore hole contains rocks below certain depth, chances of saving the child becomes very less. Whatever may be the case the rate of success depends on lot of factors like time taken for transportation of machinery to the situation, human resources and mainly the response time of various government organizations. At present there is no proper method for dealing with this

problem. The holes drilled for the bore wells are around 700 feet deep. A bore well is a well of 4.5-12 inches in diameter drilled into the earth for retrieving water. This bore wells are mostly for commercial/industrial purposes. A bore well is cased in the region of loose sub soil strata open in hard rock or in crystalline rock. High grade PVC pipes are used for casing in bore wells. The depth of the bore well can vary from 150 feet to 1000 feet.

II. METHODOLOGY

Existing Method: Parallel pit method

Now a day's robots are designed to help the human operators in the rescue mission. Rescue team normally follows the parallel pit process to save the child. First the team will find the depth of the child in the bore well by using a rope. Then earth moving vehicles are used to dig the parallel pit next to the bore hole. This particular step may take time. During this process the child may suffer due to lack of oxygen and the lack of visualization may turn the situation worst to the rescue team. In some cases makeshift arrangements are made to pull out the body of sufferer. In such methods some kind of hooks are used and sufferer's body organs get caught hold of. This may cause wounds on the affected body.

Proposed System:

The objective of the project was to construct and design of bore well rescue mechanism (i.e to rescue a trapped baby from bore well). This project is a human controlled machine that gives an insight view of rescuing the baby safely and steps taken to achieve this. It is a robot with two fingered gripper to carry the baby from the bore well. The robot is driven by dc geared motors controlled by driver circuits and with a Bluetooth control. Wireless cam is used to view and monitor the baby. Block Diagram of Borewell victim's rescue Robot is represented shown below.

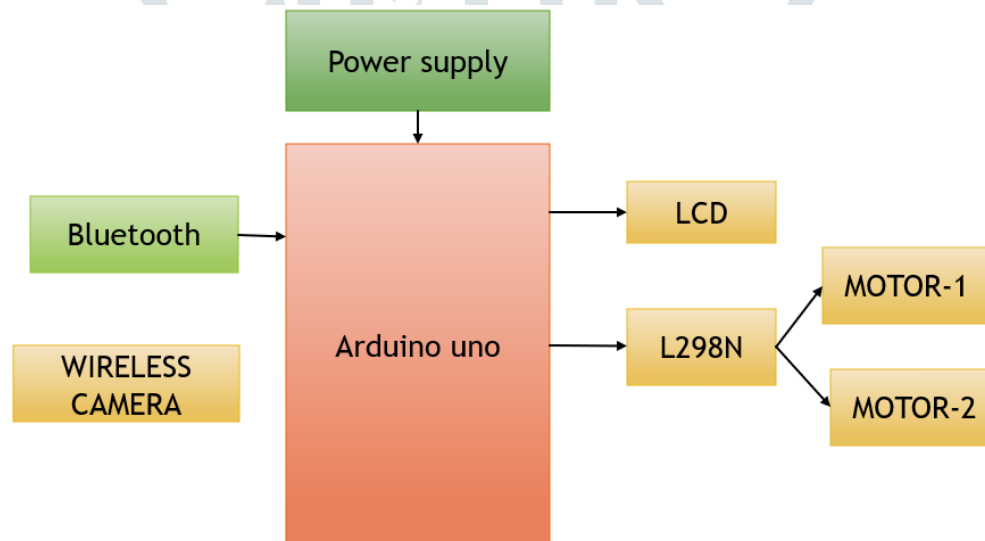


Figure: Block Diagram of Borewell victims rescue Robot

III. FABRICATION

Hardware Requirements:

- Arduino Uno
- Bluetooth
- liquid crystal display (LCD)
- L298n Driver
- Wireless Camera

Arduino Uno Board: Arduino is a single-board microcontroller meant to make the application more accessible which are interactive objects and its surroundings. The hardware features with an open-source hardware board designed around an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. Current models consists a USB interface, 6 analog input pins and 14 digital I/O pins that allows the user to attach various extension boards.

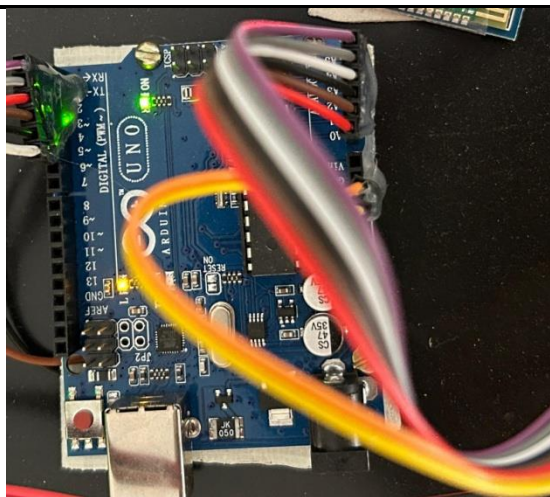


Figure: Arduino Uno Board

Bluetooth Module:

- It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard and many more consumer applications.
- It has range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions.
- It is IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network. It uses frequency-hopping spread spectrum radio technology to send data over air.
- It uses serial communication to communicate with devices. It communicates with microcontroller using serial port.

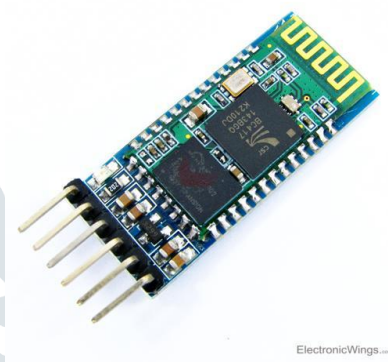


Figure: Bluetooth

Liquid crystal display (LCD):

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an controller is an LCD display. Some of the most common LCDs connected to the controllers are 16X1, 16x2 and 20x2 displays. This means 16 characters per line by 1 line 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.



Figure: Liquid crystal display (LCD)

L298n Driver:

This L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control

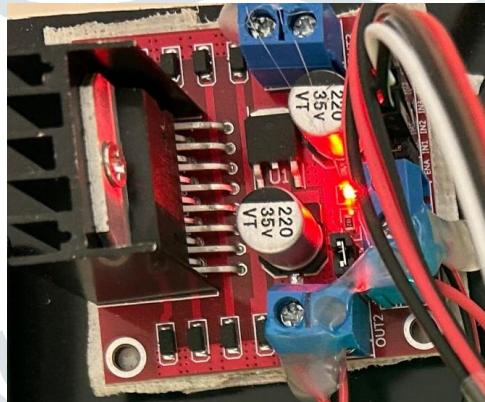


Figure: L298n Driver

ESP32 Camera:

The ESP32 CAM WiFi Module Bluetooth with OV2640 Camera Module 2MP For Face Recognition has a very competitive small-size camera module that can operate independently as a minimum system with a footprint of only 40 x 27 mm; a deep sleep current of up to 6mA and is widely used in various IoT applications. It is suitable for home smart devices, industrial wireless control, wireless monitoring, and other IoT applications. This module adopts a DIP package and can be directly inserted into the backplane to realize rapid production of products, providing customers with high-reliability connection mode, which is convenient for application in various IoT hardware terminals. ESP integrates WiFi, traditional Bluetooth, and BLE Beacon, with 2 high-performance 32-bit LX6 CPUs, 7-stage pipeline architecture. It has the main frequency adjustment range of 80MHz to 240MHz, on-chip sensor, Hall sensor, temperature sensor, etc.

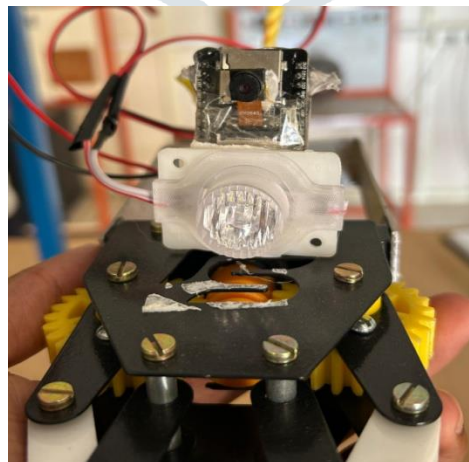


Figure: ESP32 Camera connected to mechanical arm

Steps of Programming:

- The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and is derived from the IDE for the Processing programming language and the Wiring projects
- The Arduino Uno board can be programmed with the Arduino software.

- Select “Arduino Uno from the Tools > Board menu (according to the microcontroller on your board).
- The ATmega328 on the Arduino Uno comes pre burned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol.
- You can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header.
- The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available.

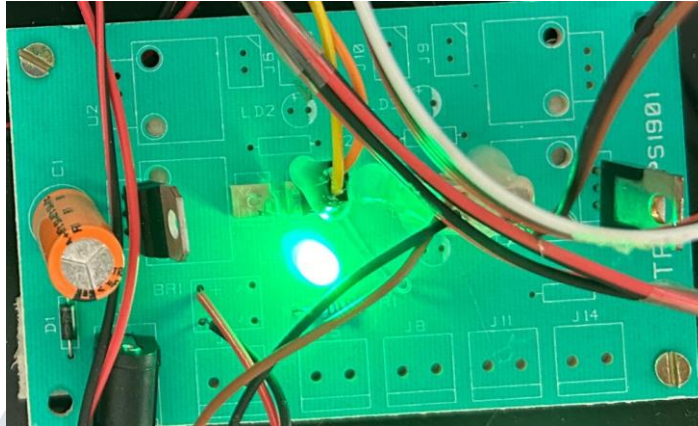


Figure: pin mapping of Arduino Uno

The ATmega16U2/8U2 is loaded with a DFU boot loader, which can be activated by:

- On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2.
- On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

Final Fabricated modal:

Fabricated working modal of Borewell victims rescue robot is shown below, its frame consist Arduino Uno board, Pin mapping board, LCD display, Batteries, Motor, shaft with pully, Nylon rope, Gear mechanism, Mechanical arm gripper, LED lights, WiFi Camera, Bluetooth control, Power supply

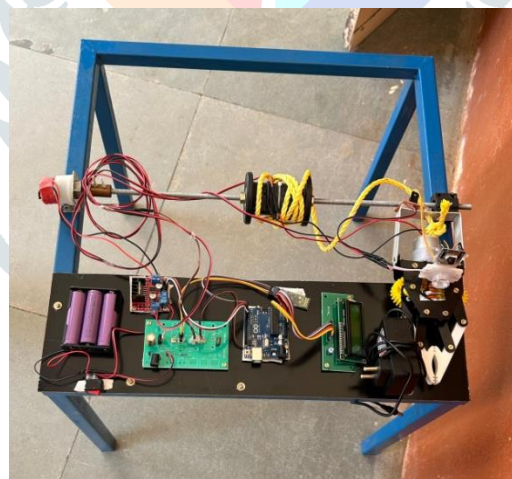


Figure: Working modal of Borewell victims rescue robot

IV. RESULT & ANALYSIS

The fabrication of bore well victim rescue robot is done successfully it is represented below

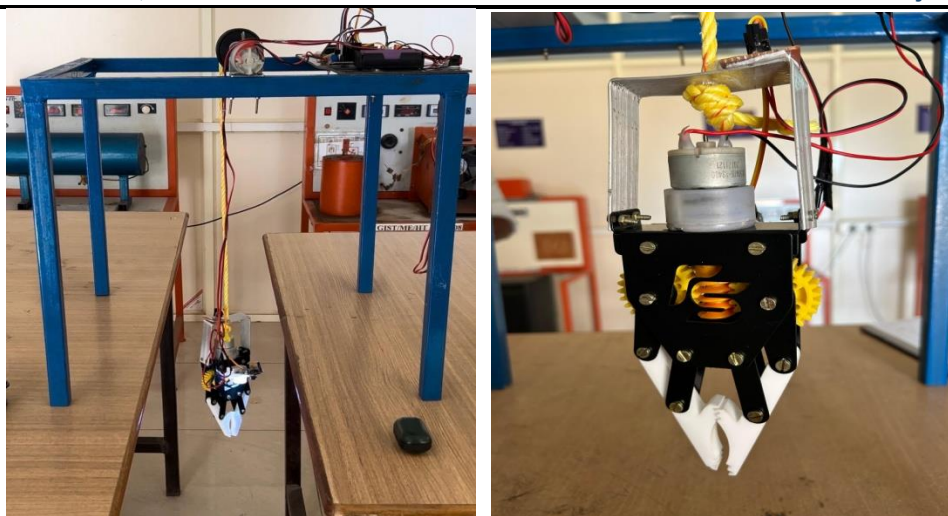


Figure: Bore well rescue robot with mechanical Arm

The fabricated model description of components and its resulted capacity are tabulated below

S.NO	DESCRIPTION	COMPONENTS	CAPACITY
1	Arduino Uno based Bore Well Victims Rescue Robot	Motor Speed	RPM=10
		Rope Type	Nylon
		Mechanical Arm Gripper	Lifting Capacity 1.5kg

V.CONCLUSION

The Arduino Uno based Bore Well Victim Rescue Robot is fabricated successfully and found its working in good condition. The weight lifting by mechanical arm gripper is calculated 1.5kg approximately.

VI. SCOPE OF FUTURE WORK

The Testing with fabricated model, it found that by apply lifting loads more than 1.5kg then the rope is rolls down, so that it suggested to change other material instead of nylon rope with high capacity motor, than we can expect more weight lifting capacity results.

VII. REFERENCES

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