

ASSISTANCE FOR BOREWELL VICTIMS

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Abstract

According to the survey there have been many accidents of childrens falling into the borewells in India. In order to save the little kids, Rescue teams working hard, spending several hours, lot of money and equipments. But in most of the cases they are unable to save the kids. Procedure used by the Rescue team in order to save the kids is very complicated and time-consuming process hence more than 70% of the rescue operation fails.

Now a day due to development in technology Robots can be used to rescue child from the borewell so that rescue operation can be completed with less time and success ratio of the operation will be greater. The proposed system Assistance for Bore well victim is designed in such a way that it rescues child from the borewell with less time and without harming child using DELTA robotics and Safety balloons.

Key Words:Microcontroller; DELTA Robot; Safety Balloon; Camera;

1 Introduction

There is a dramatic development in the field of technology. In spite of innovative advancements there is an exponential increase of bore well victims especially children. This is due to poor negligence of land owners and negligence playful activities of the children.

Even though immediate assistance is provided, rescue of the bore well victim is feeble and in most of the cases success ratio is very less. The reason for failure is due to the current rescue system, its process involved and the time taken by the rescue system.

According to the National Crime Records Bureau (NCRB) report, due to Bore well accidents an average 5 people lose their life per day. Hence the main aim of the proposed system is to provide an innovative solution to handle the borewell rescue operation.

Lifting the child up from the borewell is very risky as well as difficult operation. In order to aid the child, there should be continuous monitoring and supply necessary items required using technical methods.

The proposed system uses Delta Robotic concept in order to bring child in to the proper position inside the borewell. Safety balloon is used to lift the child up using gear motors. Camera is used for monitoring and the controlling is done by using Joystick.

2 Related Work

The design of a robot (for rescue operation of a child from bore well), capable of moving inside the bore well, works according to the human command using PC, pick and place based on arm design [1]. The robot is operated through PC using wireless Zigbee technology.

The rescue operation without human intervention is discussed in [2]. Here the wheeled leg mechanism is designed to go inside the bore well. A temperature sensor and LCD are interfaced with PIC microcontroller to sense and display on LCD.

The diameter of the bore well is narrow for any adult person and it will be dark inside. This makes the rescue task a very challenging one. The robotic system as in [3] attaches a harness to the victim using pneumatic arms for lifting the victim. A teleconferencing

system will also attach to the robot for communicating with the victim.

The facility to monitor the trapped victim are supply oxygen and provide a supporting platform to lift the victim is proposed in [4].

Robotic systems are brought in rescue operations for bore well accidents is discussed in [5]. Smart child rescue system from borewell is discussed in [6].

A robotic system with pneumatic arms for picking up borewell victims is discussed in [7]. This uses a teleconferencing system will attached to the robot for communicating with the child.

An innovative concept to handle the bore well rescue operations without human intervention is discussed in [8]. The three finger mechanisms are with camera and temperature sensor employed in this design.

Microcontroller based child rescue system is proposed in [9] uses oxygen concentrator, safety balloon, air compressor and a camera. The system in executed in embedded C by MP Lab Integrated Development Environment (IDE).

To handle the bore well rescue operations without any direct human involvement is proposed in [10]. To aid the rescue system the parameters like lack of oxygen, increased temperatures and humidity are considered. The system uses robot PC with wireless ZigBee technology Oxygen Concentrator, Rescue robot, Safety balloon and wireless camera.

3 Proposed System

Block diagram of the proposed system is as shown in Fig 1. It consists of hardware components such as Arduino Uno R3, servo motor, safety balloon, dc motor, air pump, wireless camera and delta robot.

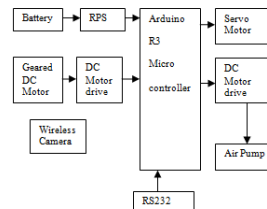


Fig 1: Block Diagram of the proposed system

a) Arduino Uno R3: The Arduino board consists of Atmega 328p processor with operating voltage 5V, 14 digital I/O pins out of which 6 pins provide PWM output, 6 Analog input pins and 32kb flash memory.

The microcontroller is used to

- i) Control the servo motor in order to control the movement of arms of the delta robot,
- ii) The DC motor to control the movement of delta robot into the borewell and
- iii) The opening and closing of safety balloon.

b) Servo Motor: Servo motor is used for the movement of delta robot arms in different precise angles. The input for the servo motor is the PWM signals from Arduino. The biggest advantage of servo motor is its high speed of operation and less power consumption.

c) DC Motor: DC Motor is used to move the delta robot inside and outside the borewell. Geared DC Motor is used to provide high torque. Motor drive is used to provide current amplification since the current from arduino is not sufficient.

d) Safety Balloon: Safety balloon is used to prevent the child falling deeper into the borewell. The safety balloon is sent into the borewell in compressed form and later expanded. Safety balloon has non-return valve to prevent the backward direction of air flow.

e) Air Pump: Air pump is used to send the compressed air in order to expand the balloon. Air at a pressure of 1 bar is sent. Motor drive is used here since the current requirement is greater than the current from the arduino.

f) Wireless Camera: Wireless camera is used to monitor the child inside the borewell. It is used to direct the delta robot and expansion of safety balloon. The advantage of wireless camera is that there are no wires and hence complication is less.

g) **Delta Robot:** Delta Robot is the end unit that handles the child based on the control signals. The delta robot consists of 3 parallelogram arms which are controlled by the servo motor. Based on the PWM signal the angle of the arms are changed and the child is held in proper position above the safety balloon.

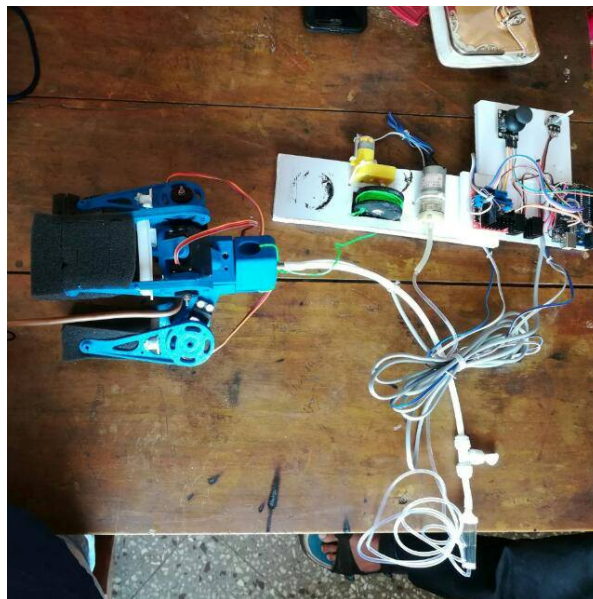


Fig 2: Working Model

Assistance for borewell victims project uses an delta robot to get the child out of the borewell safely. This method not only increases the chances of saving the child alive but also eliminates the harm that can be caused to a person who would be saving the child in traditional method .

The delta robot is used here for its good high speed operations as in these cases the time plays a vital role and as fast the child is brought out of the borewell the chances of child surviving also increases.

As in the traditional method huge machines like JCB's are used to dig the well and get the child out, this process is tedious and time consuming. Hence we eliminate the use of huge machinery and the latency caused.

Here along with the delta robot a safety balloon is used in order to prevent the child falling deep into the borewell. The safety balloon is sent in compressed form into the borewell and later expanded as it goes below the child this prevents the child falling deep into the well.

Since we know in traditional method as we know that an alternate well is digged and from there they try to reach the child in this situation the chances of child falling into well are higher. This way the safety balloon plays a vital role is eliminating this situation.

The movement of delta robot is handled with the help of DC motors and Servomotors the DC motor is interfaced with the arduino to move the delta robot inside and outside the well with help of pulley.

The movement of arms of delta robot is handled by interfacing the servo motors with the arduino. The arms movement are specified by certain angles and according to that the movement takes place.

The expansion of safety balloon is done by using an air pump and the balloon consists of non return valve in order to prevent the flow of air in backward direction. If so happens the balloon will go back to the compressed form and chances of child slipping into the borewell increases. Hence non return valve is used.

The position of the child is continuously monitored with the help of wireless camera and an led is attached in order to continue the process even if it's dark, whereas in traditional method the process is halted during night and restarted the next day but during this time span the chances of child surviving is less and hence we have come up with a system that eliminates the disadvantage of the traditional method and provides a better solution to the problem faced .

4 Implementation

The delta robot along with safety balloon and wireless camera is sent into the borewell when the joystick is moved in the forward direction.

The position of child is monitored continuously and when the child is found the safety balloon is expanded below the child by

pressing the joystick and it is expanded till the width of the borewell so that there are no chances of child falling deeper into the borewell.

Once the balloon is expanded the arms of the delta robot are activated by the servo motor and the child is held in proper position. The joystick is now moved in backward direction and the child is brought out of the borewell safely.

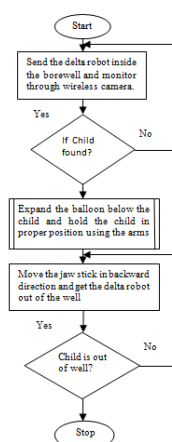


Fig 3: Flow Chart of the proposed system

Here we have used non return valve so that the air doesnt come in backward direction, if that happens then the chances of child falling deeper into the borewell are more, hence non return valve prevents this condition.

The child is continuously monitored through an android app which is connected to camera by connecting through the LAN and the camera screen appears and the child can be monitored.

5 Result Analysis

The delta robot is known for its high speed operations and hence it is useful in this case as it is required to save the life of a child and the sooner we get the child out the chances of child surviving are more. We have used 6ft borewell for our project.



Fig 4: Testing case 1

First case when the child falls completely into the borewell the time required to get the child out would be approximately 10 minutes if the child is in proper position else it will take approximately 15minutes.



Fig 5: Testing case 2

Second case when the child is stuck halfway through it would require approximately 6 minutes to get the child out completely if the child is in proper position else it will take approximately 11minutes.



Fig 6: Testing case 3

Third case when the child is stuck at the beginning then the time required is 4 minutes to get the child out completely if the child is in proper position else it will take approximately 9 minutes.

The time required in different cases is far better than the traditional methods of getting the child out. In traditional method the work is stopped during night but that wouldn't be a constraint while using the delta robot. The risk of life of the child and the person saving the child is reduced here as we are using a robot instead of a person and the usage of huge machinery is not required.

6 Conclusion and Future Work

The proposed system aims to solve the problem faced during the traditional method of saving children falling into the borewell. In the proposed system the chances of saving the child alive is more

and there is no usage of huge machinery. Sensors are integrated to know the temperature inside the borewell. It also used to check whether the child can survive in that temperature. In future by adding additional components to this procedure it can be adopted in many applications. It gives information to the Microcontroller and microcontroller gives the information to the transceiver from that the data on the PC can be obtained. By connecting smoke sensor to robot, information related concentration of smoke or gases in respective fields i.e.(coal mines, dangerous zones, etc.) can be obtained.

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