

An Efficient Microcontroller based Bore well Rescue Robot

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Abstract

The operation of child rescue is done by using big machines with large manpower involvement. It takes more time to rescue a child from the bore well and to check any kind of irregularities in pipe. This structural design makes it possible to have the adaptation to the diameter of pipe and to have adjustable attractive force towards the walls of pipe. In this project, the condition of trapped child is captured with USB Camera and monitored on PC interfaced with PIC 16F877A microcontroller and LABVIEW respectively. The robot structure consists of power supply, switch pad and gear motors. Adding a claw or gripper was the initial hurdle for which additional power supply and DC gear motor were needed. The microcontroller is not sufficient to give the sufficient amount of current to the multiple gear motors, so in spite of using motor driver, direct supply is given to gear motors using switch pad as its control centre enables the robot to work smoothly. The research article is intended to reduce the risk involved during the child rescue operation by analyzing the situation.

Keywords: Rescue, Motors, PIC, LABVIEW, Grippers

I. INTRODUCTION

To improve security and efficiency of piping networks in industrial units, continuous inspection, maintenance, cleaning and repairing of pipelines are strongly demanded because due to aging problems, a lot of troubles like corrosion, cracks and mechanical damages are possible in pipes [1]. These operations are quite expensive, so robots prove an efficient solution in this situation. A robot is an intelligent, re-programmable and

Multifunctional manipulator designed to work in inaccessible environment to do variety of tasks which are laborious, threatened and risky. The robots with flexible structure are needed so that they can adapt themselves according to the pipeline parameters. The wheeled robots are simplest, energy saving and best suited for use on prepared surfaces [2]. These locomotion systems have main chassis connected to a set of wheels through links and joints. Along with pipeline inspection, the concept of rescuing the trapped child from the borehole is also implemented in the robot design.

Since water level is decreasing day by day so more people put ever increasing demands on limited supplies. To fulfil the needs, bore wells are constructed, but these are usually left uncovered. Robots equipped with advanced sensors have therefore become more and more popular in the search and rescue theatre. Many innocent children without noticing the hole have trapped and lost their lives. In contrary to the rich financial resources, search and rescue technology to-date still rely on search dogs, camera mounted probes; mainly technology that has been in service for decades. With the increasing demand for scapegoats to go into dangerous environment, robots are being identified as good candidates to step in for human rescuers. Robots equipped with advanced sensors have therefore become more and more popular in the search and rescue theatre.

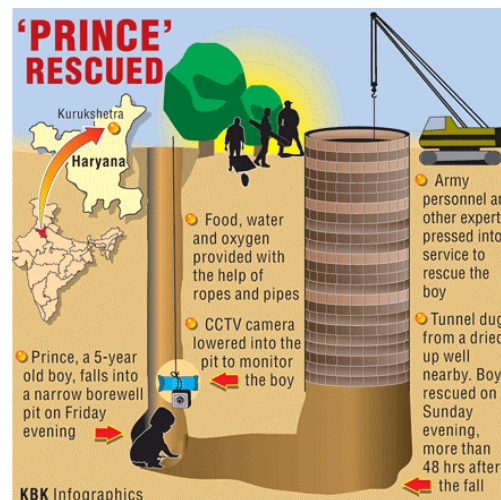


Fig 1. Image of a baby fell into borehole and Army members working for the borehole rescue

The injuries during and throughout the rescue operation also leads to the death of child [4]. The lack of oxygen inside the deep hole makes it impossible for the child to survive for long time. Hence this operation proves very difficult, risky and time consumptive.

This work is aimed towards the construction and designing of a robotic system to work in borehole rescue operations and to detect faults inside the pipeline. The robot has the arm at its front to pick and place the objects. It has camera that is interfaced with Lab VIEW for the visual display. The motion of the robot is controlled through a remote (switch pad) and also the temperature inside the pipe sensed by the robot is monitored outside on the display device. The alternative solution to this problem is the use of robotic systems which can move down the pipe and bring the subjected body out of it properly and safely. This will take lesser time than the normal operation. The alternative solution to this problem is the use of robotic systems which can move down the pipe and bring the subjected body out of it properly and safely. The project is intended to reduce the risk involved during the child rescue operation by analyzing the situation and also to provide an option detect any leakage inside the pipe.

II. PROPOSED METHOD

a) RELAY DRIVER

A relay is an **electrically operated switch**. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have **double throw (changeover)** switch. A relay is an electro-magnetic switch which is useful if you want to use a low voltage circuit to switch on and off a light bulb (or anything else) connected to the 220v mains supply. Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available.

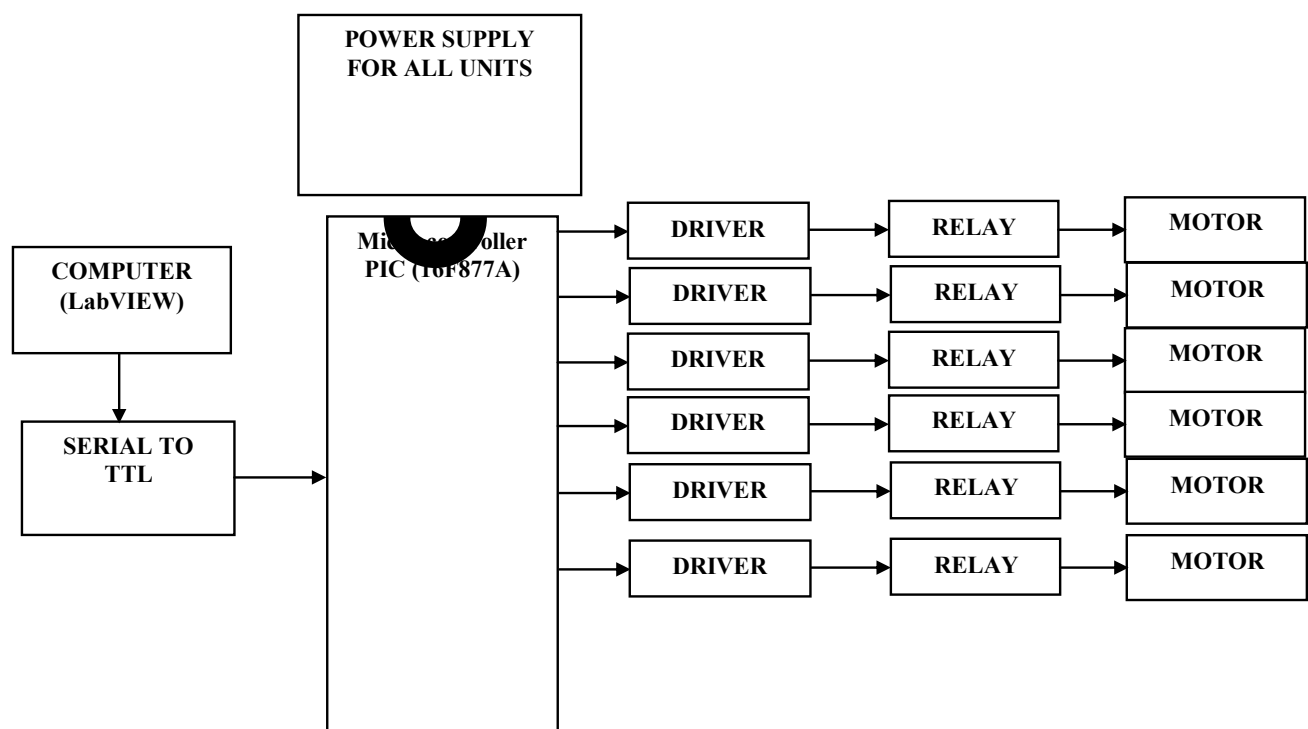
b) DC MOTOR

DC motors are part of the electric motors using DC power as energy source. These devices transform electrical energy into mechanical energy. The basic principle of DC motors is

same as electric motors in general, the magnetic interaction between the rotor and the stator that will generate spin.

A DC Brushless Motor uses a permanent magnet **external** rotor, three phases of driving coils, one or more Hall effect devices to sense the position of the rotor, and the associated drive electronics. The coils are activated, one phase after the other, they act as three-phase synchronous motors containing their own variable frequency drive electronics.

BLOCK DIAGRAM:



The parts of the electric motors using DC power as energy source. These devices transform electrical energy into mechanical energy.

When the robot is pulled out, the rope is cut off. The robot is taken outside carefully from the stand. The hands are loosened by the motor control and the baby is taken for treatment.

c) LabVIEW [Laboratory Virtual Instrument Engineering Workbench]

It is a system-design platform and development environment for a visual programming language.

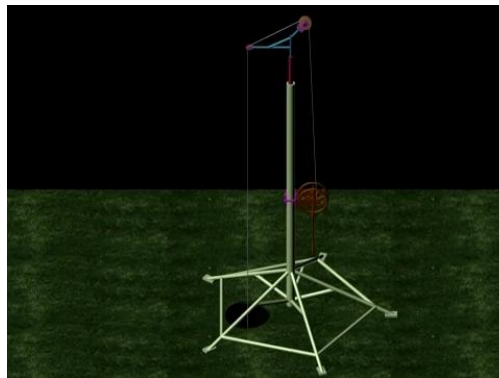
LabVIEW is commonly used for data acquisition, instrument control, and industrial automation on a variety of operating systems (OSs), including

Microsoft Windows, various versions of Unix, Linux, and macOS.

III. STEPS IN RESCUE PROCESS

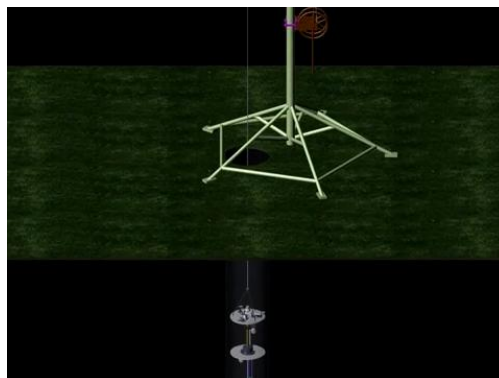
Step-1

Fix the position of stand and pulley arrangement.



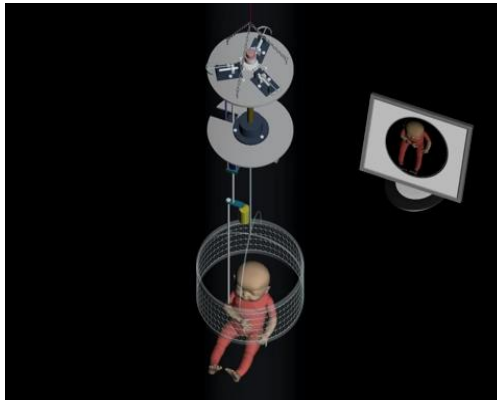
Step-2

Tie the robot to a rope and send inside the bore-well with continuous monitoring.

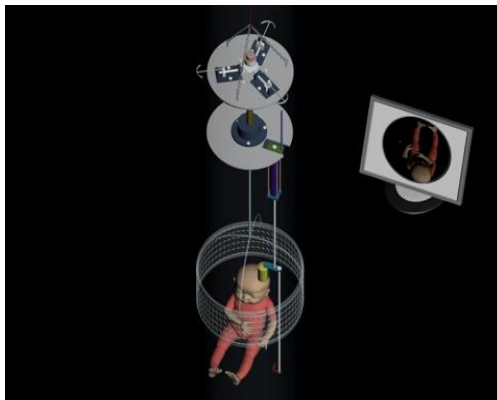


Step-3

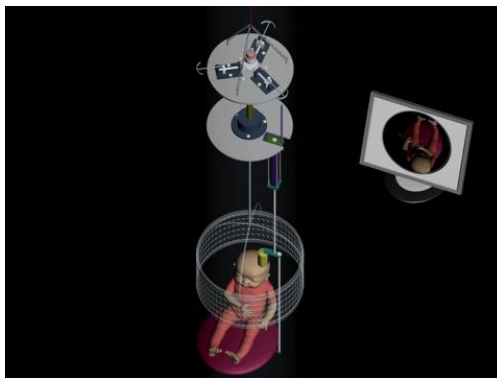
Trace out a gap between the child and wall of the bore-well.

**Step-4**

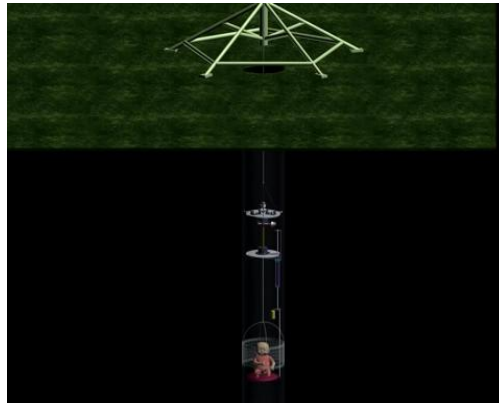
Insert the rod into the traced gap.

**Step-5**

Safety air bag is blown using air compressor.

**Step-6**

Hold the child with robotic arms and slowly pull up the entire arrangement.



IV. CONCLUSION

In last 10 years, a lot of lives have been lost due to falling in the bore well because it involves digging a pit beside a bore well which is very time consuming. The proposed system is to overcome all these difficulties. This project is used to reduce human efforts for rescuing operations from bore well. It performs rescue operations in very less time as compare to humans. It can do the pipeline inspection which is beyond of human reach.

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