Bore Well Rescue Robot

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Abstract: *An innovative concept proposed in this paper is to handle bore well rescue operation. Children often falls down in bore hole which is left uncovered and get trapped. It is difficult as well as risky to rescue trapped child from bore hole. Hence we propose a system of designing robot for the rescue of a child in a bore hole. We aid the child by continuous monitoring and supply of necessary items such as light, water, oxygen to survive using technical methods. Bores which yielded water and subsequently got depleted are left uncovered and small children without noticing get trapped inside. To aid in such a life threatening situation we hereby propose 'bore well rescue robot'.*

Keywords: SSTP89V51RD2, Sensors

1. Introduction

In order to meet the ever increasing demand for water, bore wells are dug. But these are usually left uncovered and children often fall down. Normal rescue operation strategy involves digging a parallel pit to rescue the child and adjacent holes are made to the walls of bore well. But these are time consuming and may cost life of the child.. Using a robotic structure proposed in our paper, it is possible to rescue a child within a short period of time.

Robot for bore well rescue offers solution to this situation. It is fast, economical and safe. It has the facility to monitor trapped child and provide a supporting platform to lift up the child. This system will attach a harness to child using robotic arms for picking up. The robotic arm has motor attached to it for picking and placing.

The proposed system will easily rescue the child within short period of time. It is a multifunctional, reprogrammable and intelligent manipulator model designed to perform the task. This is a light weight machine that will go down into the bore well pipe and save the child's life systematically by performing the required actions. Child can be visualized with the help of infrared waterproof cameras and a high resolution TV monitor.

2. Existing System

To meet the ever increasing demand for water, bore wells are dug. Children may falls down in bore hole which are left uncovered and get trapped. Number of techniques has been implemented to save the child. Some of them are listed below.

[1] In this technique, a big hole is dug beside the bore well up to the depth where the child is stuck. A small delay in this resource accumulation may reduce the chances of saving child alive. If the area beside the bore hole contains rocks below certain depth, in such cases the chance of saving child alive is very low.

[2] Wheeled leg mechanism is employed in this design to go inside the pipe. The legs are circumferentially and symmetrically spaced out 120° apart. The robot is made adaptive so that it can adjust its legs according to the pipeline dimensions. 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. This model is intended to reduce the risk involved during the child rescue operation by analyzing the situation and also to provide an option to detect any leakage inside the pipe.

[3] The aim of this paper is to give an innovative concept to handle the bore well rescue operations without human intervention and to inspect any type of leakage in the pipe. Lack of oxygen inside the bore well and lack of light sources causes the major difficulty during the rescue operation. There is no such special equipment for rescuing the child trapped inside the bore well. There is no proper technique to rescue victims of such accidents. When the local arrangements do not work, army is called in. In most cases reported so far, a parallel hole is dug up and then a horizontal path is made to reach to the subject's body.

These are not only time taking processes, but also risky in various ways. Moreover it involves a lot of energy and expensive resources which are not easily available everywhere and in this process we always need big space around trapped bore that we can dig. Whatever may be the case the success ratio depends on lots of factors like availability of time taken for transportation of machinery to the situation, human resources and mainly the response time of various government organizations. In India according to the NCRB report of 2011 there are 5 average deaths per day in the license bore wells. At present there is no proper solution for this problem; in this paper the model of a robot

arm which can be used for rescue operation is explained.

3. Proposed System

This work is aimed towards the construction and designing of a robotic system to work in borehole rescue operations. A temperature sensor is used to measure temperature inside the bore well. Any harmful gases present inside the bore well can be detected using the gas sensor present in the model. A Passive Infrared Sensor (PIR) is also present in the system which will help in detecting the child inside the bore well. If some amount of water is present inside the bore well then it will be detected by the Water Sensor. An APR module is attached to robot for communicating with the child. A Light Sensor is is use to detect the current ambient light level - i.e. how bright/dark it is. The robotic arm has motor attached to it for picking and placing. The robot has arms at its front to pick and place the objects.

3.1 Block Diagram
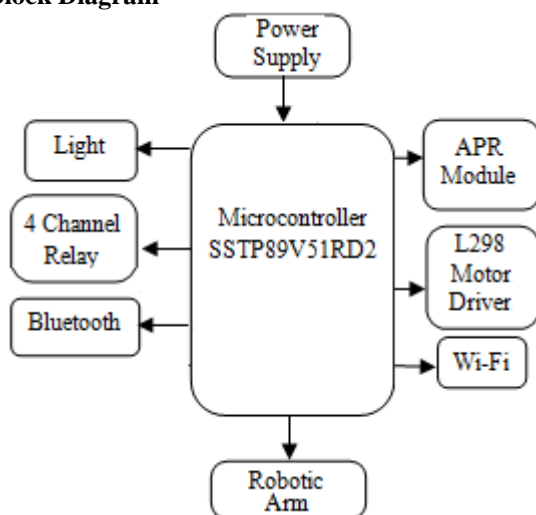
Controller Unit
This unit comprises of PIC 16F877A microcontroller. This is RISC (Reduced Instruction Set Computing) based microcontroller having analog input channels, analog comparators and additional timer circuits. The microcontroller stores the information captured by the robot and display it. The temperature sensed by the robot is firstly stored in microcontroller and then get displayed on the LCD. The video captured by the USB camera is displayed on PC using MATLAB. The serial communication between microcontroller and PC is done through MAX-232 interface. This is used to check the baud rate and changes the voltage level because microcontroller is TTL compatible whereas PC is CMOS compatible.

Audio Play Record (APR)
Being able to capture sound, store it and play it over and over again at regular intervals while at the same time, saving the digital data to storages it will be helpful for a child inside the bore well to hear the sound of their parents and come out of fear. For the record, our Digital Audio Recorder will capture a single (mono) analog audio channel with a sample rate of 22.05kHz, 8-bit sample depth and store it as a Windows WAV file with up to 4GB file size on a micro SD flash card. Now before you yawn in excitement at those

specs, remember, we're doing this with a 16MHz processor, just 2KB of RAM and 32KB of programming space.

Temperature Sensor
Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. **LM35** is a precision IC temperature sensor with its output proportional to the temperature (in °C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possesses low self heating and does not cause more than 0.1 °C temperature rise in still air. The operating temperature range is from -55°C to 150°C.

Wi-Fi
Wi-Fi most commonly used the 2.4 GHz UHF and 5.8 GHz radio bands. Anyone within range with a wireless network interface controller can attempt to access the network; because of this, Wi-Fi is more vulnerable to attack than wired networks. Wi-Fi Protected Access is family of technologies created to protect information moving across Wi-Fi networks and includes solutions for personal and enterprise networks. Security features of Wi-Fi Protected Access constantly evolve to include stronger protections and new security landscape changes.

LED
A LED is a two-lead semiconductor light source. It is a p–n junction diode, which emits light when activate But unlike ordinary incandescent bulbs, the lifespan of an LED surpasses the short life of an incandescent bulb by thousands of hours.

Motor Driver
Motor Driver is used to operate the arms of the robot. The motor driver is actually an assembly of four things: a normal DC motor, a gear reduction unit, a position-sensing device (usually a potentiometer—a volume control knob), and a control circuit. The function of the servo is to receive a control signal that represents a desired output position of the servo shaft, and apply power to its DC motor until its shaft turns to that position. It uses the position-sensing device to determine the rotational position of the shaft, so it knows which way the motor must turn to move the shaft to the commanded position. The shaft typically does not rotate freely round and round like a DC motor, but rather can only turn 200 degrees or so back and forth. The servo has a 3 wire connection: power, ground, and control. The power source must be constantly applied the servo has its own drive electronics that draw current from the power lead to drive the motor. The control signal is pulse width modulated (PWM), but here the duration of the positive-going pulse determines the position of the servo shaft. For instance, a 1.520 millisecond pulse is the centre position for a Futaba S148 servo. A longer pulse makes the servo turn to a clockwise-from-centre position, and a shorter pulse makes the servo turn to a counter-clockwise-from-centre position. The servo control pulse is repeated every 20 milliseconds.

4. Other Applications

The main application of this machine is to rescue the child

trapped inside the bore well. It can also perform some other applications like:

As Pipe cleaning machine: This machine can be used in pipe cleaning. It can drive through long pipes and with a rotary brush as an end effecter fitted at front will serve the cleaning operation of dirty pipes. As the inside surface of the pipes may be wet and slippery the high quality wheels are capable to grip on the wet surface.

Miscellaneous Application: This type of robots can also be used in the following areas.
- In manufacturing industries.
- In space programs.
- In radio active or highly hazardous environments.
- In underwater operations.

5. Results and Discussion

We hereby propose a design model as bore well rescue robot which is able to rescue a child trapped inside bore well. It can measure temperature as well as the altitude. The proposed model design is supposed to look like the following.

6. Conclusion & Future Enhancement

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 a time consuming process. 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 compared to traditional methods. Thus, it has been designed keeping the entire obstacle in mind that may arise during the operation.

The proposed model can also be further improved by adding or modifying following features:

1) An additional feature of air bag can be used to provide support underneath the child which prevents the child from falling further deep.
2) Temperature inside the bore well can be measured and can be controlled.

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