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Rescue Bot for Bore well Accidents

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Abstract— This project aims at designing a system which rescues a trapped victim handling safe from bore well.The structural design of this system makes it possible to have the adaption to the diameter of bore well and its walls.The condition of trapped victim is monitored using wired camera, temperature sensor and LCD which are interfaced with Arduino microcontroller to make precession control movements of the robotic arm.

Index Terms: Accidents Bore well, Servo Motor, Arduino.

1. INTRODUCTION

In the recent past, we have heard/seen news of children falling in to abandoned bore wells which are carelessly left uncovered in different parts of India. These bore wells, which are of no use to the humans are left uncovered after years of usage and people do not care to bury or close them properly. Children playing nearby to such uncovered bore wells often fall into these and get trapped. Rescue of children trapped inside the bore wells is not only difficult but also a risky task. Rescue teams end up spending hours and sometimes days in futile attempts to save these little kids. A lot of money is also being spent in these missions. In most of the cases, all the attempts made by the rescue teams go in vain. The children falling prey to these unwanted bore wells has increased in the recent past. This is only resulting in blaming either the government or the establishment and in some cases the rescue teams. The rescue mission to save the child from bore-well involves a long and complicated process. A small delay in the rescue can cost the victim his or her life. The rescue teams try to reach the victim from a parallel well that takes about 20-60 hours to dig. This complicated process makes 70% of the rescue operations fail. Very few of the victims have been saved in such incidents. Recently, some autonomous robots came in to picture, which helps in rescuing the trapped body in a systematic way. However, the question arises as to why these robots are not being used in the real time incident. This signals that how safely can these robots handle the victim. The rescue operation mainly consists of three processes: Approaching the Victim, Handling the body, rescuing the victim out of the well. A regular autonomous robot can easily perform the first and third operation in less time. But there is a great chance of injury to the victim as they try hooking up body organs and clothes. To overcome these hurdles, we have designed a bore-well recue robot with advanced equipment and devices. Thus the objective of this project is to construct and design a bore well rescue system which not only rescues a trapped baby from bore well but also deals with extreme security of the victim. The design of handling system is made in such a way that the victim gets No hurt or minimally hurt. This project is a human controlled system, in which, we can check an insight view of the victim and decide the steps to be taken to rescue the victim. The insight view can be seen with the help of camera attached in the system. This system consists of a linear actuators to fix the system with the inner walls of the well, robotic arm to hold the victim, a cylindrical like structure is made to pass through the walls of the bore well to reach the victim and a safety balloon attached to the lower end of the actuator to give the victim support from below. The system is controlled by using Arduino platform. By using Atmega processor and video camera module we can view both audio and video on the PC.

1.1. BLOCK DIAGRAM OF HARDWARE IMPLEMENTATION

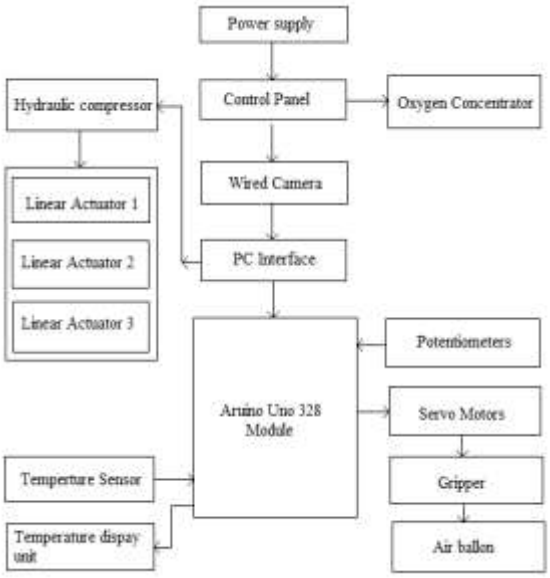

Figure 1 :Block diagram showing the connections

2. HARDWARE DESCRIPTION

2.1. Arduino description

For building many electronic projects the Arduino is a most stimulating and collective platform used. It can be used as both software and hardware tool such that designers can advance their products according to their comforts in various applications as Arduino can be interfaced with LED'S, motors, speakers, cameras, smart phones etc. A programmable circuit board named as microcontroller of the ATMEGA series is included in the hardware part and the term software mentions about the IDE (Integrated Development Environment) which runs on the computer and makes simple to write and upload the code to the board for its functioning [1],[2],[3]. We can progress any applications of our interest once the software is installed in the computer. In this we have used the newest version of Arduino family i.e., Arduino Uno board which is in turn connected to the Bluetooth module for the control of power supply to the lines through the mobile app. Figure 2 shows the arduino Uno is a ATMEGA328 microcontroller based board[5]. The Arduino can be can be power-driven via the USB connect or with an external power supply. The Arduino Uno not only communicates with a computer, but also with another Arduino or other microcontrollers. The ATmega328 offers serial communication which is available on digital pins (i.e., Rx and Tx). A serial monitor which present in the Arduino software allows data to be sent and received from the arduino board. When the data is being transmitted via the USB to the serial chip, the Tx and Rx LED's present on the board starts blinking. The ATmega328 on the Arduino board has a boot loader that permits you to upload new code to it[4]. This avoids the use of external hardware programmer which forms one of the major advantages. It can also be done using a USB cable. Another advantage of Arduino Uno is that it has a resettable poly fuse that guards your system's USB ports from shorts and over current. Even though most computers provide internal protection, this is an extra coat of protection [9].

Figure 2 Arduino board

2.2. Introduction to ATMEGA32(AVR series)

Atmega32 is an 8-bit microcontroller belonging to Atmel's AVR series microcontroller family. It has 32Kbytes of Self-programmable Flash program memory, 1024 bytes EEPROM, 2Kbytes internal SRAM. In-System programming via serial peripheral interface or by parallel programming can be done in Atmega32[7], [8]. It has got 40 pins. Two for power, two for oscillator, one for reset, three for providing required power and reference voltage to its internal ADC, and 32 I/O pins. It is also skilled of handling analog inputs. Port A can be used as either DIGITAL I/O lines or each specific pin can be used as a single input channel to the internal ADC of ATmega32. No pins can accomplish and serve for two purposes. It also has 3 inbuilt timer/counters i.e., two 8-bit (timer0, timer2) and one 16-bit (timer1), one successive approximation type ADC in which total 8 single channels are selectable. On-chip analog comparator is present. An interrupt is allotted for different comparison result gained from the inputs. It can run at a frequency from 1 to 16MHz. Frequency can be attained from external Quartz Crystal, Ceramic crystal or an R-C network. Internal calibrated RC oscillator can also be used. Most of the instruction executes in a single cycle.

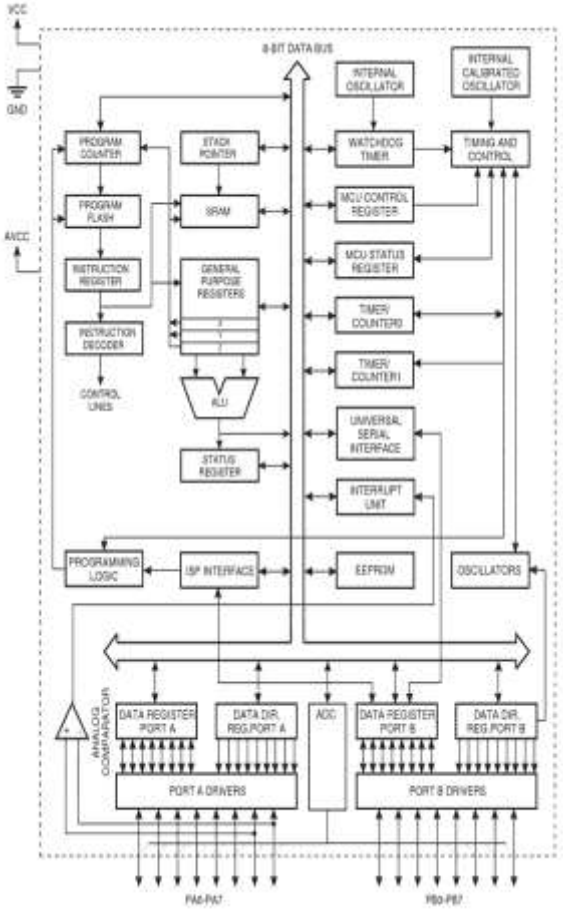

Figure 3: Block of ATMEGA32

2.3. Servo Motor

A Servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing. This is nothing but a simple electrical motor, controlled with the help of servomechanism. If the motor as controlled device, associated with servomechanism is DC motor, then it is commonly known DC Servo Motor. If the controlled motor is operated by AC, it is called AC Servo Motor.

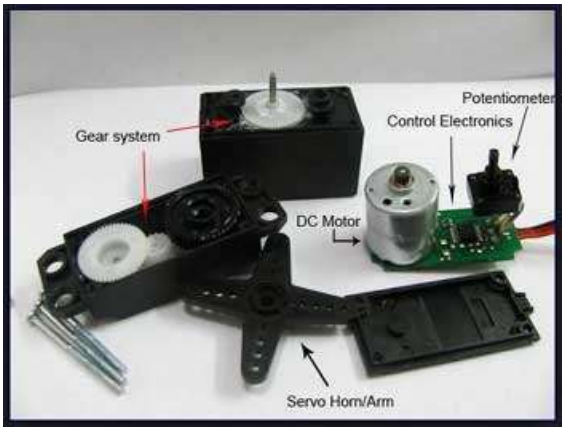

Figure 4 : Servo Motor

2.4. Linear Actuator

A Linear Actuator is an actuator that creates motion in a straight line, in contrast to the circular motion of a conventional electricmotor. Linear actuators are used in machine tools and industrial machinery, in computer peripherals such as disk drives and printers, in valves and dampers, and in many other places where linear motion is required. Hydraulic or pneumatic cylinders inherently produce linear motion.

Figure 5: Linear Actuator

2.5. Video Camera

A video camera is an optical instrument for recording images, which may be stored locally, transmitted to another location, or both. The images may be individual still photographs or sequences of images constituting videos or movies. The word camera comes from camera obscura, which means "dark chamber" and is the Latin name of the original device for projecting an image of external reality onto a flat surface. The modern photographic camera evolved from the camera obscura. The functioning of the camera is very similar to the functioning of the human eye. A digital camera is a camera that encodes digital images and videos digitally and stores them for later reproduction. Most cameras sold today are digital, and digital cameras are incorporated into many devices ranging from mobile phones (called camera phones) to vehicles. Digital and film cameras share an optical system, typically using a lens with a variable diaphragm to focus light onto an image pickup device. The diaphragm and shutter admit the correct amount of light to the imager, just as with film but the image pickup device is electronic rather than chemical. However, unlike film cameras, digital cameras can display images on a screen immediately after being recorded, and store and delete images from memory. Most digital cameras can also record moving videos with sound. Some digital cameras can crop and stitch pictures and perform other elementary image editing.

Figure 6 Video Camera

3. ARDUINO IDE

Arduino programs may be written in any programming language with a compiler that produces binary machine code. The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written in Java. It devised from the IDE for the Processing programming language project and the Wiring project. It is designed to introduce programming to artists and other newcomers unfamiliar with software development. It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and provides simple one-click mechanism for compiling and loading programs to an Arduino board. A program written with the IDE for Arduino is called a "sketch". The Arduino IDE supports the C and C++ programming languages using special guidelines of code organization. The Arduino language is CASE SENSITIVE: a capital letter is not the same as a lower case letter. There are two sections in which the program can be written:

The "void setup()" section which is extensively used to initialize variables, pin modes, set the serial baud rate.

The "void loop()" section is the portion of the code that loops back onto itself and is the main part of the code.

4. WORKING OF THE CIRCUIT

The working mechanism of this projected system is a combination of pick and place mechanism, data acquition system and the safety mechanisms for dealing with a human life. The overall working of the system deals with two cases based on the position of the victim i.e. whether the victim is trapped in the midway inside the well or at the bottom end of the well.

The stepwise description of the detailed working of the system is given below:

Step 1: Setup the system outside the bore well with the help of a metal stand.

Step 2: Connect the rope to the pulleys and slowly lower the system inside the bore well.

Step 3: As the machine is sent into the bore-well, electric wires for the motor from the control unit chip is attached along the rope.

Step 4: As the system approaches the victim his position can be monitored on the PC with the help of wired camera attached to the lower plate of the setup.

Step 5: Based on the position of the victim rotate the setup such that the two artificial claws are right above the arms of the victim. Next step is based on the two cases stated below

CASE I. When the victim is struck mid way in the bore well.

Step 6: The arm first passes down through the sides of the child using an actuator and then with the help of compressor the first air bag is blown in order to avoid further slipping of the child. The second air bag helps the child to rest on it.

OR

CASE II. When the victim is struck at the bottom end of the bore well.

Step 6: Adjust the orientation of the claws with respect to the victim's position and hold the victim by its arms and pull him slightly up. (To prevent excessive pressure on victim's arms the internal layer of the claws is lined with some soft material).

Step 7: After ensuring the safety of the victim pull the whole setup slowly outwards.

5. HARDWARE RESULTS

In this section the results is presented. First the system is dropped into the bore well with all the required power supplies and interfaces.

Figure 8 Output of system when the power is supplied

6. CONCLUSION

It is concluded that the rescue bot assures the safety of the victim and make it certain that it is the fastest way to save the trapped victims. If this system is implemented in real time it could save many people in different applications and scenarios.

ACKNOWLEDGEMENT
Design based on the condition of trapped victim is monitored using wired camera, temperature sensor and LCD which are interfaced with Arduino microcontroller to make precession control movements of the robotic arm. Of from the system function, hardware design and software architecture design, analysis of the GPRS technology in the system. a system which rescues a trapped victim handling safe from bore well.

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