RESCUE ROBOT USING WIRELESS TECHNOLOGY

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Abstract ***–Nowadays, child often fall down in the boreholewhich is left uncovered and get trapped. It is very difficult and also risky to rescue the trapped children. A small delay in the rescue can cost the child his or her life. Small children without noticing the hole dug for the bore well slip in and get trapped. This paper has been provided with an innovative concept to handle the bore well rescue operations without any direct human involvement. To aid in such rescue this system has been proposed. The Methods to keep a child alive in a bore should take in to consideration the lack of oxygen, increased temperatures and humidity, which produces hyperthermia. These problems are addressed with fresh air delivery with or without oxygen. A hand-powered equipment to deliver fresh air inside bore is being designed. This method brings down temperature and delivers fresh air. Visualizing the child is made possible with infrared waterproof cameras and a portable high resolution TV Monitor. 'Life shield robot for child in the borehole' is an advanced process to rescue a trapped baby from bore hole using shaft robot, which is capable of moving inside the pipe according to the user commands given from PC. The robot is operated through PC using wireless ZigBee technology and using wireless camera to view video about the health condition of the child. As a result of this, the child has been rescued from bore hole without any harmful effects. This robot machine can rescue trapped child from the bore well in a minimum amount of time and good medical care. This is light weight machine that will go down into the bore well pipe and save the child life systematically.***

Keywords- Oxygen Concentrator, ARM M3 cortex processor, Rescue robot, Safety balloon, Borehole.

I INTRODUCTION

B.Bharathi et al., described major problem faced by human civilization is water scarcity, which leads to a large number of bore wells being destroyed [1]. There are the situations some times when a child falls into the bore hole and to rescue him/her it may takes so many hours or days probably. Birk.A et al., described this kind of situation, the child may alive or dead it's a un- imaginary [2]. In normal rescue operation, a parallel pit is dug deep to achieve the child and adjacent holes are made to the walls of bore well. J. Burke et al., described a common method used to find the depth of child by using of rope [3]. The alternative solution to this problem is the use of robotic systems which can move down the hole and bring the subjected child out of it properly. Chen. H et al., discussed in their paper, it takes lesser time than the normal operation, but the safety of the child is not secured [4].

This technical improvement put together with the need for high performance robots created faster, more accurate and more intelligent robots using new robots control devices, new drivers, advanced control algorithms and also medical equipment with providing facilities of oxygen cylinder, safety balloon. This paper 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. The primary use of robots includes searching for survivors, where unusual viewpoints can be perceived with better human-robot interaction. Usual method followed by the rescue team is first to find the depth of the child in the bore well by using rope. After finding the depth, a parallel pit is dug using earthmoving vehicles. This method of rescuing has following difficulties; it takes up to 30 hours to dig the parallel pit, by that time the child would have died. Lack of oxygen inside the bore well. Lack of visualization causes the major difficulty during the rescue operation there is no such special equipment for rescuing the child trapped inside the bore well. C. Kemp et al. [5] described in 2012, six year old boy is rescued from the bore well, but later he died due to injuries during the rescue operation and lack of medical aid. Their deaths are caused due to uncovered dry bore wells. R.R.Murphy et al., described the ratio of dead and alive children in 15:1, this shows that frequency of those trapped children in bore well has increased who get died in the hole due to insufficient amount of oxygen or injuries throughout the whole process [6].

In the existing system, if the child fell into the bore well. The rescue workers dug the hole near the bore well to save the child. It's fully manual and more harmful during the rescue operation. The presence of the child in the bore well is not identified by the rescue workers. So it's the time consuming process and the oxygen present in the bore well is very low.

In below, Table.1 shows the real time Incidents Occurred Inand Around the Country due to the improper maintains of borehole. For instance, in Hyderabad the small boy his name is dinesh, he died due to the improper maintenance of borehole and etc., the real scenarios are denoted by Table-1.

S.No	Name of the Child	Age	Place of Incident	Recovered (Alive Or Not)	Source of Information (Newspaper)
1.	Dilraj Kaur	3	Chandigarh	Not alive	The Hindu-June,4th/2010
2.	Ankitaa Wade	2.5	MP, Bhopal	Not alive	Ndtv-Jan,29th/2010
3.	Pankaj	4	Bhilwara, Rajasthan	Not alive	Indian Today-Jan,29th/2010
4.	Dinesh	2	Hyderabad	Not alive	Hindustan Times- Jan 19th/2010
5.	Darawath Prasad	1.5	Warangal, AP	Not alive	Ndtv- Jan 18th/2010
6.	Devar Nimbi, RGI	4	Bijapur, district	Not alive	The Hindu-Sept,4th/2009

Table.1 Incidents Occurred In and Around the Country

The method for Rescuing has arisen following difficulties; it takes up to 30 hours to dig the parallel pit, by that time the child would have died. Absence of oxygen inside the bore well and imagining causes the major difficulty during the rescue operation. There is no such special equipment for rescuing the child trapped inside the bore well. In the recent past, the rate of death due to child blocked in bore well has increased. G. Nithin et al, in 2007, prince have been discussed about the required parameters are used for the analysis were deeply explained [7]. Rescue processes have been taken around 48 hours, even though the effect made by the saved child is not able to protect from natural problem such as oxygen [fig.1] insufficient.

As the paper is being inspired by the shaft robot mechanism, some modifications are required that enable the robot to be used for child rescue operations from the borehole. When claw or gripper is added to the robot, the controller is not able to provide the sufficient amount of current to the multiple gears which affects the operation. K.V.Pavan Kumar et al., described that motor driver section is removed from the robotic structure and direct supply is given to the gear motors using switch pad as its control center enable the robot to work smoothly and effectively. Also provided safety balloons and oxygen concentrator for fresh air supply to child from the bore hole [8].

The rescue is carried out in the following method to avoid rushing everybody to the bore well, fix the platform on the well so that the central hole of the platform is above the well. Guide the 12' long pipe attached to the blower in to the well and admit fresh air into the well and the Camera attached with the wire into the well carefully, till it reaches the child, watching the monitor carefully. Lift the camera up and

fit it on the grasper. Attach the connecting pipe, connecting rod and the safety belt to the grasper.

II METHODOLOGY

A. Robotic Unit

This unit comprises of 12V power supply, switch pad and gear motors. The switch pad has three micro switches connected to the microcontroller I/O pins. One end of the switch is grounded and other is connected to the microcontroller port [fig.2]. When any switch is pressed that particular port is grounded. The microcontroller always monitors these switches in real time (i.e. in continuous mode). Also five gear motors are used for performing the robotic action. Three motors are for moving the robot up and down, one for clock and one for the contracting/expanding of the gripper.

B. Safety Balloon

The safety disc is an air-filled disc that has a unique dome shaped top. The safety balloon disc is 12" in maximum diameter. It is initially in the deflated condition, fitted with the nozzle [9]. It is inflated, when this safety balloon is in the right position under the baby. It is used to provide support for the baby.

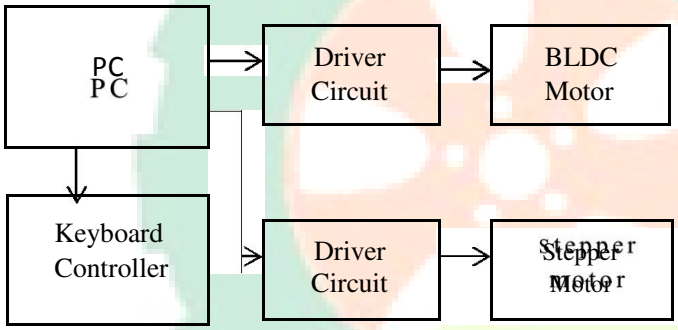

Fig.1 Controller Unit

C. CCTV Camera

Closed-Circuit Television (CCTV), also known as video surveillance, is the use of video cameras to transmit a signal to a specific place, on a limited set of monitors. It differs from broadcast television in that the signal is not openly transmitted, though it may employ point to point (P2P), point to multipoint, or mesh wireless links. In industrial plants, CCTV equipment may be used to observe parts of a process from a central control room, for example when the environment is not suitable for humans. CCTV systems may operate continuously or only as required to monitor a particular event. CCTV camera connected to the TV tuner. It shows the baby position inside the barrel and display on the TV [10].

D. Advanced Digital Oxygen Supply System

The respiration of human beings will difficult, if the percentage of oxygen in the air becomes less than 18%. So, a device is needed to supply proper oxygen to the baby in the rescue process. An oxygen concentrator is placed on the surface of the bore well. It will automatically sense the defect of oxygen at the rescue region and it supplies the required oxygen [fig.2]. For this purpose oxygen concentrator, an oxygen tube of 200meters is placed on the surface [11]. The tube is sent along with the robot to supply emergency oxygen to baby.

E. Controller Unit

The unit comprises of ARM M3 processor. This is a 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 CCTV camera is displayed on a PC using Embedded C [fig.2]. The serial communication between microcontroller and PC is done through a MAX-232 interface.

F. Display Unit

For displaying the information like temperature and smoke values, LCD (16*2) is used on each line this dot matrix LCD display module holds 32 characters-16 on each line and has a green backlight with black text [12].

G .Software Requirements

The new KeilμVision5 IDE has been designed to enhance developer's productivity, enabling faster, more efficient program development and it helps to provide the variation simulation output.

III METHOD OF RESCUING

The rope is connected to the top of the robot. As the robot is sent into the bore well whole, electric wires for the motor from the control unit chip is attached along the rope. The oxygen hose is fixed to the upper plate of the robot. Depending on the robot movement, the hose length is adjusted from outside the bore-well. The gas hose from the compressor is connected to the gas box located on the lower plate through the hole in the upper plate. The gas box act as an intermediate gas transmitter.V.Venamthi et al., described by using the motion detector and other special features of the camera, the baby position is seen through a computer [5]. At the appropriate position, the fork will punch into the bore-well wall using the motor connected to the bevel gear setup on the upper plate.

If the baby is trapped in the middle of bore-well, using the motor connected at the lower end of the hollow tube, the lower plate is rotated in such a way the safety balloon gas tube is in the gap between bore-well and the baby. Initially the gas tube is above the end of robot hands. It will avoid stabbing of gas tube on the baby. Using the motor connected to the pinion, the rack is moved lower than the robot hands. Then the robot is moved down in such a way that the robot hands free to hold the baby head or middle of the body. Then the safety balloon is inflated by using the air compressor through gas box. The air pressure is measured in analog pressure gauge connected to the compressor.

The Digital display is placed below the upper camera. After the safety balloon reached the exact pressure, the compressor is cut off. Then the safety balloon is moved upward using motor connected to the rack and pinion setup till the safety balloon completely supports the baby. Now the baby is completely in robot control. The baby movements see through the lower camera and other data readings see through camera. The two way audio communication will help us to know the stipulations of the baby. Then slowly, the baby is moved upward. By pulling the rope using the pulley control system. The medical team will be able to prepare for the treatment depending on the already seen temperature of the baby. 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.

IV RESULTS & DISCUSSION

The paper is designed to construct a Robot which is capable of moving through the bore hole. The robot is operated using computer wireless using Zigbee from a remote location and also such that robot can move either forward by pressing button ‘f’ or Backward by pressing button ‘b’, from the PC through the Hyper Terminal.

V CONCLUSION

Bore well child server is a significant attempt to save the life of the victim of bore well accidents. Besides this the unique capability of moving through vertical and inclined hole makes wide scope of application for this machine in manufacturing industries and other relevant fields. In the current design of bore well child saver robot has been made to suit every possible situation may occur in rescuing operation. The structure is made strong enough to sustain all possible loads, though it is made flexible at the same time to adjust wider range of bore diameter and any change in the diameter of bore. In the rescuing operation, time is a vital factor which alone helps the success of the entire operation.

VI FUTURE SCOPE

The paper can further be improved by enhancing the 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. Smoke sensor can be added to sense the dangerous gases concentration inside the pipe.
3. It can also be made water proof.

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