Rescue Child from Bore well using Embedded System

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Abstract: *This paper is based on the recovery of children who fallen into borewell. Due to drought and depletion of underground water more bore wells are drilled on the surface of the earth. When the ground water gets dried or polluted nearby industries, the motor along with casing pipe are removed and the outer, surface of the bore is not insulated properly. As a result of this, the children who were playing near the bore, accidently fall into it which has drunk their lives. This aids to recover the children from the bore well without any danger of the victim. The sensor systems are interfaced with the ARM8 processor. A camera along with an LED light is used to visualize the victim as well as it helps to operate the system by control unit. The vacuum cup is used to adjust the child position. The arm movement of the robot is controlled by stepper motor. Once child is perfectly picked by robot, BLDC motor is used to lift up the child from borewell. The ZigBee plays a vital role of data transferring between the victim in borewell and the recovery team in earth surface. The simulation results are obtained by using the software Keil C. The hardware output is implemented and the results are shown.*

Keywords: ARM 8 processor, Vacuum cup, Sensors and ZigBee

1.INTRODUCTION

In current scenario, falling of children or even adults in bore well are increasing. These accidents are mainly happened due to carelessness or playful activities of the child, Moreover most of the bore wells are drilled and leaved as it as open without any proper coverings. When a child fall into the bore well the existing rescue operations in such a cases are more risky and become a non-safe to the rescue team members.

In existing system, a big hole is dug beside the bore well up to the depth where the child is stuck. This process a huge amount of human resources (military, Para medical, etc.), machinery (JCBs, Tractors, etc.) is used. A small delay in this resources 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. 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 briefly explained.

2. LITERATURE SURVEY

B.Bharathi *et-al* [1] describes the designing a robot for rescue a child from inside bore well, which is capable of moving inside the bore well, according to the human comment by PC and also pick and placing based on arm design. . The robot is operated through PC using wireless Zigbee technology and using wireless camera can view both audio and video on the TV. This robot has a high power LED which acts as a light source when light intensity inside the pipe is low. It is a low cost robot used to monitor and the human controlled robot that gives an insight view of rescuing the baby safely taken to achieve this.

Palwinder Kaur *et-al* [2] describes the rescue operations without human intervention. Here the wheeled leg mechanism is design to go inside the pipe and the legs are circumferentially and symmetrically spaced out 120^0 apart. The robot can adjust its legs according to the pipeline dimensions. The robot has consisting of power supply, switch pad, and gear motor. The child position is captured from bore well with USB Camera and monitored on PC. The LM35 temperature sensor and 16*2 LCD are interfaced with PIC 16F877A microcontroller to sense and displays on LCD.

Manish Raj *et-al* [3] describes as the diameter of the borewell is narrow for any adult person and light goes

dark inside it, the rescue task those situations is challenging. The robotic system which will attach a harness to the child using pneumatic arms for picking up. A teleconferencing system will also attach to the robot for communicating with the child.

John Jose Pattery *et-al* [4] describes the facility to monitor the trapped child, supply oxygen and provide a supporting platform to lift up the child. The 1st motor placed at top turns a gear mechanism which, in turn, pushes 3 blocks arranged at 120 degrees from each other towards the side of the bore well. The 2nd motor placed below the plate turns the bottom shaft by 360 degrees, the helping to locate the gap through which the lifting rod passes. This is done with the help of a wireless camera attached to the lifting rod.

The 3rd motor adjusts the radial distance of the lifting rod. When the diameter is adjusted, the 4th motor helps the lifting rod to screw its way through the gap towards the bottom of the child. Once the lifting the rod reaches a safe position under, an air compressor is operated to pump air to the bladder attached to the end of lifting rod through an air tube that runs downwards inside the lifting rod. The bladder provides a safe seating to the child. Then 1st motor is then reversely operated so as to unclamp the system. Simultaneously it is lifted out of the well using a chain or rope.

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 borewell 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. This may lead to death of the child. To overcome this automation system is implemented.

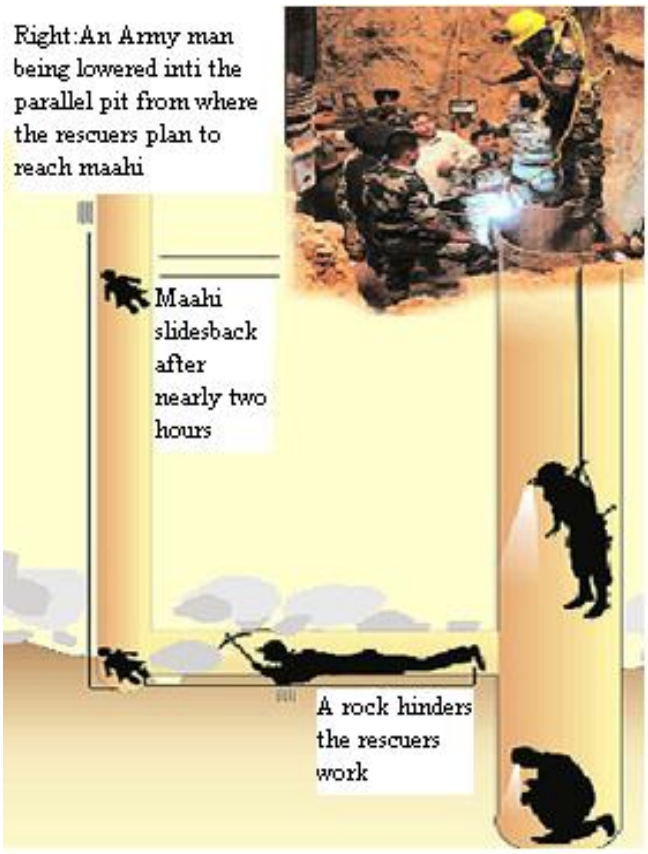

Fig-1: Existing System

3. RESCUE ROBOT SYSTEM

The system is divided into two separate units, one is Transmitter (controller) unit and another one is Receiver (Robot) unit. The unit which is inside the bore well is controlled by the keypad controller. In this robot, low-power digital radios based on the IEEE 802.15.4 ZigBee standard for Wireless Personal Area Networks (WPANs) is used and it transmit 1 to 1000meters (about 3 to 3.280 feet) signals. Here the temperature measured by thermistors, for pressure transducer are used to measure the pressure and the poisonous gas detectors is used to find the proportion of hydrocarbons, methane, volatile organic compounds in parts per million(ppm). These measured values of temperature, pressure and poisonous gases are shown in PC.

During the rescue operation the robot setup is sent to the bore well till the victim is found, Later the parameters are sensed by the sensors. The transmitter in borewell is used to send the signal of temperature, pressure and presence of poisonous gaseous. If any poisonous gas is detected, oxygen provided through the oxygen probe from atmospheric air can externally pumped into the bore well till the ratio of poisonous gas of inside bore well is reduced.

Using ZigBee these signals are transmitted to controller setup. These processes are monitored with help of camera. The camera along with high power Light Emitting Diode (LED) torch is provided to visualize and monitor the child movement inside of borewell in a clear manner.

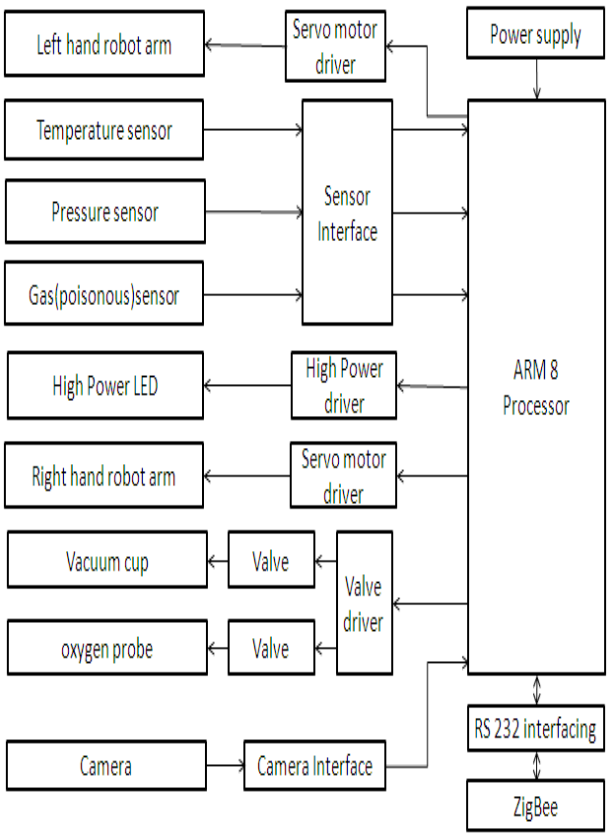

Fig.2. Rescue Robot unit

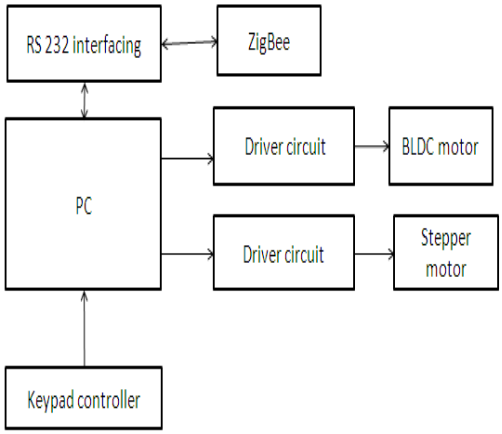

Fig.3. Controller unit

The whole system has been controlled by ARM8 and the operator using keypad controller. Here, vacuum cup can also be used along with robot arm to recover the child without any injury. After that the victim can be taken out with the help of robot arms. The PC used to display the parameters such as temperature, pressure and the presence of poisonous gas with help of sensors. The vertical movement of the robot has been controlled by which it is operated by BLDC motor. An angle of left and right movement is controlled by which is operated by Stepper motor since all the actions are controlled by this unit it is known as Transmitter (controller) Unit. Finally the overall process is monitored with the help of PC display unit.

4. SOFTWARE RESULT

Keil C µVision4:

The new KeilµVision4 IDE has been designed to enhance developer's productivity, enabling faster, more efficient program development and it helps to provide the variation simulation output.

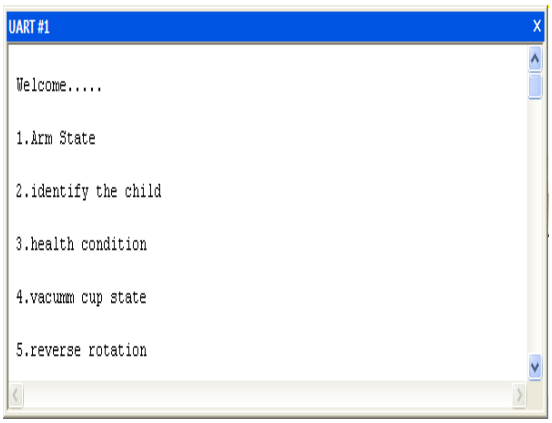

Fig-4: Keil C output

5. CONCLUSION

This system is mainly used for rescue child from borewell. Here the proposed system consists of ZigBee transmitter, ARM 8 processor, robot arm and the sensors perform their role in these operations. In past 10 years, a lot of lives have been lost due to falling in bore well because digging a pit beside the bore well is very tedious and time consuming process. The rescue operation team using this technology is so safe and the rescue operation time is very less. Using highly advanced IC's with the help of growing technology this project can be successfully implemented. This can be conclude that, the proposed system retain lives of many who fell into the bore well in future.

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BIOGRAPHY

S.Gopinath is pursuing, PG in the discipline of Embedded System Technologies at Knowledge Institute of Technology, Salem, under Anna University, Chennai, India. He received his UG degree in the discipline of Electrical and Electronics Engineering at Knowledge Institute of Technology, Salem, under Anna University, Chennai, India. He has published and presented a number of technical papers in National and International Conferences. He is the Executive member of Embedded Club at Knowledge Institute of Technology, Salem. He is doing minor research works on various fields like Robotics, Automobiles, Biomedical, Embedded Systems and Renewable Energy systems. He got best project award for his project in UG. During his PG project shortlisted qualifying round in Texas instruments innovation challenge India design contest 2015 one among the 1000 participations. He got best student in extracurricular activities and achievers awards. He is a university football, Hand ball and Hockey player. He is highly appreciated by the Head of the Department.

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