Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 7 Issue 02, February-2018

Arduino Based Child Rescue System from Borewells

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***Abstract*— In present scenario there have been several incidents reported on abandoned borewells which are turning in to death wells. Many innocent children are being trapped into these borewells and losing their lives. The actual purpose of borewells is to save lives, but these borewells in turn have started taking many innocent lives. In several cases the rescue operations are done by big machines and lot of man power involvement. Usually these rescue operation are very lengthy, complicated and very time taking processes. [1]**

The paper presents a simple and effective method to rescue the child from the borewell. The traditional way to rescue the child is to dig a parallel pit t adjacent to the bore well. This method is difficult, lengthy and also risky to rescue the trapped child. In the proposed method mechanical system moves inside the borewell channel and moves its gripper arm in accordance with the user commands given. The hardware is interfaced to the PC and arduino setup is used to control the mechanical set up.

Keywords*— *Borewell; Child Rescue System; Arduino Based Control

I. INTRODUCTION

The bore wells are sometimes left open without any proper covering. The rescue operations in many cases are more risky even to the rescue team members. A small delay in this whole process may reduce the chances of saving the child. If the area near the bore hole contains rocks below certain depth, chances of saving the child becomes very less. Whatever may be the case the rate of success depends on lot of factors like time taken for transportation of machinery to the situation, human resources and mainly the response time of various government organizations. At present there is no proper method for dealing with this problem. The holes drugged for the bore wells are around 700 ft deep. The below table1 shows the statistics of these bore well accidents.

A bore well is a well of 4.5-12 in diameter drilled into the earth for retrieving water. This bore wells are mostly for commercial/industrial purposes. A bore well is cased in the region of loose sub soil strata open in hard rock or in crystalline rock. High grade PVC pipes are used for casing in bore wells. The depth of the bore well can vary from 150 feet to 1500 feet.

TABLE-1 No. of accidents

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
No of Bore well Accidents (2006 to 2014)	1	7	2	4	1	2	4	5	8	34
Percentage	3	20	6	12	3	6	12	14	24	100

The following chart shows average number of bore well accidents in each state

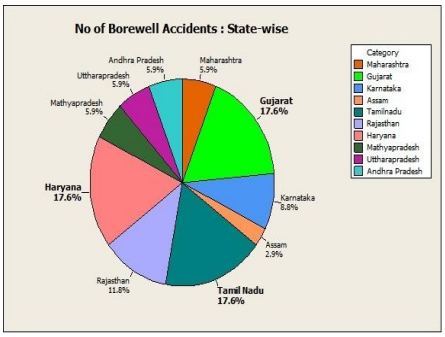

Figure1.state wise bore well accidents

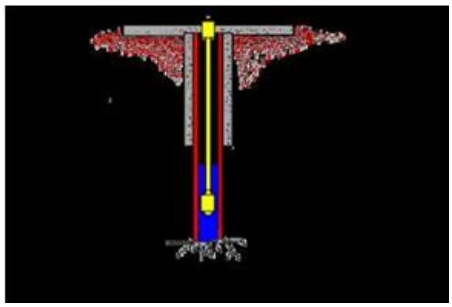

figure2. Schematic of borewell

II. EXCISTING RESCUE METHODS

A. Parallel pit method

Now a day's robots are designed [2-5&7-11] to help the human operators in the rescue mission. Rescue team normally follows the parallel pit process to save the child. The parallel pit method is shown in fig 4&5[6]. First the team will find the depth of the child in the bore well by using a rope. Then earth moving vehicles are used to dig the parallel pit next to the bore hole. This particular step may take time. During this process the child may suffer due to lack of oxygen and the lack of visualization may turn the situation worst to the rescue team.

In another method a light weight machine as shown in fig6 is sent inside the bore well pipe and holds the trapped body systematically. The robot is operated through a PC using wireless Zigbee technology [8].In some cases the rescuing robots are also used. Even though all these inventions and methods exist still there are only 25-30% chances of survival.

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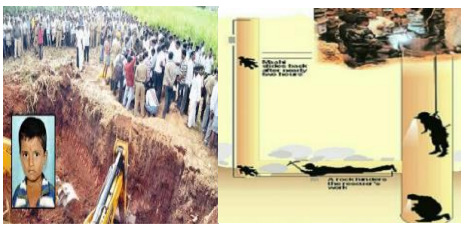

Figure 4 & 5. Parallel pit method

Figure6. Mechanical setup

Some failure cases are also reported. One of such is case of a 14 year old girl from Chevella, 60km from Hyderabad, rescue operations are rendered by National Disaster Response Force (NDRF) and police failed to extricate the child from the 60-foot deep pit. In this case the parallel pit method seems failed. Not only parallel pit method but the rescue robot also failed because of its wider area of arms. The second case is found in Karnataka. Another rescue team trying to save the trapped six-year-old girl who fell into an abandoned borewell in Zunzarwad failed to retrieve the girl. Another is case of Kaveri who accidentally slipped into an abandoned borewell when she had gone to collect firewood along with her mother. Several rescue attempts have been made for three days but did not yield any results. Attempts to reach Kaveri by drilling the area around the abandoned borewell failed as the machines kept hitting boulders and hard rocks. Both drilling teams from the National Disaster Relief Force (NDRF) and Hatti Gold Fields tried to create a tunnel to reach Kaveri. However, lack of coordination between the two teams further delayed the rescue. “The difference of opinion among the team members halted operations several times on Monday. The teams failed to judge the right place for drilling and hence kept intercepting boulder after boulder,” as said by an official on the site. In the above incident also, the rescue operation failed because of time dragging processes. In view of all the above failures the proposed system is prepared to overcome the short comings.

III. PROPOAES METHOD

Even though there are so many methods existing, still there is a need of more simple and sophisticated rescue equipment. Here we are proposing a system called arduino based child rescue system from bore well. In this system, there is no need to dig big pit parallel to the bore well up to the depth where the child is stuck. Hence may not depend on the huge amount of human resources (military, Para medical, etc.), and machinery (JCBs, Tractors, etc.). Therefore the delay involved in this accumulation of resources may be reduced and the chances of saving child alive are increased. The exciting method uses a highly advanced microcontroller, well developed accurate hand gripping mechanism (capable of carrying loads about 5kg) and a visual feedback system using a high resolution camera the project is implemented successfully. The following figure7 shows the main building blocks of the method.

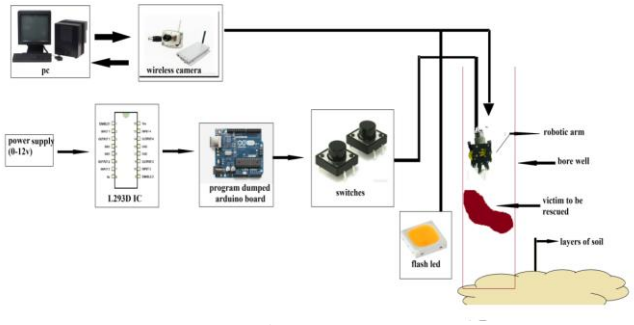

Figure7. Block diagram of Arduino based child rescue system

IV. RESULTS AND CONCLUSION

The proposed system is tested with a test object (stuff doll) and is observed the performance of the system is quite satisfactory in rescuing operation also completed in very less time compared to traditional methods. The prototype has been designed keeping the possible practical issues in mind. The structure can be made strong enough to sustain all possible loads. A high resolution camera is used in the system to identify the position of the baby. The gripper mechanism is operated using a switches in order to rotate the arm (to align in proper position) and to open and close the grippers on the arm as shown in fig8.

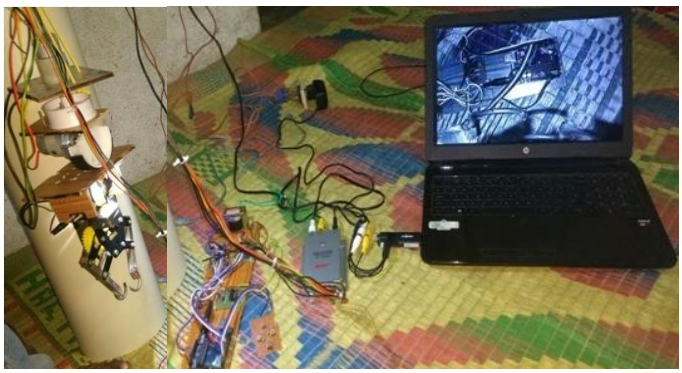

Figure8. Gripper mechanism and visual feedback from the camera

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