Real Time Implementation of Smart Child Rescue Robot from Bore Well using Arm and Belt Mechanism

Jayasudha.M, M.Saravanan

Abstract—In India for recent years, water scarcity is the principle inconvenience. To overcome these issues, people initiated to burrow bore well. In our nation, the vast majority of the people are agrarian and they depend on the water for irrigation system. Children involuntarily fall into the bore well which yielded water and left revealed. The process of saving the trapped child into bore well is relatively challenging. At present, the rescuing task is accomplished by the method for burrowing a parallel pit close to the bore well with the same depth of the child and makes a passage that interfaces with the two wells. It takes about 30 hours to burrow the new well. By that period the child would have passed on. To overcome this concern, a well-planned robot is designed in a unique way, that it saves the stuck child and also it observes the child carefully by using web cam within a short time span. It consists of two modules which are rescuing system and protection system. The protection system is with the guide of setting an air sack at the base of the passage and recovers the child at the base of the passage and recovers the child at any rate of gripper disappointment. The safeguarding instrument is about a robot gadget fit for moving underneath the bore well bolstered with their user directions, equipped with robot arm, unrestrained objectives modernized camera, high resolution LED. The robot arm is utilized to fix the belt to the trapped children. The belt is hooked with the dc metal gear for lifting the child from the bore well.

Keywords—robotic arm, dc metal gear motor, bore well, air sack, servo motor

I. INTRODUCTION

India being an agrarian nation, farmers depend for the most part on groundwater for water system. With expanding population, lesser land possessions and urbanization more profound bore wells are burrowed for groundwater deliberation. After yielding the water, the bore wells would left uncovered. So that, the vast majority of children accidentally approaches the well and falls into it, which is the only reason behind these sorrow mishaps presently. In our country, bore well deaths are happening frequently.

Now-a-days, we often listen regarding the child tumbling under bore wells over both urban, sub-urban and towns. The recurrence from claiming such news is expanding step by step. The vast majority of the children unknowingly approaches the wells and falls into it. After instructing everybody regarding these bore well accidents, there appeared on be no progress in the number of tearful mishaps. Over this children, some of them were claiming those situations and many of them lasted their lives. To eradicate such problems in rescue method, a robot is created with two broad mechanisms which are belt mechanism and robotic arm hardware unit. A web camera to monitor the child closely and also video surveillance is available for making continuous interaction with the trapped child for moral support. It consists of robotic arm and belt to rescue the child and the setup is uplifted safely with precautions. In this proposed system, there is no need of digging a new well parallel to the bore well. In the parallel pit method, we need lots of human resources, machineries and also army personnel. The parallel pit method are shown in Fig.1. It would take at least 30 hours to dig a new well, by that time the trapped child may have died. Servomotors are required to accomplish the robot developments and ensure that the child has been held securely by the robot and then the whole arrangements are uplifted by utilizing Dc engine.

Fig. 1. Parallel Pit Method.

Required oxygen and water are furnished with the assistance of the ropes and pipes. CCTV camera are brought into the pit down to view child.
According to the report of government, magazines, articles of bore well mishaps in the last a long time brought about a sum of 46 bore wells occurrences Since 2019 are shown as histogram in the Fig. 2. The period of child caught in the bore wells ran from two to nine years. Investigation of bore well mishaps as indicated by the year with the help of histogram.

![Histogram of bore well accidents](image)

**Fig. 2. Histogram representation of bore well accidents.**

II. LITERATURE SURVEY

Bharathi.B et.al[1] depicts the plan of a robot for saving the kid from bore well. This robot is fit for moving underneath the drag well, as per the human comment by Pc, it will pick and spot dependent on the arm structures. It is worked through Pc with the assistance of remote zigbee innovation and remote camera which is used for video surveillance. The main drawback is that the arm structure can’t give adequate security to the child while lifting.

Manish Raj et.al[2] depicts as the dimension of the drag well is slender for any grown-up in difficult and bright goes dim inside it, the rescuing task in that circumstance is very difficult. The automated framework which will join an outfit for lifting the child from the bore well. The video chatting method is also available for speaking with the child. The robotic arm is like clipper, so that the lifting mechanism is very difficult.

Giridharan.M et.al[3] described about designing a robot consists of three engines to save a child on the drag well. The primary engine is used for movement which is up and down by using screw bar. Second engine is utilized for grabbing reason with the surface of lead screw arrangement. Another engine is used to rescue the child through rack and pinion arrangement. Based on the location of the child, the whole arrangement can be pivoted. Then the child is lifted from the bore well.

Arthika.S et.al[4] described about the mechanism of safeguarding child from the bore well. The temperature sensor is used to detect the temperature and similarly gas sensor is used to detect the gas spillage in the specific region. ARM compression and expansion method is used for roper up and down movement. The robotic arm is using relay operation for picking and placing the child. This method provides safeguarding activities in less time. The major drawback is lifting of child is very difficult by using gripping arm.

III. EXISTING METHODOLOGY

In this method, the rescue mechanism is carried out by placing the rescue arrangements close to the drag well where the injured child felt inside and it is confirmed that the gripper is appropriately embedded into drag well with no diversions. At first the dc engine is for controlling the winch drum is gone on to pivot counter clock wise, along these lines the rope injured on the drum get discharged with regard to the pivot experienced on the drum. The expansion of rope causes the gripper which is attaches with it to travel inside the drag well because of the gravitational power, in this manner the gripper development of action arrives at injured individual. At that position, the winch drum engine gets turned off and the engine to control the gripper is gone on to pivot clock wise along these lines the injured individual gets grasped by the gripper and once the sufferer get held firmly the gripper engine is halted and again the winch drum is actuated in clockwise direction. This makes the rope twisted on the winch drum and makes the gripper with the sufferer to climb. When they had arrived at ground level the engine is turned off and the gripper engine is triggered to discharge the trapped child.

Based on this survey, the main deficits in the existing proposals were analyzed. There is no such adequate robotic arm for lifting the child safely within a short span of time. The mortality rate of child is increasing day by day. By using proposed system, child will be rescued without any injuries.

IV. PROPOSED SYSTEM

A. Block Diagram

The main objective of the current research is to develop a smart child rescue robot using simplified method within a short span of time. Now-a-days, various methods were adopted for saving the held child from the bore well. Here we propose a model which is very unique in its structure and also lifting mechanism.

![Block Diagram of Proposed System](image)

**Fig. 3. Block Diagram of Proposed System.**

B. Block Diagram Description

In this proposed system, the basic system consists of two modules which are Robotic arm hardware unit and Belt mechanism hardware unit. The purpose of using robotic arm unit is to fix the belt to the child, so that it eases the process of lifting the child from the bore well and it also ensures the safety of the child. The belt mechanism is used to hold the child appropriately which is attached with the dc motor. When the motor starts running correspondingly the belt gets tighten to the child. Then we can lift the trapped child from bore well easily.
C. Block Diagram of Robotic Hardware Unit

In this proposed system, to defend a child who has tumbled into bore well, we have utilized a robotic arm to fix the belt to the child by using servomotor. The picking part of the belt is attached with the robotic arm with gear assembly. By adjusting the knob of the potentiometer, the angle of the robotic arm gets varied. It goes about as an extremely helpful and utilization less device for bringing the kid up within a short span of time. To vision the bore well the robotic system is attached with the web camera. The robotic arm is utilized to securely bring the child out of the bore well.

D. Block Diagram of Belt Mechanism Hardware Unit

In this project, the rescue method is carried out by using belt mechanism. The metal gear motor is controlled by using DPDT (Direct Pole Direct Throw) Switch. The Dc motor is used for body, left and right hand gripping. The direction of the dc motor is changed by using DPDT switch for uplifting and down lifting. The belt is connected to the child, then the DC motor starts running correspondingly the belt gets tighten and the trapped child is rescued.
C. Servomotor

The servomotor works on the principle of pulse width modulation which converts electrical signal into angular displacement on motor shaft. Servomotor is constrained by sending a pulse width tweaked signal through the control wire. A pulse is sent for each 20 Ms. The width of the pulse decides the position of the pole. When we direction a servo engine to move by applying pulse of suitable width, the pole moves and holds the required position of the pole. At each joint of the robot, we interface a servomotor to give the automated arm its exact point.

D. Web Camera

As the drag well condition is a dull domain the robot will have lights which will give enough lighting conditions to the activity of the robot. The entire situation will be feed as live through the correspondence module which will distribute pictures and furthermore recordings from the camera of the robot. The relatives of the injured individual can likewise observe the condition where their relative is been stuck. Along with the controlling module, the web camera is utilized for observation. The principle capacity of camera segment is to give pictorial information about the child to the user which eases the process of lifting the trapped child from the bore well.

E. DPDT Switch

DPDT switch is used to control the direction of movement of the dc motor. It has two separate normal terminals and each of those is associated with either of the other two terminals on a similar side of the switch. A DPDT switch has a third exchanging situation in the middle which is off. This can be helpful for engine control since you have forward, off and reverse positions. If we change the polarity of the power supply, then there is a change in bearing of revolution of Dc motor for rescuing the child.

F. DC Motor

The electric motor activity relies upon the straightforward electromagnetism. A Current passing on conductor makes an attractive field when it is in the external attractive field, it will experience a power relating to the current in the conductor and to the nature of outside attractive field. In the magnet the opposite boundary (north and south) will draw in and such furthest point (north and north, south and south) putdown. The interior arrangement of the DC motor is planned to load the attractive correspondence between a current-0 passing on conductor and an outside attractive field to make rotational movement. The DC motor is utilized to fix the belt by utilizing DPDT switch as controller, in this way the child is saved effectively from the drag well.

VI. WORKING OF MECHANISM

Our project consists of two broad units which are robotic arm hardware unit and belt mechanism hardware unit. The bore well rescue robot moves underneath the well by using rope movement. The web camera is used to provide video surveillance and corresponding images of the trapped child which is very useful for the operator to rescue the child within a short period. The input from the potentiometer feed to the arduino, and then it will give the values of corresponding angles which is given to the servomotor.

Then the robotic arm can rotate in 180degree to fix the belt to the child. After fixing the belt to the trapped child, the belt gets tighten by using the Dc motor which is controlled by DPDT Switch. If the switch is in forward position the belt gets tighten and simultaneously it got discharged when the switch is in inverse position. The belt mechanism is having two separate gripping mechanism for left and right hand gripping. It holds the body of the child and then the whole setup is uplifted and the trapped child is rescued from the bore well.

VII. RESULTS AND DISCUSSIONS

The Proposed system can rescue the child easily by using arm and belt mechanism. Once the belt was fixed to the child by using robotic arm, the belt mechanism gets activated by controlling the DPDT switch and then the belt gets tighten to the child. At last, the child rescued from the bore well very easily. Addition to this, the air sack is placed at the base of the passage that can protect the child from gripper failure. This protection mechanism will gives additional support to the child.
The future upgrade of our task is to incorporate Gas sensor which is utilized to check any lethal gas present inside the drag well. Although this, an oxygen test can be associated which is utilized to supply oxygen to the kid. A little vacuum unit with suitable weight could be utilized to suck the mud particles that have been collected over the child and annoying the correct securing of the pictures. Then the potentiometer is get replaced by hand gesture mechanism to increase the rescuing time from the bore well.

REFERENCES

1. B. Bharathi, B. Suchitha Samuel “Design And Construction Of Rescue Robot And Pipeline Inspection Using Zigbee” International Journal Of Scientific, Engineering And Research (Ijar) Volume 1 Issue 1, September 2013
2. Sridhar Palaniswamy “ Life Saving Machine” The First International Conference On Interdisciplinary Research And Development, 31 May-1 June 2011, Thailand.
3. Manish Raj, P.Chakraborthy And G.C.Nandi “Rescuerobotics In Bore Well Environment” Cornell University Library [V1] Mon, 9 Jun 2014 10:51:44 GMT(244kb).
4. Venmathi, V., E. Poorniya, And S. Sumathi. "Borewell Rescue Robot." International Journal Of Computer Applications 113.14 (2015).
5. Sridhar, K. P., And C. R. Hema. "Design And Analysis Of A Bore Well Gripper System For Rescue." Arpn Journal Of Engineering And Applied Sciences 10.9 (2015): 4029-4035.
6. Nithin, G., Et Al. "Design And Simulation Of Bore Well Rescue Robot- Advanced." Arpn Journal Of Engineering And Applied Sciences 9.5 (2014): 3101-3104.
7. Kurukuti, Nish Mohith, Et Al. "A Novel Design Of Robotic System For Rescue In Bore Well Accidents." 2016 International Conference On Robotics And Automation For Humanitarian Applications (Raha). Ieee, 2016.
8. Shah Vrunda, R., Chirag S. Dalal, And Rajeev Dubey. "Automatic Machine For Rescue Operation For Child." International Journal Of Research In Engineering And Technology (2015).
9. Rajesh, Singuru, Gamini Suresh, And R. Chandra Mohan. "Design And Development Of Multi-Purpose Prosthetic Bore Well System-An Invincible Arm." Materials Today: Proceedings 4.8 (2017): 8983-8992.
10. Retnakumar, Joselin G., Et Al. "Automated Bore Well Rescue Robot." Far East Journal Of Electronics And Communications 16.4 (2016): 909.
11. Ajay, V. K., Et Al. "Hgd: A Rescue System For An Alive Human Gesture Detection In Disasters Management-An Experimental Study." (2006).

AUTHORS PROFILE

M. Jayasudha, is pursuing her masters from IFET College of engineering in applied electronics. She completed her bachelors in same college under Anna University. She is contributing to different open source platforms. Her areas of interest are Internet of Things, Application Development and Real Time Systems. Till date, she is having 2 publications in mentioned fields.

Dr. M. Saravanan, PhD (2013) in Engineering and technology (Software Defined Radio) from Dr. M. G. R Educational and Research Institute, University, M.Tech (2005) and M.B.A (2007), in systems from Madras University. Since last 10 years, he is working as an Assistant Professor in Department of Electronics and Communication Engineering. Till date, he is having 15 research publications in international journals, 6 International Conference and 4 National Conference.