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AUTONOMOUS BOREWELL RESCUE SYSTEM

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Abstract

In present time, children fall in the Borewell due to the carelessness nature of the people in society.The currently available systems to save the child are less effective and costly too. thus the society is in need of a new technique which is more efficient and effective. In most cases reported so far, a parallel hole is dug and then horizontal path is made to reach the child. It is not only a time taking process, but also risky in various ways. The autonomous borewell rescue system is capable of moving inside the same borewell where the child has been trapped and performs various actions to save the child. By directly connecting wifi to the android phone via IP address we can move the directions of an arm. By sing wifi and android mobile we ca control the whole system. The advancement in the field of automation along with the mechanical design has a great impact on the society. This project includes series of process development from hand drawn sketches to computer generated design. The modern equipments are implemented for various parts of the system, since the system performs a life rescuing activity. The light weight servomotors are implemented for the system's operations. Borewell rescue System is a human controlled computerized system embedded with additional safety devices.

KEYWORDS: Borewell , Autonomous , Rescue , Direction , Society , Design , Devices, Impact ,Trapped System

I.INTRODUCTION

Our project titled as "Autonomous borewell rescue system " has been undertaken with the aim to save a life. Borewell [1-2]accidents are common due to uncovered openings of borewell. [3-4]It is very difficult and risky to rescue the Lifting the child out of the narrow hole of the borewell is not easy. [5-6]The child who has suffered the trauma of the fall is confined to a smaller area where with the passage of time, the supply of oxygen reduces.[7-9] The main objective of this project is to design and construct a portable system which is cost effective, quick in action and accurate. [10-15]This system is also capable of performing life saving action like supplying oxygen.[16-20] The Borewell Rescue System is capable of moving inside the well and performs operations according to the user commands.[21-26] The system is operated through personal computer according to the observations made continuously using CCTV camera.

1.1. NEED OF PROPOSED WORK

*The main purpose of this research is to save the life, child trapped inside the borewell safely.[27-32] The problems in current existing methods are: *It takes up to 30 hours to dig the parallel pit 110ft, by the time the child would have died. *Lack of oxygen inside the borewell. [32-35]*Lack of visualization causes the major difficulty during the rescue operation. There is no such equipment for rescuing the child which had

fallen into the bore well. * There is no interaction of child inside borewell and the parents. Children fall in the Borewell due to the carelessness nature of the people in society.

• 'The currently available Systems are less effective and costly too. [36-38]• In most cases reported so far, a parallel hole is dug and then horizontal path is made to reach the child. It is not Only a time taking process, but also risky in various ways. TO Overcome these lapses, we have designed and implemented a " Autonomous Borewell Rescue system " as Our B.Tech. project.

Which has following advantages: -

l. System is capable to get inside the same borewell the child' s fall. There is no need to dug a parallel hole,

2.It saves time with this System to rescue the child.

The child can be taken Out Of borewell safely.

OBJECTIVE OF RSEARCH WORK

• The objective Of Our B. Tech. project work entitled " Autonomous borewell rescue system " are as follows:

Manually monitoring the child with the help Of camera and controlling unit Of system.Communicating with the System by sending appropriate commands to it and activate the suitable motors.Once the system has reached proximity Of child, it is stopped immediately and is given the commands by the controlling device to perform the closing Of the systemic arms.Controlling a system to takeoff the child inside the bore well, which is controlled by sthe person from outside.

II. REVIEW OF THE RELATED LITERATURE

For finalizing objective Of Our project work we have reviewed following research papers majorly being related with the technology which we have used in Our project work [37-41]" Autonomous borewell rescue system ' ' apart from books and websites. Kavianand Ill describes the designing a System for rescue a child from inside bore well. This system is capable Of moving inside the bore well. This Smart Child Rescue System consists Of PIR sensors which help to sense Only humans irrespective Of the external conditions. In this system Raspberry pi is used which is costly than Arm microcontroller. It requires more peripherals. Nish Mohith Kurukuti [42-26] describes the rescue operations without human intervention. The system can adjust its legs according to the pipeline dimensions. The system consists Of power supply, actuators, and dc motor, servo motor. The child position is captured from bore well with Camera module and monitored On PC. [47-51]The ultrasonic sensor interfaced with arduino. The arduino uses a microcontroller not an application processor, so can not run any Operating System On it. You can not get a video output Or Ethernet port On arduino. Manish Raj 131 describes the diameter Of the narrowborewell for any adult person because light goes dark inside it, the rescue task is challenging. The systemic System attaches a harness to the child using pneumatic arms for picking up. A teleconferencing system is [52]also attached to the system for communicating with the child. N. Bourbakis and I. Papadakis- Ktistakis 141 describesdesign Of two mcomplementary role to existing larger systemic Structures, which mainly perform different rescue tasks. Here the microsystem, called This as, is under development by a research team consisted of researchers from the ATRC-WSU (micro-design, software), the Ohio State University (micro-antennas) .icro- systemic structures in an effort for assisting the detection of human under debris and rescue them. These microstructures will play. K. P. Sridhar C. R. Hema S. Deepa described a wireless sensor fusion system in the mechanical gripper systemic arm to assist the rescue operation and paramedical team effectively. Multiple sensors are interfaced to the wireless sensor fusion system to acquire the important parameters such as humidity, temperature, CO, and other gaseous levels from the bore well to monitor the condition of the child inside the bore well. In this system pic microcontroller is used which has low speed operation than Arm. Preedipat Sattayasoonthorn and Jackrit Suthakorn described a battery management for rescue system battery management for rescue systems is summarized in this paper as aguideline for new developers. Thispaper covers the topics of power consumption, battery selection, battery charging/ discharging and battery maintenance but this system requires more hardware and also its design is complicated so this system is costly. Wang Chuanjiang Described The framework of rescue system is just, it is composed of rescue m*echanism, anchorage set, hoist set, manipulator, frame work, control and communication system. The system system can undertake the rescue tasks for small caliber wells, whose

diameters can change from 1m to 0.3m by replacing some mechanisms. This system canbe used for small caliber well rescue system. It requires more hardware.Palwinder Kaur , Ravinder Kaur, Gurpreet Singh made an autonomous system having self moving and self sustaining capacity. Wheeled leg mechanism is are circumferentially and symmetrically spaced out 120 apart. LM-35 Temperature Sensor and 16X2 LCD are interfaced with PIC 16F877A microcontroller to sense the temperature inside the bore well and to display it respectively. K. Saran, S. Vignesh, Marlon Jones Louis have done a human controlled computerized machine to rescue thchild by using servo motors to hold the child and the safety balloons are used beneath the child to provide an additional safety to the child. This project includes series of process development from hand drawn sketches to computer generated design Hon Jose Pattery , Jittu Varghese Kurian , Noble K John have done a prototype consists of four mechanisms driven separately The motor placed at the 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. B. Bharathi, B. Suchitha Samuel have done a wirelessly controlled system using Zigbee technology and dc motor based gripper operation for systemic arm. This prototype uses PIC 16F877A microcontroller in the operation of rescuing the child. The system is operated through PC using wireless Zigbee technology and using wireless camera we can view both audio and video on the TV. 111.

III.METHODOLOGY : The entire system is manually controlled by the user. The functional block diagram of Borewell Rescue System

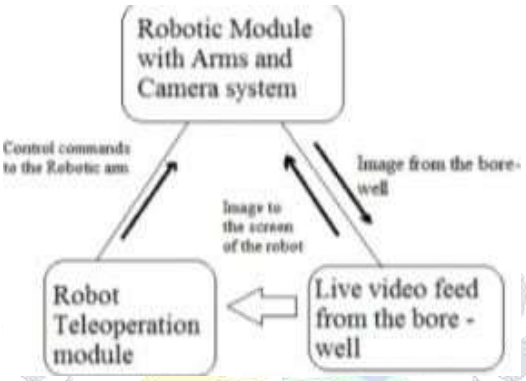

Fig I.BIOCE Diagram or the designed system

Our proposed system consists of mainly two round plates. The full hardware system has been illustrated by the. A mechanical system will be attached to the higher plate which will try to release two linear actuation units which will hold the system in position by pushing the wall of the bore-well. Another mechanical gear system will be attached which will rotate the lower plate to get position it in plane with the victim. Two high resolution cameras will be attached downwards in the lower position of the lower plate. As the bore well environment is a dark environment the system will be having lights which will provide enough lighting conditions for the operation of the system. The pneumatic arms will be having another two individual cameras for each arm which will publish the view of the arms. A chest mount harness will be attached with the system which will be highly essential in picking up the victim from the bore well.

Fig2 : Borewell recuse system

The systemic arms will be teleoperated to attach the straps of harness around the victim. As from the upper mounted cameras we can only observe the upper view of the situation,the task will get complicated if the victim will not be co-operative Or get senseless. As the system attaches the harness to the victim, the victim

would be ready to pickup. As various commercial harness are available today we choose to use the chest harness to reduce the complexity Of the task. A chest harness is capable Of lifting a 15 yr Old boy easily. The chest harness lifting a boy is shown in fig.2.

WORKING

Initial Detection:

The system is usually activated when a person is detected falling into a borewell. Sensors like cameras, infrared sensors, Or ultrasonic sensors can detect the presence Of an object in the borewell. 10T devices can automatically alert authorities Or family members, triggering the rescue operation.l)eploying the Rescue Device:A robotic device, equipped with cameras, sensors, and a mechanical arm, is lowered into the borewell.This device is designed to navigate the narrow and deep borewell and can be controlled remotely via an 10T interface.The robot is typically equipped with live-feed cameras to provide visual feedback to the rescue team, allowing them to monitor the situation closely.

Real-time Monitoring and Control:The robotic system is connected to the 10T network, which allows for real-time monitoring and control from a remote location.The rescue team can monitor the status Of the victim, including vital signs if sensors are attached, and guide the robotic arm to securely grasp the individual.The 10T system can integrate various sensors, such as temperature, humidity, and gas sensors, to assess the environment inside the borewell.Rescue Operation: Once the robotic arm securely grips the victim, it is carefully lifted from the borewell.The 10T system provides constant feedback On the position and status Of the victim during the rescue, ensuring safety and precision.The System can also coordinate with emergency services, providing them with live updates On the rescue process.

Data Collection and Analysis:

The system can store data related to the rescue operation, which can be analyzed later to improve future rescue strategies. This data may include the depth Of the borewell, the time taken for the rescue, and the environmental conditions inside the borewell.

Post-Rescue Care:

Once the victim is safely Out Of the borewell, the 10T system can assist in the post-rescue care by monitoring the victim' s health conditions and alerting medical personnel if necessary. Hence, the child can be safely taken Out from the borewell using this mechanism.An autonomous borewell rescue system is an innovative solution designed to address the critical issue Of children accidentally falling into Open borewells. The autonomous rescue system employs advanced technologies such as robotics, sensors, and artificial intelligence to locate and safely extract the trapped individual. The system typically includes a robotic arm equipped with cameras and Sensors to navigate the borewell and identify the child's position. It can then carefully lift the child to the surface, minimizing the risk of further injury. This technology not Only enhances the efficiency and effectiveness Of rescue Operations but also reduces the reliance On human intervention, ensuring a quicker response in emergency situations. The development and deployment of autonomous borewell rescue Systems represent a significant advancement in Safety measures and emergency response capabilities .The Autonomous Borewell Rescue System represents a Significant technological advancement aimed at addressing the frequent and tragic incidents of children falling into Open borewells. This System is designed to be a comprehensive Solution that autonomously navigates the Confined space of a borewell to rescue a trapped child. Key features Of this innovative system include:

l. *Autonomous Navigation .

The System is equipped with sensors and Al algorithms that enable it to autonomously navigate the narrow and often irregular walls of a borewell. This ensures that it can reach the Child quickly and efficiently without human intervention.

2.*Integrated Camera and Communication*: :High resolution cameras provide real-time video feed to the Operators, allowing for continuous monitoring of the child' s Condition. Additionally, a built- in microphone and speaker System enables two-way communication, providing comfort and reassurance to the trapped child.

3.*Robust Lighting System*.

Given the dark environment Of a borewell, the System includes powerful LED lights that illuminate the area, improving visibility for both the camera and the rescue operations.

4.*Life-Support Mechanisms*:

The System is capable of delivering oxygen and other life-supporting measures to the child, addressing the critical issue of diminishing oxygen levels within the borewell.

5.*Mechanical Arms and Harness*.

Two robotic arms, controlled remotely by operators, gently secure the child using a soft but sturdy harness. This mechanism is designed to safely lift the child out Of the borewell without causing any harm Or discomfort.

6.Versatility and Adaptability* :

The design of the Autonomous Borewell Rescue System is adaptable to different borewell diameters and depths. Its modular construction allows for easy transportation and rapid deployment in emergency Situations.

2.*Cost-Effective and Time-Efficient*:

By eliminating the need for digging parallel borewells and Other time-consuming traditional rescue methods, this system significantly reduces the time and costs associated with rescue operations. It ensures a swift and safe retrieval Of the child, potentially saving lives that might otherwise be lost due to delays.

IV RESULT

All the objectives had been fulfilled successfully and thus we are able to design a autonomous borewell rescue System to save live. autonomous borewell rescue system is designed with two arms,ESP8'266, switch, servo motors and sensors. The System is capable Of moving inside the borewell from the same hole and perform the rescue operation. The android mobile that connected to wifi helps to move the directions Of the arm. The photo Of Our project is shown in fig.3. Thus the designed System is helpful in saving the child trapped inside borewell. It can

Fig3: Advanced technology to rescue inclined pipes

replace all the Old existing technology as it is safer and takes very less time. Saving a life is a big task and we have successfully made this project in order to rescue child in future in lesser time. We have used the light weighted servo motors so that the system is not heavy and also it is precise.

V. CONCLUSION

Human life is precious. Our bore well child rescue System is a significant attempt to save the life Of the victim Of bore well accidents. Besides this, the unique capability. In the current design Of bore well child saver machine has been made to suit every possible situation may occur in rescuing operation. Further, we would like to conclude that with the help Of Our project, we would be able to rescue the child safely within short period Of time. The Autonomous Borewell Rescue System is a ground breaking development that combines robot.Its implementation could prevent numerous fatalities and injuries, Offering a robust and

efficient method to address this critical issue. As technology continues to evolve, further enhancements and refinements to this system will only increase its efficiency and reliability in real world applications.

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