FAST AND SECURE CHILD RESCUE SYSTEM FROM BORE WELL USING ZIGBEE

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ABSTRACT

Children trapping in bore well has been a serious issue across various countries including India from past several years. Several studies had a note of around 500-600 children trapping in bore wells across the globe every year. Most of the cases have been ending in tragedy. The innocent children of age around 1-3 years are been influenced because of the carelessness of few people. The present existing methods to rescue the child were time taking and are not effective. These has been a serious issue. So, in order to rescue the child alive with less time, we are proposing a system named “FAST AND SECURE CHILD RESCUE SYSTEM FROM BORE WELL USING ZIGBEE”. In this system we used a robot which will automatically detects carbon dioxide, temperature and pressure inside the bore well, and automatically pump oxygen, coolant as required. Then it will find the distance between child and ground and drags the child from the bore well with utmost care. We used the ZIGBEE communication in order to interact with the rescue device and to transfer the information from the proctor. As we had used wireless technology, it can be implemented in any place irrespective of depth. It can be further use in man-hole rescue, coal mine accidents, etc., it can also be used in fire accidents rescue, where the human cannot rescue.

Index terms: Zigbee, Bore well, rescue device

I. OBJECTIVE

The main objective of the project is to implement the child rescue system, which will reduce the time of rescue and will ensure the safety of the child. The project has to be further implemented in coal mines, manhole rescue by using the latest technology in cost effective and to monitor the position and condition of the child by using the wireless technology.

II. INTRODUCTION

Water is perhaps the most important requirement in day-to-day life. For every daily household activity and for plants the water is the only key. So, the majority of the people across the globe are dependent on underground water resources. In order to extract the water from the ground, the basic method being used is digging the bore well and later they have been kept open if the water is not available at that particular place. These kind of bore wells which are near to the residential areas causing much damage to the lives of children playing nearby. The kids who are unaware of the open bore wells unfortunately falling into them. The rescue operations in India are not effective.

Zigbee communication is one of the effective modes of wireless communication. It requires very less power to operate. It has the variable range of communication up to 200 feet. The loss of data is very negligible. Another parameter is the battery capacity, it can be long last for several years. These parameters stand out the Zigbee from various other modes of communication.

A Step-down transformer is utilized to step down the power from 230V AC to 12V AC. Here input is 230VAC and yield is 12V AC. Furthermore, LM35 model temperature sensor is utilized to figure the temperature and warmth
present inside the bore well. Diode converts AC signal to DC signal. Capacitor is used to store the power. 7805 Voltage regulator IC is used to convert 12V DC to 5V DC. Relay invite is a single relay invite to control DC motor. Two relay invites is used to control the rescue robot. Zigbee transmitter is used to transmit data from kit to personal computer.

III. RELATED WORK

S.Prabhu, R.Pranesh and M.Pazhaniappan [m.e.,(phd)] Mechanical Engineering Department, prince Shri Venkateshwara Padmavathy Engineering, College, India[5]. They had worked on “design and optimization of child rescue device” for rescue of the child. They had done research and made the clear vision of accidents occurred in recent years. With the help of Tongs mechanism and other mechanisms like the chain and Rope mechanism, Lifting mechanism, Nylon Rope mechanism. These method does not contain various sensors and camera for the monitoring of the child.

S.Ravikumar, M.Vinoth, S.Sankar, and K.Saravana Kumar, Assistant Professor Department of Mechanical Engineering Sengunthar College of Engineering, Tiruchengode, Namakkal[6]. They had worked on “design and fabrication of bore well trapped child rescue system” for saving the child from bore well. They had built up the framework utilizing the parts like shaft, rope, gripper, metal strip, metal ball, dc engine, battery, screw bar, prod gear, gear terminology. The salvage gadget which had planned, is greatly muddled and it isn't well disposed to utilize. Furthermore, the disadvantage is it doesn't focus on the security proportions of the kid. Additionally, these plans aren’t reasonable for significant distances over 15 feet.

Aravind N Kaimal, Bijith P B, Midhun C Baiju, Muhammed Suhail K, UG Scholar, Department of Mechanical Engineering, Gurudeva Institute of Science and Technology (GISAT), India [7]. They had worked on the project “Borewell Child Rescue System” for rescue of the child from open bore wells. Here, they had used Rack and pinion mechanism to ensure the child does not fall further deep in the bore well. They had worked on the various dimensions of the bore well. They had further used rope and pulley in order to pull the victim from the bore well. They had also used screw mechanism in order to push the robot to the bottom of the child. They had tested on the variable depths. The drawback in this method is the durability of the rope and pulley is in effective and it will cause much damage to the child. And also, they had not used the sensors for monitoring of the child. The design is more often like a mechanical design with less efficiency and does not ensure the safety of the child.

Sanjeev S, Ajayan J, Gowtham. S Coimbatore, India [8], had developed a mechanism named “Microcontroller Based Bore well Vehicle Status Informer Using GSM”. Here they had mentioned a mechanism in order to save the child from bore wells. They had used GPS for monitoring the time and altitude of the child fell inside the bore well. The drawback was they had used GSM module as the mode of communication. This is useful for short range. They also designed with the help of SD card, for storing the memory which was detected inside the bore well. They did not use any sensors for continuously monitoring the position of the child inside the bore well. They did not give the method to rescue the child.

IV. PROPOSED WORK

As we have drawbacks in current existing methods, in order to overcome them, we are proposing a system called “FAST AND SECURE CHILD RESCUE SYSTEM FROM BORE WELL USING ZIGBEE”. The proposed design will contain various sensors like CO2 sensors for monitoring the carbon dioxide value inside the bore well, Temperature sensors for checking the temperature inside the bore well, pressure sensors for monitoring the pressure inside the bore well as the pressure will increase the temperature of the child will also increases. We had also used Photo Infrared Sensor [PIR] for detecting the depth of the bore well and the distance from the ground where the child got trapped inside the bore well. These various sensors will detect the environment inside the bore well and position of the child trapped. If the CO2 sensor detects the greater value than the predefined threshold value, then the system will pump oxygen to compensate. If the temperature sensor detects higher value than the normal temperature, then the system will send the coolant in order to normalize the temperature inside the bore well. Along with the various sensors we had also used LED light for the clear vision of the child and a high-resolution camera for monitoring the position of the child. For communicating with the robot, the Zigbee module is used. As Zigbee
can transfer the information fast and can be used up to the depth of 200 feet. We had designed the robot in such a way that, it can be adaptable to any diameter of the bore well. The design can be further used in coal mines for rescuing the people. It can also be used for manhole rescue.

V. BLOCK DIAGRAM

In bore well section, we will use the various sensors like gas sensor, pressure sensor, temperature sensor, Photo Infrared sensors, which will be connected to the ADC port of the Arduino Uno microcontroller. The ADC [Analog to Digital converter] will convert the analog signal data into the digital data. These data will transfer to the microcontroller. These data will be displayed on the LCD screen which will be in contact with the microcontroller. The UART port [Universal Asynchronous Receiver Transmitter], is connected to the Arduino in order to transfer the signals from bore well to the monitoring section.

![Block diagram of bore well section](image)

A relay module is also connected with the Arduino along with the servo motor as shown in (fig: 1), for pumping oxygen and coolant whenever the sensors detect the higher values than the threshold. High resolution camera is used to monitor and capture the position of the child. Finally, the Rescue robot, which is constructed, will get the instructions from the microcontroller and acts accordingly. The device will make use of instructions given from ground and acts accordingly.

![Block diagrams of the monitoring section](image)

In the monitoring system, the Zigbee module will make use of the UART port for communicating with the robot as shown in (fig: 2) the robot will send information to the monitoring area through the Zigbee communication mechanism.
VI. WORKING PROCESS

The working process of the system is simple. First, the sensors which have been connected to the microcontroller as shown in (fig: 3), will produce the analog signal. The ADC which has been in build in microcontroller, will convert the analog signal to the digital signal. The values will be displayed in the LCD. The motor will supply the oxygen required as shown in (fig: 4). The information will be transmitted with the help of Zigbee module. The rescue device will be sent inside.

Fig: 3 Hardware connections of the project

The robot will drag the child with utmost care by taking inputs from the ground monitoring area where the whole process is monitored through the personal computer.

Fig: 4 Flow diagrams of the project
Fig: 5 Commands for controlling rescue device

The design of the rescue device is simple. We had used servomotors, for the motion the robot and a gripper for holding the child. The rescue device will be in contact with the Zigbee transmitter and will be continuously communicate with the Personal Computer. The instructions will be transfer to the device through Zigbee module wirelessly. On command is used to turn on the device. Off command is to turn off the device. Down command is used to move the device downwards. Similarly, as shown in (fig: 5) up command is used to move the device upwards. Pick command is used to pick the child safely. Whereas Drop command is used to drop the child.

VII. OUTPUT AND CONCLUSION

By implementing the proposed design, we can save the child in less time as required with the existing methods. Since we have used Artificial Intelligence, this method is easy to operate and will absolutely have no chance of error. The sensor values will be displayed on the screen as shown in (fig: 6).

Fig: 6 output values

These designs will surely applicable to related fields such as coal mines rescue, septic tank rescue and drainage rescue. This proposed design is more over a friendly device and easy to operate by anyone.

VIII. RESULT

As we have mentioned in the proposed design, we had implemented a system which will reduce the time of rescue and will ensures the safety of the child. And more overly these systems can also be implemented in various other fields like coal mines and manhole rescue. We had used the latest Zigbee technology which is cost effective and had used various sensors for monitoring the health condition of the child. We had also used a wireless which will be a long last device.
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