BOREWELL RC BOT

Dr. Arokia Renjit J
Department of Computer Science and Engineering
Jeppiaar Engineering College
Chennai,India

Mohana Priya C[1]
Department of Computer Science and Engineering
Jeppiaar Engineering College
Chennai,India

Sharulatha S[2]
Department of Computer Science and Engineering
Jeppiaar Engineering College
Chennai,India

Yagavardhini V[3]
Department of Computer Science and Engineering
Jeppiaar Engineering College
Chennai,India

ABSTRACT-- Our proposed system completely focuses on rescuing a trapped child from the borewell. Borewell concept has been brought to save the lives of people by providing water from the ground. The main issue begins when leaving the borewell uncovered after yielding water from the ground. So many children when roam near the borewell they accidentally fall into the borewell and get trapped for many days. There are many existing systems to rescue the child but their methodologies are very time consuming and need more human and machine resources. Most of these systems are ended up in failure. So, in our proposed system we have a rescue bot which consists of robotic arm, magnetic lock system, vacuum pump and sensors to bring out the trapped child from the borewell in a safe and secure manner.

Key words- Borewell, Magnetic Lock System, Robotic Arm, Vacuum Suck Pump, Rescue, Sensor.

I. INTRODUCTION

India is one of the country known for its agricultural activities. The backbone of the agriculture is the water. Before many decades we have abundant groundwater which is enough for the agriculture works. But due to extreme water scarcity and depletion of groundwater we are in the situation to take the water through borewell. To be noted not only farmers, most of the population started drilling bore well in their homes. The main problem gets started when after yielding water from borewell they leave it uncovered. So many children when come near the bore well they fall accidentally into it. The concept of bore well is to save the life of people but it has become a death pit for many children due to the carelessness of owner who leave the bore well uncovered.

There are approximately 27 million bore wells in India. According to the National Disaster Response Force(NDRF), since 2009, over 40 children had died after falling into the borewell and 70% of the rescue operation had failed.There are many existing systems to rescue the trapped child but they are very challenging and time consuming. Victim in the borewell suffers from lack of oxygen, lack of light, lack of food and the temperature in the borewell also bothers the trapped child. So delay in the rescue process make the situation more worse. And the existing systems are very risky to both the child and the person who rescue the child. Most of these systems ended up in failure.

We proposed a prototype to safe the life of the trapped child from the bore well in a fast and efficient method. Our paper is based on cloud computing and internet of things. Cloud computing is the network of remote servers hosted in the internet to manage, process

data and store data rather than PC or local servers. IOT is the network of physical devices that connected with sensors, software and with other technologies for exchanging data with other objects and systems over the internet. With the help of this domains we proposed a smart bore well rescue bot to save the child.

II.   REALATED WORKS

A.   KNOT SYSTEM

In this system, people who are above to help the trapped child prepare a knot. And they sent the knot into the bore well and get the hands of the child inside the knot and try to pull the child up.

Disadvantage: when they try to take out the child by this method there is a chance of dislocation of child's arms.

B.   PARALLELL DIGGING SYSTEM:

In this method, they parallelly dig the ground to the side of child's trapped area. Then a man goes into the parallelly dug area to reach the child.

Disadvantage: when they dig parallelly there is chance of landslide so that they situation may get even worse than before and this method take lot of time.

C.   ROBOTIC ARM

In this system the robotic arms is controlled by camera to locate the arms to take correct grip of the child's hand.

Disadvantage: In this system the child's hand may get dislocated and if the gripping system is not too accurate then the victim may go further deep into the bore

well. If child's hands is not at the top of the head then the robotic arm cannot be used.

D.   FOLDABLE SEAT

In this system, the seat goes under the foot of the child and after the whole set up is ready a harness is used to lift the child.

Disadvantage: When the bore well diameter goes very narrow then folded seat cannot be used.

III.   LITERATURE SURVEY

1.   ARDUINO BASED CHILD RESCUE SYSTEM FROM BOREWELLS

The Arduino which is a microcontroller controls the whole mechanical setup and all other components are connected to the Arduino and the pc is interfaced to the hardware. The system consists of a gripper that holds the hand of the child and camera is used to monitor the child. Independent of human resources and machines. [1]

2.   AN AUDIT PAPER ON BORE WELL RESCUE ROBOT

A harness is attached to the child with that we can able to rescue the child without any injury and using foldable seat we can lift the child in a safe manner. This system consists of temperature sensor and ultrasonic sensors which is used to sense the distance of the trapped child in the borewell and APR module is used to communicate. Camera is used to monitor and robotic arm holds the hands of the child. [2]

3. SMART CHILD BOREWELL ROBOT RESCUE SYSTEM

The system contain robotic arm which is used to hold the hand of the child but in some cases while lifting the child using robotic arm lead to the dislocation of child's hand and it is also connected with communication system, oxygen is also supplied using the oxygen supply pump inside the borewell and camera used to monitor the child condition and also used to fix the robotic arm and the child's hand. [3]

4. CHILD FALL SAFEGUARDING ROBOT

Arm diameter adjustable technique used to carry the child. The robot consists of gas sensor detects the hazardous gas that may cause health issues to the child present inside the borewell , temperature sensor senses the temperature condition inside the borewell and Infrared sensors also used to measure the infrared radiation in the borewell .Arm adjustable technique is suitable for any borewell size.[4]

5. CHILD FALL SAFEGUARDING ROBOT

The framework consists of Transmitter (Controller) unit , Receiver (Robot) unit, Robotic arm & Camera with LED is attached to the robot and that is sent into the borewell. This robot is transmitted and controlled through controller setup (PC).Stepper engine is used to operate the robotic arm. The entire framework is constrained by Raspberry pi & the administrator utilizing Keypad controller.This idea is used to lessen human endeavors for the saving task of the children. The Robotic arm operated based on potentiometer value. The belt used to hold the body of the child and the child is rescued.Belt Mechanism can give adequate security. [5]

6. BOREWELL CHILD RESCUE SYSTEM

The entire setup is supported by a tripod stand on the ground with an oxygen concentrator and is sent into the borehole controlled by watching the virtual images in PC or Mobile. After reaching the child, depth and position of the child is sent and the setup is stabilized. The Protective casing is extended to the borewell sidewalls. Lifting the rod which has a balloon cushion to screw its way through the gap towards the bottom of the child. Air compressor is operated to pump air to the balloon.T he system is raised up to a certain level till the child reaches inside the protective casing. Lower U clamps released to lock the base of the rod.Whole setup is adjustable. [6]

7. IMPLEMENTATION OF A CHILD RESCUE SYSTEM FROM BOREWELL USING ZIGBEE FOR LONG RANGE APPLICATIONS

Rescue set up with surveillance camera used to monitor the child condition and robotic arm with temperature is used to detect the temperature inside the borewell ,humidity detects the humidity level in the borewell and ultrasonic sensors are used to get distance between the setup and the child. Zigbee is used to transmit the collected data of the sensors used in the Rescue set up. High speed Communication because of zigbee. [7]

8.AN APPROACH TOWARDS RESCUE ROBOTICS IN BORE WELL ENVIRONMENT

Robot with Chest Mount harness and pneumatic arms are used to lock the belt into the chest of the child. The camera is attached in the pneumatic arms with the help of that we can find the position of the belt and the lock, once the belt is locked then the child is carried out

from the borewell , oxygen supply pump is used to supply oxygen to the child based on the condition inside the borewell. In the top surveillance camera is fixed to monitor the condition of the child. Belt system provides a additional safety while lifting the child from the borewell.[8]

9. ARDUINO BASED SMART BOREWELL AMBULANCE RESCUE SYSTEM

Robotic arm having Spongy surface which is used to hold the hands of the child ,Spongy surface does not lead any injury and it is operated by keypad controller it consists of metallic plate which is used to lock the base of the child which prevents the child from moving deeper into the ground and alert system used to alert about the accident to the neighbour and rescue team .With the addition of this alert system ,Rescue team can be able to know about the accident in a short time. [9]

10. DESIGN AND IMPLEMENTATION OF LABVIEW BASED BORE WELL CHILD RESCUE ROBOT

Rescue operation with robotic arm which helps to carry the child from the borewell and Advanced Digital Oxygen Supply System detects the deformity of oxygen based on that the oxygen is supplied to the child. Advanced Digital Oxygen Supply System operated with ZigBee Technology .Wireless camera is attached to the robot with the help of that we can able to hear the sound of the child and also see the video of the child (Both audio and video).It also used to monitor the industrial pipes. Communication speed is high with the help of zigbee technology. [10]

IV. METHODOLOGY

PROPOSED SYSTEM

At first using conveyor belt , the bot moves inside the borewell . The whole rescue bot is totally adjustable according to the size of the borewell. The bot stops at a distance of 10cm before the position of the child. This gap is needed to pull the child inside the bot.

The bot consists of many sensors which include heat, gas, humidity, temperature and ultrasonic sensors. With the help of ultrasonic sensor we can find the distance of the trapped child from the bot. The heat sensors senses the amount of heat present in the walls of the bore well and the humidity sensor senses the amount of water content inside channel.

When the trapped child comes into the bot by the time to check the temperature inside the bot, temperature sensor is used. To detect the presence of any poisonous gas, gas sensor is used. The sensors senses the data and it is stored in cloud with the help of node mcu esp8266 which is a low cost open source IOT platform and it is present in the borewell system. The values that are sensed by the sensors can be viewed in 20 x 4 liquid crystal.
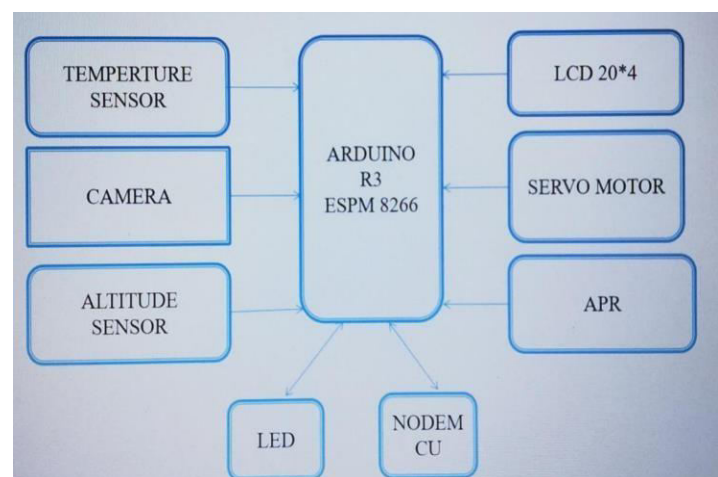
Figure.1 Architecture diagram

Cloud and LCD shows the data that are received by the sensors. The difference between the cloud and the

LCD is, when if any sensor does not work then LCD will not display any value for that particular sensor but in cloud it shows the previous or constant value of that sensor. When we only depend on cloud value we may not find that a particular sensor is not working so with the help of LCD we can able to find that which sensor is not working properly.

The vacuum suck pump gets the child head and the robotic arm takes hold of the hands. The arm's motion is controlled by the 3 way back switch. The arm gets open only when the switch is ON or else the arm gets closed. By using the vacuum pump and the arm we can bring the child into the bot. To look the child's position inside the bore well camera ov7060 is used and displayed on TFT

inch graphics display. To have the clear picture of the child in camera LED is used.

Once child successfully gets inside the bot, the metal sheet from the bot goes under the foot of the child. So that child will be safe and there is no chance for the child to move further deep. The metal sheet is adjustable so it can be changed as per the diameter of the borewell.

The above operations are controlled using the Arduino where all the sensors and the other components interact with each other and the connections are done using bread board. In this prototype, we use two Arduino in order to split the voltage among sensors.

When the whole set up is ready then by using conveyor belt we can take out the trapped child from the bore well in a safe and fast manner .

ADVANTAGES OF PROPOSED SYSTEM

- Rescue the child in safe and secure manner.
- Cylindrical chamber is resizable based on the borewell size.
- Have both Vacuum and Robotic arm system.
- Prevents the child from moving further deep into the ground.

V. RESULTS AND DISCUSSIONS

The prototype has been designed successfully for the Borewell RC Bot to rescue the child from the borewell in a secure way. The robotic arm is opened and closed by using a 3 way switch which is operated by a dc motor. The Bot is capable to sustain the all possible loads. Overall our RC Bot is designed to overcome the cons of existing systems.
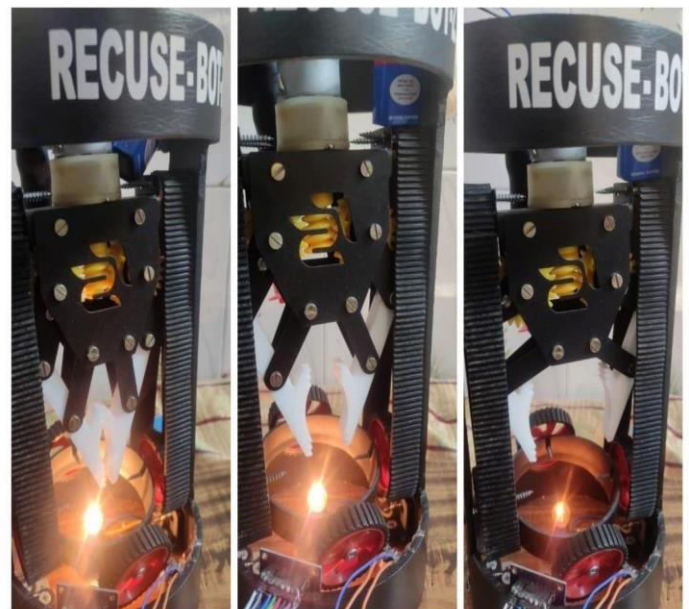

Figure.2. Robotic arm operation

Vacuum suck pump which helps to hold the head of the child. It gives a additional support to the child and the Thin metal sheet is used to lock the bottom of the bot when the child gets into the bot with the help of robotic arm and Vacuum suck pump .It prevents from further moving deeper into the ground while doing the rescue operation.
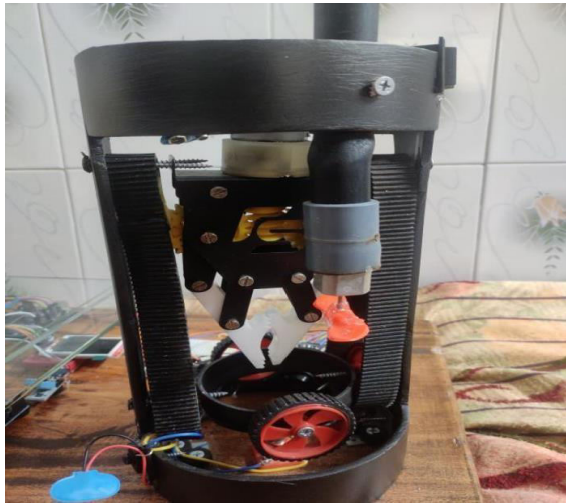

Figure.3 Vacuum suck pump

The Temperature, Humidity, Heat and Ultrasonic sensor senses the environment and that data are displayed in the LCD display. Gas sensor value is displayed in the TFT 1.4 inch graphics display.
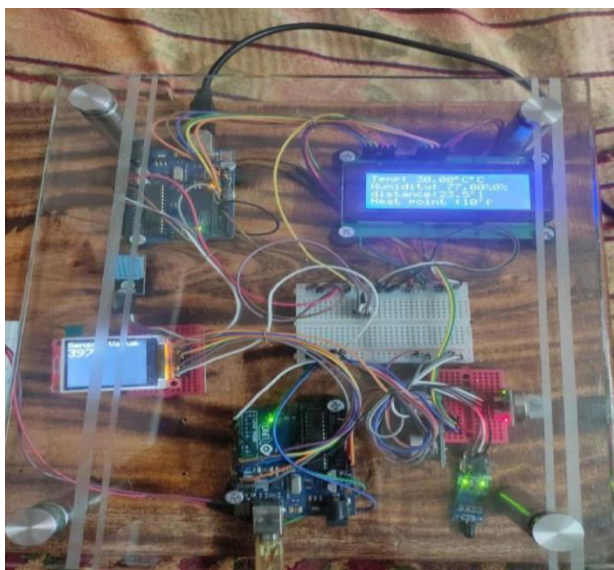

Figure. 4 Sensor derivatives

The data collected through the sensors are stored in the cloud and that data are analyzed. The data stored in the cloud with the help of Node MCU ESP8266 module.
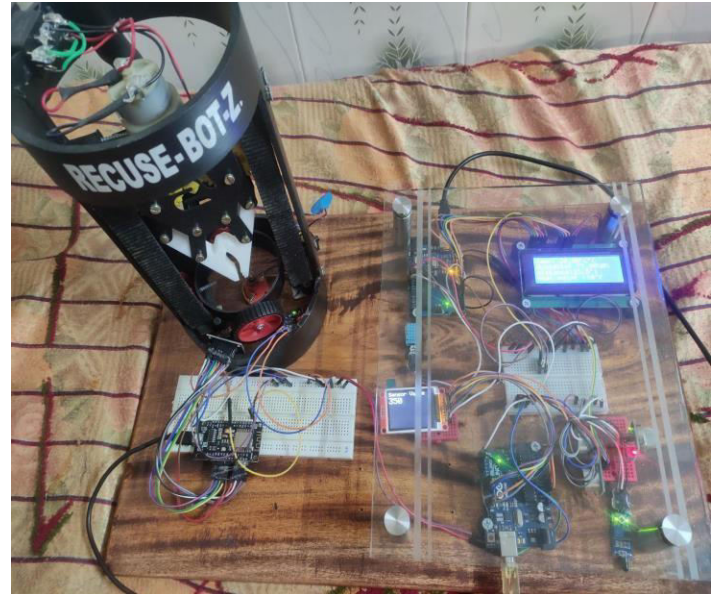

Figure.5   Prototype of borewell RC bot

VI. CONCLUSION AND FUTURE ENCHANCEMENTS

A. CONCLUSION

Many children's life had been lost pathetically due to the uncovered borewell. So to put end point to such accidents, we proposed a rescue bot which saves the life of the trapped child inside the borewell. The whole rescue bot is fully flexible so that it can change its size depending upon the diameter of the borewell. And the bot is capable to lift the child irrespective of the weight. With the aid of robotic arm, vacuum pump, magnetic lock system and sensors ,we can able to save the child in a safe and secure manner.

Most significant aspect is that when we compare to other rescue methodologies, the factors like human power, machine resources and the cost are very

reasonable. With the help of these criteria we can able to save the child within a short span of time.

B. FUTURE ENHANCEMENTS

In future, we can add oxygen level sensor in the bot to sense the level of oxygen and also to provide oxygen supply to the victim. In this proposed system, the robotic arm is not controlled by the gesture movement of the user but in future we can implement the haptic technology to the rescue bot so that the user's gesture movement will have the control over the robotic arm.

VII.   ACKNOWLEDGEMENT

VIII.   REFERENCES

[1] "K.P.Sridhar", "C.R.Hema"and "S.Deepa", "**Design of a Wireless Sensor Fusion System to Analyze Conditions Inside Borewells**",Springer Science+Business Media
New York 2016.

[2] "Singuru Rajesh", "Gamini Suresh" and "R Chandra Mohan", "**Design and development of multi-purpose prosthetic bore well system- an invincible arm**", International Conference on Advancements in Aeromechanical Materials for Manufacturing (ICAAMM-2016).

[3] "S.Ravikumar", "M.Vinoth"and "S.Sankar", "**DESIGN AND FABRICATION OF BORE WELL TRAPPED CHILD RESCUE SYSTEM**", International Journal of Innovative Research in Advanced Engineering (IJIRAE) , Issue 03, Volume 6 (March 2019) - Special Issue ,SPECIAL ISSUE - 5th Inter National Level Conference - "MEEMIC – 2019".

[4] "Seeram Srinivasa Rao"and " Nagula Srikanth", "**Modeling and Analysis of Bore well Rescue Robot Using Haptics and Lora Technology**", International Journal of Innovative Technology and Exploring Engineering (IJITEE), Volume-8 Issue-7, May, 2019.

[5] "S.Magibalan", "A.Mohanraj", "S.Navin, "N.Nirmal kumar"and "C.V.Pranavsuresh", "**Child Rescue from Bore Well**", International Journal of ChemTech Research, Vol.13 No.03,2020.

[6] "Jayasudha.M" and "M.Saravanan", "**Real Time Implementation of Smart Child Rescue Robot from Bore Well using Arm and Belt Mechanism**", International Journal of Innovative Technology and Exploring Engineering (IJITEE), Volume-8 Issue-12, October 2019.

[7] "A.Balachandran","G.Barath Vignesh", "A.S.Hemnath Kowshick", "R.Gayathri", "N.Santhiyakumari" and "M.Saranya", "**RESCUE ROBOT USING WIRELESS TECHNOLOGY**",IJARMATE,2016.

[8]"Aashvij Shenai", "Abhijeet Antin", "Pallvai R" and "Dawnee Soman", "**Development of In-Pipe Robot for Assisting Borewell Rescue Operations**", IEEE Third International Conference on Circuits, Control, Communication and Computing,2018.

[9] "Nish Mohith Kurukuti", "Mahesh Jinkala", "Purushotham Tanjeri", "Somasekhar Reddy Dantla" and "Mallikarjuna", "**A Novel Design of Robotic System for Rescue in Bore well Accidents**", 2016 International Conference on Robotics and Automation for Humanitarian Applications (RAHA),2016.

[10] " Keerthi Premkumar", "**Smart Phone Based Robotic Arm Control Using Raspberry Pi, Android and Wi-Fi**", IEEE Sponsored 2nd International Conference on Innovations in Information Embedded and Communication Systems (ICIIECS'15),2015.