ISSN 2395-1621

SMART BOREWELL RESCUE ROBOT

Mansi Chaher1, Mayuri Jathar2, Pradnya Bhor3

mansichaher895@gmail.com
m.jathar03@gmail.com
bhorpradnya156@gmail.com

Guided by
Mrs. Mrunalini Bhandarkar.

Dept of Electronics and Telecommunication Engineering, PCCOE.
University of Pune, Maharashtra, India

ABSTRACT

In India, in the recent consecutive years it has been observed that children below age group of 10 often fall down in borewell. To meet the increasing demand of water borewells have been dug which are often left uncovered due to this children get easily trapped inside the borewell. Rescuing children from such panic situations is not only difficult but is also risky. A very small delay in this rescue operation can cost dangerous to the child's life as the child may loose his/her life. During the borewell accident it is expected that an immediate rescue operation should take place but it is quiet difficult to perform rescue operation as there are many challenges inside the borewell as it gets deep. The diameter of the borewell is narrow but to lift the child out from it is not that easy as there is complete darkness inside and also insufficient oxygen. Here we are proposing a robotic system which will pick up the child using pneumatic arms and will also detect the temperature, harmful gases and depth inside the borewell.

Keywords— Rescue robot, Sensors, Wi-Fi.

ARTICLE INFO

Article History

Received: 8th March 2020

Received in revised form :

8th March 2020

Accepted: 10th March 2020

Published online :

11th March 2020

I. INTRODUCTION

In India, the population has been increasing day by day so due to increasing population the needs of basic survival is also been increasing. One of such need is water. Currently human society is facing a major problem which is water scarcity. Due to this borewells are dug to meet the need of daily life. But after meeting the daily need of life the borewell are been left uncovered which can be fatal for the life of the child. Due to not properly closing of borewell unknowingly small children fall into it and get trapped.

Taking an overlook at the statistics it says that in the recent years more than 30% deaths took place by getting trapped in the borewell. And the number suggests that around 91% victims are under the age of 10.This fatal life trap came into highlight in the year 2006, when a small 5 year old kid named Prince fell into borewell and was lucky enough to get rescued by the Indian Army experts after the rescue struggle lasting up to almost 49hrs[3]. This didn't stop here yet.Again the same tragedy took place in Village Adsar Rajasthan (Bikaner district) in the year 2007 on 7th April where a small two year old girl named Sarika lost her life by falling into a 155-feet deep open borewell. On July 4,2007 in village Nimada (Jaipur, Rajasthan), Suraj a six year old lost his life when he fell into an uncovered borewell 180-feet deep[5]. A two-and-half-year kid unknowingly fell into 300-foot borewell left uncovered in Vellore, Tamil Nadu[2].These uncovered and unattended borewells had become death pits for many of the younger children. But saving the child from the borewell is a very challenging and risky process. Even though if people notice a victim trapped inside the borewell it takes 20 to 40 hours to rescue them by conventional method[4]. The holes dug for the borewell are approximately 800 feet deep[1].Many died due to lack of oxygen and the longer duration required for the rescue, even if rescued late it resulted into death or severe injury which also resulted in waste of time and money. As the pits are very deep the pitch darkness results in panic situations and makes the rescue more difficult. The most common thing in these incidents was lack of technology. In order to solve and

overcome such kind of situation and incidents the rescue system has been designed to save the child and is named as “SMART BOREWELL RESCUE ROBOT ”

Fig.1: Image while rescuing the child from borewell

II.BLOCK DIAGRAM OFPROPOSED SYSTEM

The main aim of designing this system is to help the child to get rescued from the borewell. The main components used here are: AT mega328, Temperature sensor (LM35) to sense the temperature inside the borewell, Ultrasonic Sensor (HC SR-04) to sense the depth and Gas sensor (MQ-5) to sense harmful gases inside the borewell. ATmega328 is a microcontroller which is used for controlling the movement of arms and measurement of sensor parameters. Camera (IP camera of cell phone) is fitted inside the robot and connected to the local machine through Wi-Fi. So that the live footage can be clearly seen on local machine. The Wi-Fi module will be giving input to the controller this Wi-fi would be taking input from the mobile phone.

Temperature sensor is being used for sensing the temperature inside the borewell it will sense the temperature. Ultrasonic sensor is used to measure the depth of the borewell. Gas sensor will sense the gases in the borewell and the gas leakage in particular area. There are three DC or servo motor driver which controls the arms of the rescue robot.

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 borewell. This clamps the whole system firmly to the borewell wall. The 1st motor placed below the plate turns the bottom shaft by 360 degrees, thereby helping to locate the gap through which the lifting rod passes. This is done with the help of a wireless camera attached to the lifting rod. Once the gap has been located, the 2nd motor adjusts the radial distance of the lifting rod. When the diameter is adjusted, the 3rd motor helps the lifting rod to screw its way through the gap towards the bottom of the child. Once the lifting rod reaches a safe position under the child, an air compressor is operated to pump air to the bladder attached to the end of the lifting rod through an air tube that runs downwards inside the lifting rod. When the child is secure, the lifting rod is contracted to its maximum position.

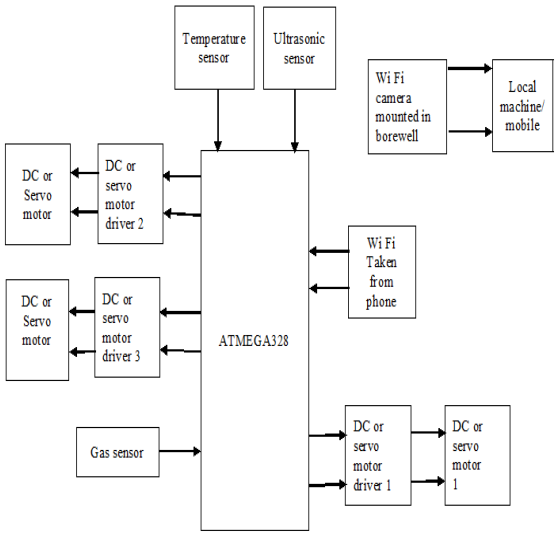

Fig.2: Block diagram of system

III. HARDWARE COMPONENTS

1. AVR(ATmega328):

AVR is a family of microcontrollers developed by ATMEL acquired by MICROCHIP TECHNOLOGY. These are modified HARVARD architecture 8bit RISC single chip microcontrollers. In this the program and data are stored differently.

Fig.3: AVR(ATmega328)

2. Ultrasonic sensor (HC-SR04):

An ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measure distance by sending out a sound waves at a specific frequency & listening for that sound waves to bounce back. By recording the elapsed time between the sound wave being generated and the sound waves bouncing back, it is possible to calculate the distance between the

Ultrasonic sensor and the object. It senses obstacle around and also gives distance of obstacle in cm.

Fig.4: Ultrasonic sensor(HC-SR04)

3.Gas sensor (MQ-5):

A gas detector is a device that detects the presence of gases in a area, often as a part of a safety system. This type of equipment is used to detect a gas leak or other emissions and can interface with a control system so a process can be automatically shut down.

This is a simple-to-use liquefied petroleum gas (LPG) sensor, suitable for highly sensing LPG (composed of mostly propane and butane) concentrations in the air rather it is less sensitive to alcohol and smoke. The MQ-5 can detect gas concentrations anywhere from 200 to 10000ppm. It can be used in gas leakage detecting equipment in consumer and industry applications, this sensor is suitable for detecting LPG, iso-butane, propane, LNG. This sensor has a high sensitivity and fast response time almost<10s. The sensor's output is an analog resistance.

Fig.5:Gas value in terms of pp

4.Temperature sensor (LM35):

LM35 series are precision integrated circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature. The device has an advantage over linear temperature sensors calibrated in Kelvin.

Fig.6: Temperature value in terms of deg C

5. DC Motor:

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. In this project we are using DC motor to move the vehicle from one place to other to sense the required parameters.

Fig.7: DC motor

6. Motor Driver:

Motor driver is used to amplify a signal. The IC used in the motor driver is L293D and the voltage rating for the motor driver used is 12V. It is mainly used to take low current signal as an input and send the high current signal as an output.

IV. FLOWCHART OF THE SYSTEM

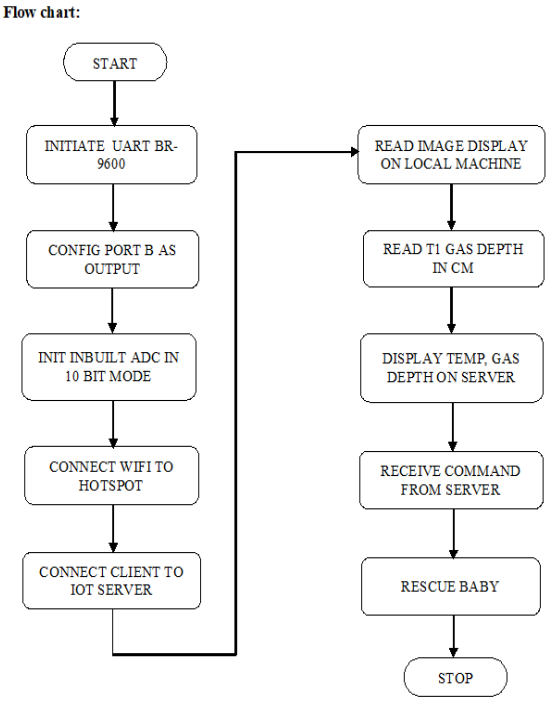

Fig.8: Flow chart of the Proposed system

V. DESCRIPTION OF ROBOTIC SYSTEM

The robotic system is mainly divided into three parts.The first part is the middle block which connect to all other parts and support the component placed on it. The middle block is nothing but a wooden block on which four wheels are placed which are driven by motor and the motor are coupled to the pinion gear.

The next part mainly consist of two U shaped block in which the motor are mounted and are coupled with wheels on one side. The rack and pinion mechanism is used for expansion and contraction of the robot. The last part consist of robotic arm which are placed on a rod that is connected to the middle block. With the help of servo motor the robotic arm are actuated. the robotic arm will work on the commands given by the operator. The Ultrasonic sensors are mounted on the block they are placed before the wheels i.e in between the wheels at the end of the wheels. The Ultrasonic sensor will get us know the depth of the bore well. Temperature sensor and gas sensor are mounted on the middle block and they will be in position to sense the harmful gases and temperature inside the bore well. A camera module is also mounted on the middle block which will help us to get the live footage. Camera (IP camera of cell phone) is fitted inside the robot and connected to the local machine through Wi-Fi, as it will connect to the server fast without any delay. As the bore well gets the deeper the environment inside the bore well will be completely dark so bulb(light) will also be attached to the robot provide efficient light.

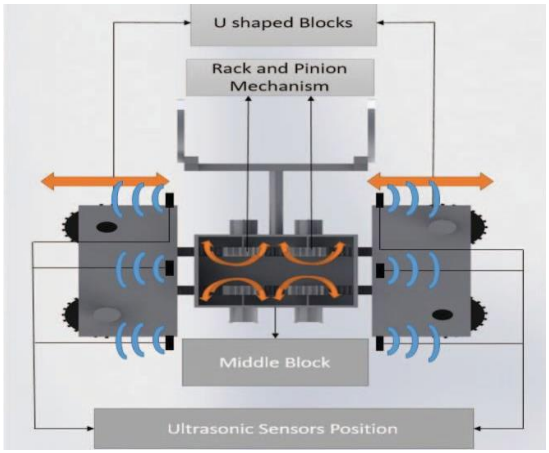

Fig.9: Front view of the Robotic system

Fig.10:3D Model of the system

VI. CONCLUSION

The proposed system is in position to rescue the victim from the borewell safely and in less span of time. By using motor drivers and rescue arms, advanced technology and live streaming rescue operation is done more successfully. In addition the system consist of three rescue arms which provides better grip for the victim. With the help of live streaming on local machine the system will know about the movements that take place inside the pit .This system is used to reduce human efforts for rescuing operations in less time.

REFRENCES

[1] Seeram Srinivasa Rao, Nagula Srikanth, “Modelling and Analysis of Borewell Rescue Robot using Haptics and Lora Technology.” International of Innovative Technology and Exploring (IJITEE). ISSN: 2278-3075, May 2019.

[2] S. Arthika, S. C. Eswari, R. Prathipa and D. Devasena, "Borewell Child Fall Safeguarding Robot," *2018 International Conference on Communication and Signal Processing (ICCSP).DOI:0.1109/ICCSP.2018.8524550.*

[3] P. Sumathy, A. Monika, R. Dhanashree,”Smart and Safe Child Rescue System” International Journal of pure and applied mathematics, Volume 119 No. 15, 2018, 861-865.

[4] N. M. Kurukuti, M. Jinkala, P. Tanjeri, S. R. Dantla and M. Korrapati, "A Novel Design of Robotic System for Rescue in Bore well Accidents," *2016 International Conference on Robotics and Automation for Humanitarian Applications (RAHA)*, Kollam, 2016, pp.1-5. doi:10.1109/RAHA.2016.7931875

[5] M. Raj, A. Bansal, A. Makhal, P. Chakraborty and G. C. Nandi, "An Approach towards Rescue Robotics in Bore well Environment," *2014 International Conference on Communication and Signal Processing*, Melmaruvathur, 2014,pp.1097-1100. doi:10.1109/ICCSP.2014.6950017.

