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REAL TIME CHILD RESCUE SYSTEM FROM BOREWELLS WITH MANUAL STEP RELEASE SYSTEM

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Abstract – Nowadays the number of victims of open borewell has increased even though many awareness has been given. Many new innovative techniques have evolved to conduct effective and safe rescue operation as a replacement for the traditional methods which does not guarantee for successful mission. In this project, a new method has been introduced for a practical, safe, time saving rescue with less manpower. Here the system utilizes the associated work of wireless technology with mechanical setup for the rescue. Various technically efficient gadgets are combined in the setup. To ensure the medical safety of the victim the system has been aided with oxygen supply and water sprinkler along with many sensors to detect temperature, heart beat and presence of gas.

Keywords- Borewell rescue, wireless, sensors, oxygen supply, medical safety.

I INTRODUCTION

In recent times water scarcity is getting evolved as a big crisis and this leads to the construction of borewells in many areas. After a period of time the borewells also gets dried up and left unnoticed. Although many awareness programs and strict rules are forwarded by the government to close the open borewells people have converted the borewells as a death traps due to their lethargic behavior. Mostly the victims are small children and animals as the diameter of the hole will be small. Surveys have revealed that most of the victims are found dead during the process or at the hospital immediately after the rescue.

The rescue operation will be a tedious and dangerous process for both the victims and the rescuer. The common method used for rescuing is the process of digging a hole parallel to the borewell with larger diameter for the rescuer to get inside with the safety measures. The depth of this hole will be based on the level at which the child is trapped. Reaching that level, a horizontal tunnel will be made towards the position of the child and through this the child will be saved. But this process will be time consuming as it may take several hours for digging and the survival of the child until then will not be possible. This parallel hole process will also be dangerous as this may cause further slide of the child as heavy machineries are involved.

The medical condition of the victim will become critical as they would have struck deep down without enough light, oxygen supply, food, water etc., further the temperature, pressure and gas present inside the pit may become hazardous to the child's health. As the victims are of small age these factors would make them weary and leads to their death during the rescue operation. While pulling up the child the harness, hooks or other equipment may cause further scratches or wounds and it may even pull them down if it is not placed properly. This will create further crisis to the situation. To overcome all these hurdles many new methods

and techniques have been adopted for this rescue operation. One such method involving various techniques of rescuing is combined and described in this paper. This method is aimed to resolve most of the difficulties involved during the rescue process.

II LITERATURE SURVEY

Shivam Bajpai et al., 2017 [1] suggested a alternative method to save children who got trapped in borewell. The traditional way of digging parallel hole near the borewell is replaced by using robotic system in the borewell itself. The system is designed in such a manner that it gives pre-treatment for the child while rescue operation is being carried out. The setup consists of 3 mild steel rods positioned in triangular form with pulley, hanging disc operated by D.C motor, VGA camera and hanging balloon arrangement. Using this arrangement, the child will be safely rescued by the team without consuming long hours and large amount of manpower.

Here, Sara Anjum et al., 2018 [2] described about a procedure to provide assistance for the victims of open borewell. Here instead of conventional methods the modern system is adapted using Delta robotics, which is familiar for its high-speed potency along with temperature sensor and wireless camera. The experimental setup provides good result with respect to time consumed.

Surya Saravana Pandiyan et al., 2018 [3] devised a prosthetic rescue robot which can be used for different types of rescuing tasks. Here the PBRS system is accompanied by multiple sensors for the safe rescue of the victim. This system with mild modification can also be used for detection of fissures or breaches in boilers, pipelines etc.,

Nitin Agarwal et al., 2019 [4] have designed a system that involves manual operation to rescue a sufferer from a borewell. The system uses a robotic module with camera and teleoperation system. Along with the robotic arm the setup is equipped with LED light, live streaming camera and mic for interaction with the victim.

Prakash Bethapudi et al., 2019 [5] developed a structure to save the lives got struck in borewell. The system has a sensor over the borewell to sense and produce alarm sound if anyone got slipped into the borewell. Eventually it also sends alert message to the people concerned and emergency numbers for rescue. This is an automated system which has a carrier fixed at 5 feet inside the pit to lift up the victim once the fall was detected. This carrier was furnished with soft cushion, light and toys for the safety and comfort of the kid rescued.

In this paper, Sriramireddy et al., 2020 [6] has studied about various types of techniques involved in the rescue of the borewell victims. The different kinds of hurdles and rectifications present in the process of identifying and lifting the victims and are also discussed here.

Aravind N Kaimal et al., 2020 [7] proposed a method which combines multiple techniques in the rescue operation of children trapped in borewell. Here they combined the function of robotic arms along with camera and sensor detections for the rescue task. The robot was directed about the child's position based on the results obtained from camera. Then it would be extended towards the child and upon reaching the child it positions itself using protective casing. Using balloon technology, the child is safely landed over the balloon cushion which would be extended to raise the child and to avoid further falling. Next the whole system would be lifted up along with the victim above the ground level. This method's prototype was successfully implemented and found to give satisfactory results.

III PROPOSED SYSTEM

To design the proposed system some facts and features as mentioned below are considered to acquire the expected outcome.

- First thing is it should be portable, simple and should consume less time for the process to get complete as it is related to the survival chance of the victim.
- It should periodically check and provide the required life supporting essentials to the victim for live rescue.
- The lifting up process of the victim from the pit should ensure safety of the survivor and must avoid further fall.

This proposed framework is a smart child rescue system which combines wireless technology with image processing and embedded system to minimize expensive resources, manpower and time. The following elements are assembled to construct the system. The following fig 1 shoes the block diagram of our proposed system.

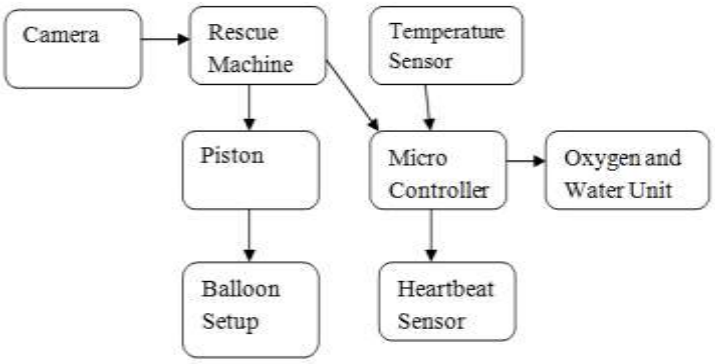

Fig 1: Proposed System Block Diagram

Mechanical elements:

It consists of robotic arm to go through the pit to reach the victim. This arm will be operated by the motors and gears setup. This setup is use to fix the arm through rope drive in a stable spot, rotate it according to the position of the victim and grasp them by either using power grasp or precision grasp tools.

Imaging tools:

A digital camera unit along with a light source is connected with the robotic device when it is lowered inside the hole. This camera unit is used to capture all the visual data and this signal is transferred using suitable software to the monitor setup placed in the ground level. Based on the data obtained the further instructions will be followed in the process. This also streams audio signals along with video signal between the pit and ground.

Sensors:

Along with the audio-visual sensors some other sensing elements are used to observe and monitor the victim's health condition. As the victims are children this abandon situation will disturb their mental and physical health. So close monitoring of their health status is important. Hence the following sensors are used in the system: **Temperature sensor:** This sensor is used to measure the heat or chillness present inside the pit. Some of this type includes thermocouples, infrared radiators, thermistors etc.,

Heartbeat sensor: This is used to monitor the rate of heart beat of the victim using he LED present in the sensor. The amount of light reflected back from the LED light when passed through the skin determines the heart rate.

Gas sensor: Usually dangerous gases will be present inside earth's surface after certain level. This sensor is used to sense and measure the presence of hazardous gas concentration in the hole.

The information collected by the sensors are transferred to the controller board of the system. Based on this information the necessary rectification steps will be provided.

Oxygen and Water supply:

When the presence of oxygen in a region goes beyond 18 % it will lead to suffocation and will make breathing difficulty which will eventually disturbs the operation of other parts of the human body. So, an oxygen concentrator is included in the system which will automatically monitor the level of oxygen present in the hole. Based on the results oxygen will be pumped into the pit using the oxygen tube inside the borewell for stabilizing the child's breathing status. A water sprinkler is also attached along with the oxygen concentrator to provide humidity to the environment and avoid dehydration of the victim.

Safety Balloon:

Once the robotic arm is set to grip the child in correct position, the safety balloon which is in deflated condition is slipped below the child through the gap present between the child and wall of the tunnel. Once it comes under the child it is inflated using air pump with non-return valve to provide a cushiony seating to the child. This balloon is used to avoid further descending of the child during the rescue.

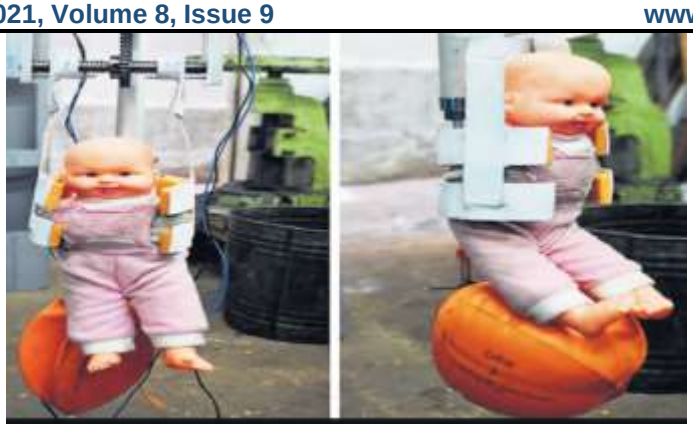

Fig 2:Expansion of safety balloon

Working Principle

Initially the dimensions of the borewell have to be calculated to lay the setup. It will be ranging between 4.5 inches to 9 inches. Based on this value the device will be erected above the pit. Here the conventional method of parallel digging is avoided to consume time and the rescue process will be carried out in the same pit. After the fixation of mechanical instruments, the robotic arm along with all the required gadgets will be lowered inside the pit based on the visual data provided by the camera. Based on the information obtained by the images captured, the instructions will be given to the device by the controller. Once the position of the victim is detected the actuation of the fixing parts are done. Meanwhile based on the data carried by the sensors all the precautionary measures will be carried out. The required amount of oxygen and water supply will be provided to energize the child until the completion of the operation. The audio system present in the device is used to stable the mental health of the victim by making interaction with them. When the robotic arm is properly placed to hold the child in a comfortable position the safety balloon will be released below the child to avoid falling and grip the child's posture. Using the lifting rod, the child will be taken out of the hole gradually following the controller's instruction from the ground. Once the child is lifted above the ground immediately the first aid process will be rushed up. The entire process of rescue will be caried out using Embedded C programming language and executed using MP lab IDE.

IV RESULTS AND DISCUSSION

In this chapter let us discuss in detail how our machine works. The following fig 3 represents the proposed machine made of strong iron with step fabrication which will help in rescuing the child of weight 12Kg to maximum 15Kg in real time situations.

Fig 3: Rescue Machine

The following fig 4 represents the output of the two sensors namely Heartbeat sensor and Temperature sensor that we are using in our rescue machine.

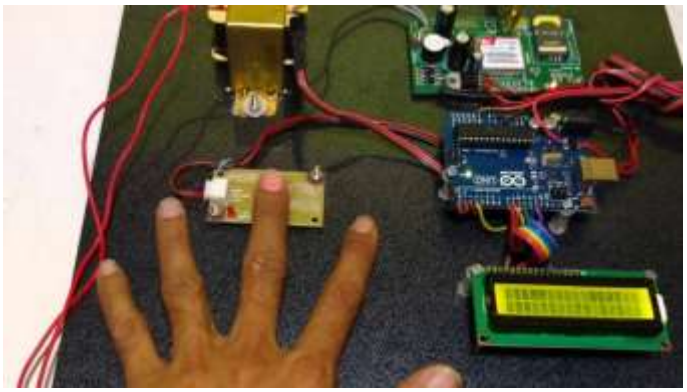

Fig 4: Heart beat and Temperature Monitor

IV CONCLUSION

Objective of this paper is to develop a potential model which helps to rescue a victim alive from unnoticed borewells. The demerits of the traditional methods are controlled by this method in terms of minimal time, resource management and cost efficiency. Here various techniques are combined together for effective functioning of the system and to reduce human efforts.

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