RESCUE SYSTEM FOR MANHOLE AND WELL

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ABSTACT

In present world man has witnessed a tremendous change in technology right from invention of wheel to greatest architecture. But during these evolution man has also faced many problems and tried to solve it, one of problem is drainage system.In many places of the world there are open manhole , wells, borewells etc. There were many accidents reported in over the period of last few decade. Sometimes these are children and sometimes it's workers etc. In developing countries like India there is more need of better system and protocol to handle the situation. Current system used is more time and resource consuming, life is at stake here. Robotics an automation has made an tremendous impact on the human life. Time and labour for any process has reduced significantly because of automation. Our proposed system is more economical ,safe and less time consuming. The design process of this project has started from research, survey, modelling, analysis and fabrication of the project is made. 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.

Keywords: Drainage system , manhole ,accidents, automation, servomoters.

INTRODUCTION

Water is one of the precious gift given to us by the nature. The human as well as every life on earth depend on water. It is our responsibility that we should use water carefully. Water management is a greater task for today developing and growing world. Global warming is one of major concern for todays environment. In developing countries like India, srilanka, Bangladesh etc, even today water resource management is not fully perfect. Drainage system is still not developed in many parts of India Many non functional manhole, wells, borewell etc are left open. In India almost 70 % of people occupation is agriculture many wells are digged for ground water extraction. Many holes are fully closed because of which many cases are reported in the recent years.. Increasing of bore wells in that particular area causes more groundwater stress which results in the bore will be dried up. In most of the cases, children are victim of falling in the borewell, manhole and many children died due to these kind of accidents. Therefore it is as responsible citizen our duty to put pressure on the local authority to atleast cover holes so the number of accidents could be reduced. Apart from that the process of rescue is also time consuming and less effective. The SOP (standard operating procedure) is followed during the rescue of victim. It is reported that sometimes it tooked about 4 days to rescue the victim. In recent some years field of Automation has grown exponentially. We have tried to make use of these automation to the above discussed problem although it is a difficult task, a person life is at stake here.so our proposed model uses different types of sensors and actuator to monitor and rescue operations. Sensors like gas sensor , Ultrasonic sensor, temperature sensor are used for different sensing operation such as finding the position of the victim, identification of oxygen and other gases in the man hole. Different force analysis has been done in the system so that the a parameter upto which the system will work can be found.Servo/stepper motor can be used because of its efficiency and economic point of view. Different wireless camera with inbuilt mic and speaker will be used for monitoring. Flash light is provided for visual and a screen is used monitoring.

NEED FOR RESCUE SYSTEM

1. To reduce the man power required.
2. Safety of persons is the utmost priority.
3. An economical approach is required so the system can be easily available to everybody.
4. Many accidents were reported during the past few years.
5. There is a need for monitoring and oxygen supply.
6. Implementation of automation in the rescue system.
7. Implementation of IOT(internet of things)in the whole rescue process
8. Time is crucial in the whole rescue process
9. Communications during the rescue process needs to be improved

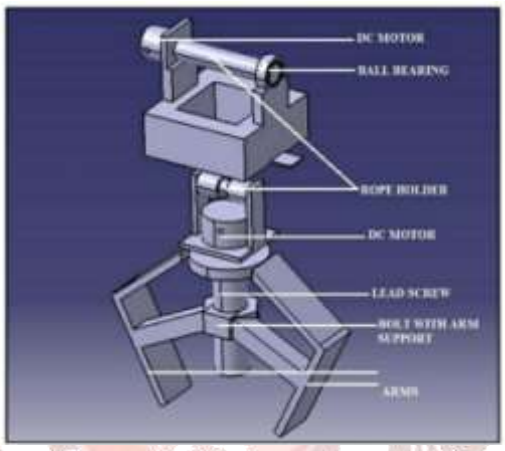

FIG.1.EXISTING SYSTEM PROPOSED BY RESEARCHER

LITERATURE REVIEW

1. Mohith Kurukuti, Mahesh Jinkala, Purushotham Tanjeri, Somasekhar Reddy Dantla and Mallikarjuna Korrapati, "A Novel Design of Robotic System for Rescue in Bore well Accidents" International Conference on Robotics and Automation for Humanitarian Applications (RAHA), 2016. According to this paper the rescue robot made by the team will adjust as per the sizeof the borewell i.e diameter can be adjusted. The artificial arm are provided to rescue the victim and visualization is done with the help of camera. The whole model was made by 3d printing and tested.

2. Kavianand. G, Gouri Ganesh K, Kartikeyan, "Smart Child Rescue System from Borewell" IEEE, 2016. In this Paper they have designed a new system in which at the top of a borewell a sensor has been kept that helps to sense the child if he/she fell inside. This paper outline the major use of the sensor available in the system. The sensor which sense the distance between the child and the surface. The system also alerts if the person is stuck and gives the location to the concern person. They have design this smart child rescue system to save efficientlythe victims.

3. Yong yang, Guiyun Xu, "Parent Child Robot System for Rescue Missions", International Journal of Pure and Applied Mathematics, 2016. In this paper they have described a robotic system which consists of parent robot, a tracked child robot and a legged robot. The effort has been made to make the system flexible enough to save the the person. Different parameters are measured and technology is used. A legged robot is used in this system, which has superior ability of adaptiveness according to the condition. This system is bit costly.

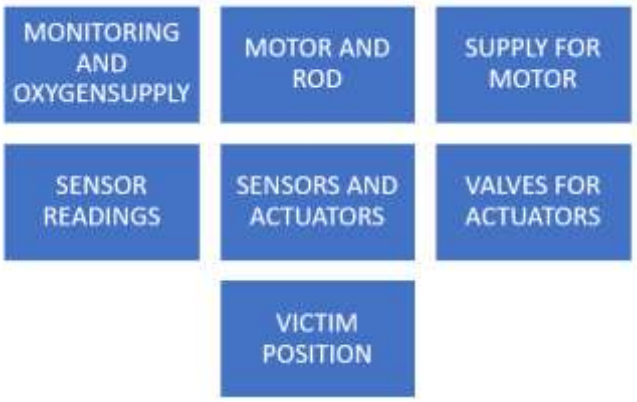

FIG.2.PROPOSED SYSTEM

CONSTRUCTION OF SYSTEM

Our system comprises of mainly four sub system

COMPONENTS REQUIRED

FIG.3.WIRELESS CAMERA

1. CAMERA: A wireless night vision camera is employed to visualize the position of the child trapped in the bore well.

FIG.4.SERVO MOTOR

2. SERVO MOTOR: MG996R servo motors are using which each motor can resist 10 kg torque as shown in fig. Five servo motors are using in these robot first one for rotating the circular disc and second one for controlling of thumb finger on left hand, third one for controlling of rest four fingers with one D.O.F on left hand, fourth for controlling of thumb finger on right hand, fifth for controlling of rest four fingers with one D.O.F on right hand. The servo motors consist of three wires Red is for power, yellow/white is for signal and black/brown is for ground.
3. Solenoid Valve: A solenoid valve is valve used to operate the actuator different type of valves are available such two port, three port etc.

FIG.5.PNEUMATIC GRIPPER

4. Robotics Arms: A Robotics Arm is a type of mechanical arm, usually programmable, with similar functions to a human arm: the arm may be the sum total of the mechanism or may be part of a more complex robot
5. Microcontroller: A microcontroller is a small computer on a single integrated circuit consisting of a relatively simple CPU combined with support functions such as a crystal oscillator, timers, watch dog timer, serial and analog I/ O etc. icrocontrollers are also used in scientific, high technology, and aerospace projects.

RESEARCH METHODOLOGY

1. Step no. 1: The first step involves setting of rescue system at the location. Proper judgement and knowledge is required at the moment. Proper power supply and space should be selected.
2. Step no. 2: After the system is set now comes work of sensors. First ultrasonic sensor should be used to measure the distance and find out is there any obstacle in between.
3. Step no. 3: Temperature and humidity sensor should be used to detect temperature, oxygen, humidity or any dangerous gases are present.
4. Step no. 4: Now since all sensor work is done person should be monitored and information about the victim should be gathered as much accurate as possible.
5. Step no. 5: Now the motor should be started and slowly the arrangement of gripper should be taken towards the victim. Once it is at appropriate position the pneumatic gripper should be operated accordingly.
6. Step no 6: Once the person is attached now the motor should be operated accordingly and the system should be pulled up.

SAFETY PRECAUTIONS

Safety of the person, operator, equipment, system and environment is most important. Since many crucial equipment are used in these system, therefore their proper handling, use, maintainance and Safe storage is an important aspect. The following rules to be followed.

1.For motor: Proper installation should be done , current supply must be checked whether it is according to the standards .Ensure proper connection to the shaft. Different parameters like vibration should be checked.

2.For operator: Safety helmet, gloves, shoes, tools should be weared by the operator during the operation.

3.For sensor : Different sensors are used in the system which needs to be operated the skilled operator. Proper calliberation of the different sub system is need time to time.

4.For bearing and rod: the lubrication of bearing and the rod and shaft should be done at frequent intervals so that it work properly and do not corrode since it is rotating element.

5.For victim: There should be proper monitoring of the person trapped,

Such as position of person, oxygen level in manhole, identification of different hazardous gases etc. Supply of oxygen, light, food should be provided during the rescue process

SCOPE AND FUTURE WORK

1. Better meshing can be configured to the borewell so that could be option for a person to climb.
2. Problem regaurding manhole and borewell should be monitored and solved by the local authority so that there will less accidents
3. Innovation in the use of sensor can be more effective in the rescue system.
4. Use of better actuator and motor drive could lead more cost effectiveness.
5. Robotic technology can be used where human being cannot enter e.g harmful areas
6. Airbag should not be restricted only in the vehicle it should be used in different field too
7. Indicator of danger reguarding the borewell should be provided to alert the people.
8. This system can come in handy for fire services.

FIG.6.ROPE

CALCULATION

.1 Double Acting Pneumatic Cylinder

• Stroke length : Cylinder stoker length 160 mm = 0.16 m

• Quantity : 1

• Seals : Nitride (Buna-N) Elastomer

• End cones : Cast iron

• Piston : EN – 8

• Media : Air

• Temperature : 0-80 º C

• Pressure Range : 8 N/m

2 Design of Piston rod::Piston Rod Load due to air Pressure. Diameter of the Piston (d) = 40 mm

Pressure acting (p) = 6 kgf/cm²

= 6 ×0.981 = 5.886 bar

= 0.5886N/mm2

Material used for rod = C 45 (data book page no 1.12)

Yield stress (σy) = 36 kgf/mm²

= 36×98.1

= 3531.6 bar

= 353.16N/mm2

factor of safety = 2

(data book page.no 8.19)

force acting on the rod (F) = Pressure x Area

= p x (Πd² / 4)

= 0.5886 x {(Π x 40²) / 4 }

F = 739.6N

Design Stress(σy) = σy / F0 S

= 353.16 / 2 = 176.5N/mm2

∴d = √4F/π [σy]

= √ (4×739.6)/ π[176.5]

∴diameter of rod required for the load = 2.3 mm

We assume diameter of the rod = 15 mm

3 Rope: Specifications:

Diameter: 1-10 mm

Length:50-100m •UIAA

• According to UIAA standards, required type of rope is selected

.4 Camera: Specifications

C170 webcam Video Capture:

up to 1024x768 pixels Photos:

Up to 5 mega pixels

CONCLUSION

From the results obtained about the project by different test results and by the literature review available it can concluded that there is a need for new system and procedure because time and resources are precious. Development of rescue system is difficult task and implementation of such system may not be accepted today

but with the advancement of technology especially in the field of robotics and automation, these types of system will be accepted in future, a great e.g is china they are using robotic police officer. . Sensors used in the system can predict much accurate result. Conditions can be predicted at much faster rate . The proposed system is much economical compared to the conventional method. The rescue system is less time consuming as it 3-4 days to rescue in the conventional method but use of automated system can save the most precious time. Many manpower and used in the conventional method and there is gap in communication between the authorities which is why many deaths were reported during the span of last 5 years use of latest technology can save many lives. Sufficient supply of oxygen is given due to the use of various sensors. IOT system should be implemented for better communication. Live feeds gives better visualization. The controlling of the vehicle and the rescue robot is highly sensitive that makes it possible to reach to high depth as soon as possible and handle the human child without hurting. The outlook of end effecter of the rescue robot is design in that way that it should not threaten the child or it should appear friendly to the child.

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