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Bore Well Rescue Robot

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Abstract- Recent incidents in the system which may be of naturally occurring or because of human interaction, which are smaller in size but have greater impact. Reflecting the same we had found a hand full of problems and picked one among them i.e, getting back the infants/babies alive, who fall in open dry wells using technological subjects. Considering the design, manufacturing attributes and merits, demerits, we are preparing a model to rescue them. By this, we are making an attempt to reduce the efforts of rescuers and decreasing the processing time. BOREWELL ROBOT RESCUER – its working depends on wire less Zigbee control which communicates between microprocessor and PC. Using coding which is dumped in the microprocessor we control the motion of the arm. Considering the tension in rope/wire the weight to be lifted is limited.

Index terms – Zigbee module, microcontroller, driver circuit, motors.

1. INTRODUCTION

In the present scenario because of negligence and with the added laziness, people are not doing their duty correctly. One such scenario is observed in borewell cases in which infants/children fall in dried up wells and lose their lives. A small solution gives a non- technological answer that is by closing borewell, but not happening because of the above-explained reason(negligence). So, we thought of a technological solution which helps in taking up the child who fell in borewell without any injury. Here we use a wireless technology along with mechanical equipment to rescue the baby from the borewell.

2. LITERATURE SURVEY

For various compositions the stages involved in hand lay-Survey unveiled following mentioned information.

a) Only theoretical methods are present.
b) Rescue teams dig parallel to the bore.
c) Out of 57 such incidents from past 10years which comes into life, only a few were rescued alive.
d) Even though the bore is of max depth(>400mts)s, children are being struck below 250 mts depth.
e) Points to be considered are pressure and temperature and gases.
f) Mainly observed near industrial allotted lands.

3. PROJECT OBJECTIVES

- To protect the child safely
- To make it used by unskilled labours
- Should be available cheaply

4. REQUIREMENTS

Micro Controller, Regulated Power Supply, DC Motor with a driver, USB Camera, High power LED with a driver, Crystal oscillator, Reset button, LED indicators, Zigbee modules.

5. PRODUCT DESCRIPTION

The below schematic diagram of BOREWELL RESCUE ROBOT explains the interfacing section of each component with the microcontroller, L293D, and ZigBee. Crystal oscillator connected to 9th and 10th pins of the microcontroller and regulated power supply is also connected to the microcontroller and LED's also connected to the microcontroller through resistors.

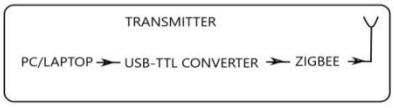

Fig.1 – Transmitter

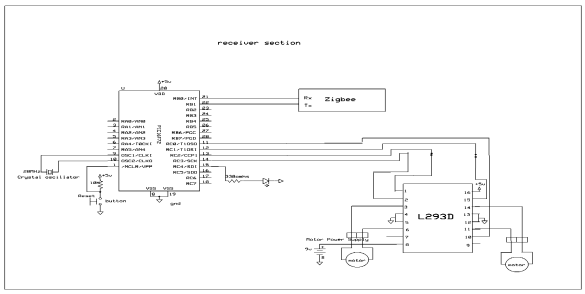

Fig.2- Receiver

5.1 Working

There are a transmitter and a receiver. This transmitter is connected to ZigBee module and that to laptop. And the receiver is on the other side. This section is shown in the previous page schematically. When the code is given in the laptop transmitter transmits the signal and the receiver takes the signal and acts accordingly to the signal. There is a total of 6 degrees of freedom in the whole mechanism. Firstly, the up and down motion secondly, clockwise and anti clockwise motion and finally the gripper open and close. There will be a camera attached to it. According to the infant's position in the well the robotic gripper can be manipulated. And accordingly, the infants can be saved.

5.2 Design

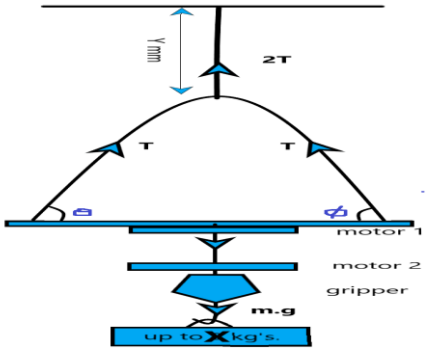

Fig.3 Free body diagram

5.3 Denotations

s.no	Format symbol	Description
1.	ɵ,ϕ	Angles = 60 degrees (from construction)
2.	g	gravity constant = 9.81 m/s2
3.	x	mass of the body to be lifted in kg's
4.	m	mass of gripper, 2 motors, gyroscopic parts and connecting shaft = 1.3 kg (from construction)
5.	T	Tension force in Newtons

Thread used: silicon thread
Strength of thread: 6 kg/m2 upon gradual load lifting.
Note: from construction means measurements considered from proto modal.

5.4 Calculations

Here to maintain equilibrium, the sum of upward forces equals the sum of downward forces.
Upward forces include: 2T, Tsin(**ɵ**), Tsin(ϕ)
Downward force include : m.g, x.g
Considering ɵ=ϕ =60 degrees (since **1**)
According to equilibrium ,
2T+Tsin(ɵ)+Tsin(ϕ) = m.g+x.g ➔(A)
2T+Tsin(ɵ)+Tsin(ɵ) = m.g+x.g (since **1)**
2T+2Tsin(ɵ) = m.g+x.g
2T(1+sin(60)) = m.g+x.g
(since **1**)
2T(1+0.86) = g(m+x)
3.72T = 9.81 (1.3+x)
T = 2.63 (1.3+x) ➔ **(B)**
From the equation (B), T changes as x changes.
Depending on the mass of x tension in the wire\rope changes.
From the whole, varying parameters are :

a) X (kg)
b) Tension (N)
c) Y (mm).

For example,
Taking x as 4 kg's, we get

T = 2.63(1.3+4)
T = 13.93 N

Taking x as 10 kg's, we get

T = 2.63(1.3+10)
T = 29.71 N

But for the proto modal made x is limited to only 5 kgs.
Then, the tension in a thread is T=2.63(1.3+5)
T = 16.56 N.
The thread breaks when T<= 2.63(1.3+x)

5.5 Previous methods used

There is only one successful method which is digging the pit parallel to the dry well. There are even many kinds of research going on to rescue the child safely.

Fig. 4 Prototype model

5.6 Project url:
https://drive.google.com/drive/folders/1N2lZmggmwdQUhQb3K-E2YAw8kvacgkic?usp=sharing

5.7 Result

The results we obtained while testing the proto model is excellent. The result(video form) is shared in the above link. Required design calculations also satisfy the photo model. Therefore this well-designed working structure is capable of handling and securing the baby.

5.8 Advantages

a) Arm control by wireless ZigBee.
b) Un-skilled labor can also operate

c) Low power consumption.
d) Low investment
e) Live Audio and video can be seen in PC

5.8 Disadvantages:

- User is sensitive.
- System overheating for prolong usage
- Need to be checked regularly.

5.9 Applications

- This can be used even for lifting animals which fall in holes/wells.
- This is the example of a pick and place robot.

6. CONCLUSION

Because of some people, carelessness or someone's laziness, the dried up borewells are kept open and children playing in that surroundings fall into those wells. A few children survive but a majority won't even after struggling for a couple of days. To rescue children from death we thought of an idea of BOREWELL RESCUE ROBOT– It is a multi-disciplinary project which serves the need of people, whenever infants or babies fall in borewell.

So, considering our design calculations if we prepare a real-time project we can rescue the babies easily with least expenditure and in less time. The rope which is considered in design calculations should be replaced with high tension rope. Considering the tension equation we have to proceed.

$$T <= 2.63(1.3+x)$$

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