WIRELESS ROBOT FOR RESCUE OPERATIONS

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Abstract— In this paper, an attempt has been made to implement a robot which can move its way down to the bottom of a bore well in order to rescue a child or to inspect a broken pipeline. When a village is dried up by drought, they dig up pits in the grounds, in search for water and when the water resource is dried or polluted, they take out their pipes & equipments and leave the bore well uncovered, which in turn increases the rate of children falling in it. Our paper aims to review a multipurpose robot which can be used to do a variety of tasks like, Rescue operations', Inspection of Pipelines, Measuring depth of a pit, etc. The sensor systems are interfaced with the ARM8 processor. A camera along with an LED light is used to visualize the victim as well as it helps to operate the system by control unit. The vacuum cup is used to adjust the child position. The arm movement of the robot is controlled by stepper motor. Once child is perfectly picked by robot, DC motor is used to lift up the child from bore well. The ZigBee plays a vital role in data transferring between the victim in the bore well and the recovery team in earth surface.

Index Terms— ZigBee, ARM8 Processor, Sensors

I. INTRODUCTION

In current scenario, the rate of many children falling in bore well is increasing. These accidents are mainly happening due to carelessness or playful activities of the children. Moreover, most of the bore wells are drilled and leaved open without any proper coverings. When a child falls into the bore well, the existing rescue operations are too risky and it becomes far too difficult to help the rescue team members as well. In existing system, a big hole is dug parallel to the bore well up to the depth where the child is stuck. This process requires a huge amount of human resources (military, Para medical, etc.) and machinery (JCBs, Tractors, etc.). A small delay in the accumulation of resource may reduce the chances of saving the child. If the area beside the bore hole contains rocks below certain depth then, in such cases the chance of saving the child reduces [1]. It is not only a time taking process, but also risky in various ways. Moreover, it involves a lot of energy and expensive resources which are not easily available everywhere and in this process, we always need big space around the trapped bore that we can dig a parallel bore [2]. We are developing a robot machine that can take out the trapped body in a systematic way. It will also perform various life-saving operations for the sufferers such as oxygen supply. It will be a light weight machine that will go down into the bore well pipe and hold the trapped body systematically. In this alternative scenario, there will be no requirement of digging any hole parallel to the bore-well. The remotely controlled robot will go down the bore well and perform the action. A lot of other hassles will also be avoided by this alternative technique [3].

II. FEATURES OF THE PROJECT

- Video surveillance.
- Controlling of robot with ZIGBEE.
- Highly efficient and user friendly design.
- Low power consumption.

III. LITERATURE SURVEY

The primary uses of robots include searching for survivors, where unusual viewpoints can be perceived with better human-robot interaction. Usual method followed by the rescue team is first to find the depth of the child in the bore well by using rope. After finding the depth, a parallel pit is dug using Earthmoving vehicles. This method of rescuing has many difficulties like, it takes up to 30 hours to dig the parallel pit and by that time the child can die due to lack of oxygen inside the bore well. Also Lack of visualization causes major difficulty during the rescue operation. There is no such special equipment for rescuing the child trapped inside the bore well. Forty five deaths of children have been reported in the country since September 2009, from that we have only nineteen with the proof of a newspaper. In the year of 2012 Six year old boy was rescued from the bore well, but later died in the hospital due to injuries during the rescue operation and lack of medical aid. Their deaths are caused due to uncovered dry bore wells [4].
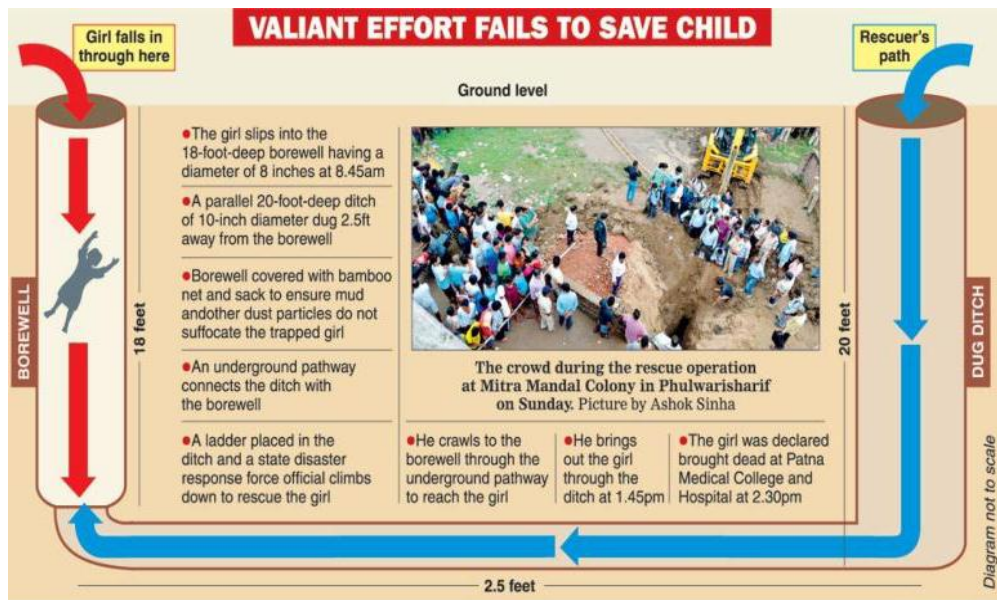

Fig-1: Increasing rate of Incidents

Fig-2: Failed efforts to save children

IV. SYSTEM DESIGN

The block diagram of the project and design aspect of independent modules are considered here,
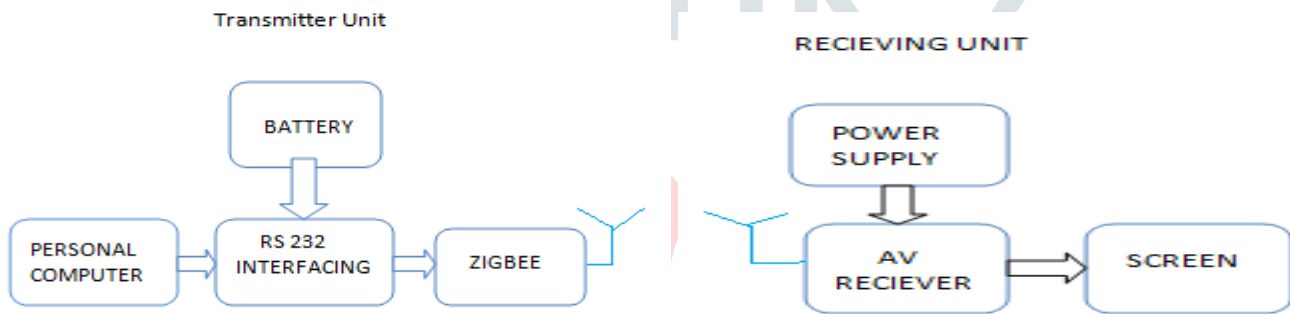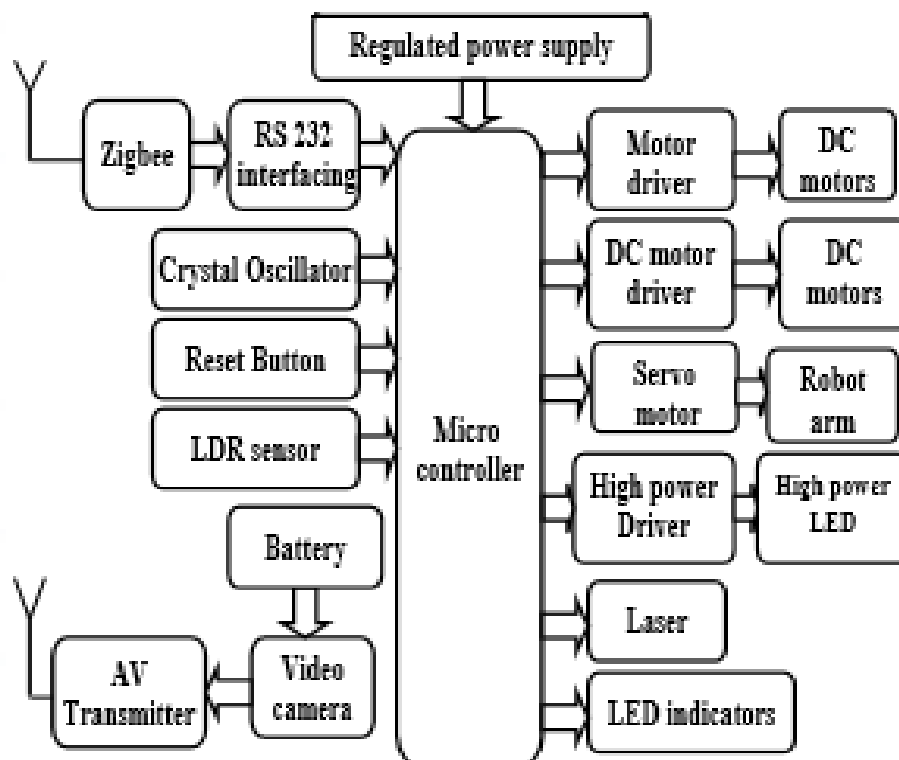**Design of Transmitter and receiver unit**

Fig -3: Rescue Robot Transmitter unit   **Fig -4:** Rescue Robot Receiver unit

V. BLOCK DIAGRAM OF THE SYSTEM

VI. RESOURCES REQUIRED

Zig Bee Module

Zig Bee technology is a bidirectional wireless communication technology of short distance, low complexity, low cost, low power consumption, and low data rate, mainly used in automatic control. It mainly works on 2.4GHz ISM band with 20~250kbit/s data rate, 100m ~1.5km maximum transmission range, and a typical 100m distance.
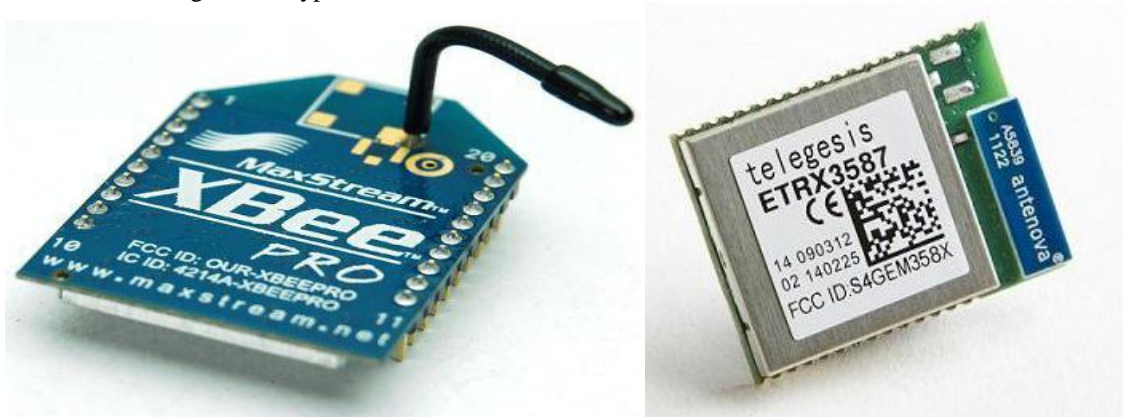

Fig -5: Zigbee Module

PIC Microcontroller

The microcontroller used in this project is PIC16F877A. PIC stands for Peripheral Interface Controller given by Microchip Technology to identify its single-chip microcontrollers. These devices have been very successful in 8-bit microcontrollers. The main reason is that Microchip Technology has continuously upgraded the device architecture and added needed peripherals to the microcontroller to suit customer's requirements.
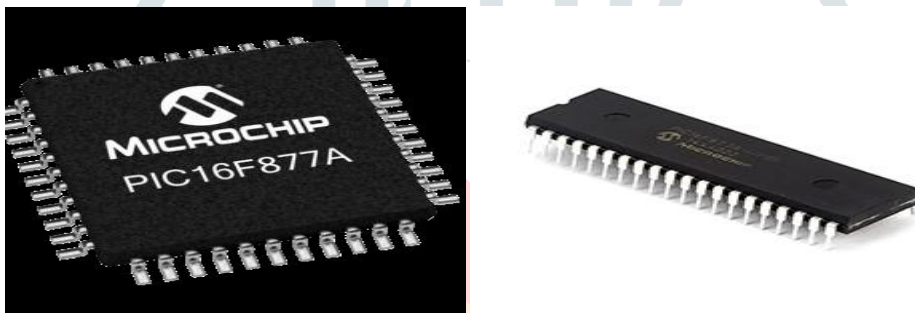

Fig -6: PIC 16F877A

D.C. Motor

A dc motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors. The reverse process, producing electrical energy from mechanical energy, is accomplished by an alternator, generator or dynamo. The input of a DC motor is current/voltage and its output is torque (speed).

Power Supply & High Power LED'S & Motor Driver

Power supply is connected to the micro controller and LEDs are also connected to micro controller through resistors and motor driver connected to micro controller.

Wireless AV Camera

Wireless security cameras are closed circuits (CCTV) cameras that transmit a video and audio signal to a wireless receiver through a radio band. "Wireless" refers to the transmission of video/audio.

Fig -7: Wireless AV Camera

Gas Detector & Temperature Sensor

A gas detector is a device that detects the presence of gases in an area, often as 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. A temperature sensor is a device, typically, a thermocouple that provides for temperature measurement through an electrical signal.

Fig -8: Modules of Gas detector and Temperature sensor

VII. FUTURE SCOPE

Our project basically aims at going down a pipe or bore well but if we provide it with artificial intelligence, in that way it can help a great deed in Military operations. Secondly, we can attach a GPS navigation system, with it help we won't have to move it using a controller instead it can find it path on its own. Lastly, the most important future scope is to add a smoke sensor to it we can get the information related to the atmospheric pressures, gas concentration in the coal mines or the dangerous sites.

VIII. INNOVATION

Our project has made itself innovative by implying many components in it like.
- We have added a smoke sensor, which can detect smoke when used in coal mines and during natural calamities.
- The temperature and gas sensor used in this project will inform us if there is any harmful gas present in the bore well.

IX. USEFULLNESS

Out of many uses, some of the qualities that our design possesses are:
- Video Surveillance
- User Friendly and highly efficient.
- Low power Consumption
- It is designed for Human welfare.
- Damages in water and gas pipeline can be inspected using a modified but same robot.

X. RESULT

The project "Wireless robot for rescue operation" was designed to construct a Robot which is capable of climbing the pipeline. The robot was operated using computer wirelessly using Zig Bee from a remote location and also such that Robot can move either Forward by pressing button 'F' or Backward by pressing button 'B', from the PC through the Hyper Terminal. This robot has a high power LED which acts as a light source inside the pipe.

XI. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC"s with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed.

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