Rescue Robot

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***Abstract*—A concept, design, modelling and prototype of a remotely controlled out-pipe climbing robot for inspection such as nuclear power plant pipe, petrochemical complex pipes, rescue operations i.e, Manholes are discussed in this work. Situation awareness and its ambiguities are some of the main problems for rescue robotics. In a disaster area, there are many obstacles and confined passages. This robot is designed in a way which tackles and handles such situations. The robot consists of two moving modules and one connecting arm which can alternatively maneuver on the pipeline surface. The operator must perceive the environment and decide the robot motion based on limited sensor data. These make it difficult for the operator to perceive the situation. The operator should be aware of the relative size of the obstacles in comparison with the rescue robot and the direction of the robot to navigate the disaster area and avoid collisions with obstacles. Collision detection in the expected paths and their neighbours can be performed. This helps the robot along the course of its path which helps to find the victim and rescue the same. This mechanism is a good solution for pipe climbing ,obstacles and serves as a permanent solution to rescue people fallen into manholes.**

I. INTRODUCTION

Situation awareness and its ambiguities are some of the main problems for rescue robotics. In a disaster area, there are many obstacles and confined passages. This robot is designed in a way which tackles and handles such situations. The operator must perceive the environment and decide the robot motion based on limited sensor data. The main objective of this project is to rescue people fallen into Man holes, Deep wells etc. The robot consists of two moving modules and one connecting arm which can alternatively maneuver on the pipeline surface. The operator should be aware of the relative size of the obstacles in comparison with the rescue robot and the direction of the robot to navigate the disaster area and avoid collisions with obstacles. Collision detection in the expected paths and their neighbours can be performed. The injuries during and throughout the rescue operation also leads to the death of child. The lack of oxygen inside the deep hole makes it impossible for the child to survive for long time.

Hence this operation proves very difficult, risky and time consumptive. The solution to this problem is the use of robotic systems which can move down the pipe and bring the subjected body out of it properly and safely. This will take lesser time than the normal operation. The alternative solution to this problem is the use of robotic systems which can move down the pipe and bring the subjected body out of it properly and safely. The project is intended to reduce the risk involved during the child rescue operation by analyzing the situation and also to provide an option detect any leakage inside the pipe. This work is aimed towards the construction and designing of a robotic system to work in borehole rescue operations and to detect faults inside the pipeline.

II. BLOCK DIAGRAM

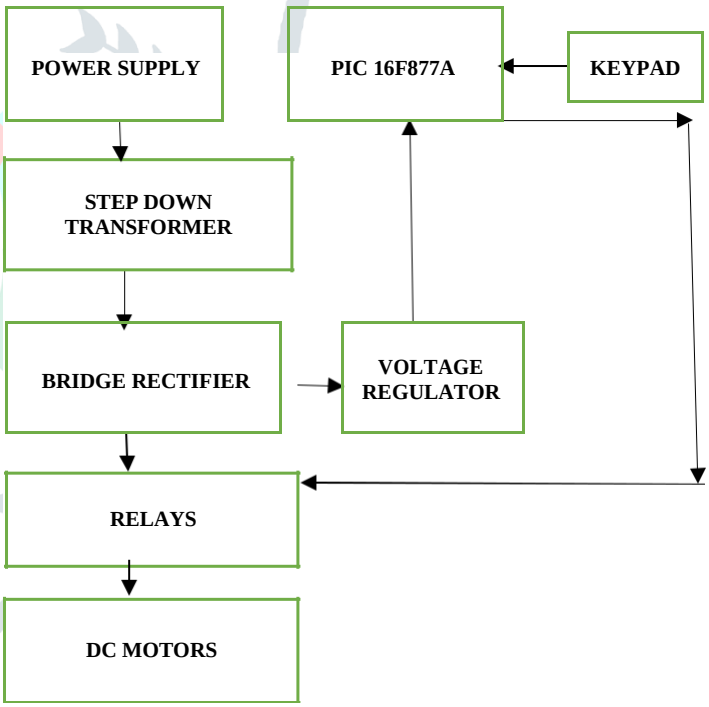

Fig 1. Block diagram of proposed system

The term PIC, or Peripheral Interface Controller, is the name given by Microchip Technologies to its single chip microcontrollers. These devices have been phenomenally successful in the market for many reasons, the most significant ones are mentioned below.

PIC micros have grown in steadily in popularity over the last decade, ever since their inception into the market in the early 1990s. PIC micros have grown to become the most widely used microcontrollers in the 8- bit microcontroller segment. The PIC16F877A is 40 pin IC. There are six ports in this microcontroller. Namely PORT A, PORT B, PORT C, PORT D and PORT E. Among these ports PORT B, PORT C and PORT D contains 8-pins, where PORTA contains 6-pins and PORT E contains 3-pins.Each pin in the ports can be used as either input or output pins. Before using the port pins as input or output, directions should be given in TRIS register. For example setting all the bits in TRIS D register indicates all the pins in PORT D are used input pins. Clearing all the bits in TRIS D register indicates all the pins in PORT D are used as output pins. Likewise TRIS A, TRIS B, TRIS C, TRIS E registers available for PORT A, PORT B, PORT C and PORT E.

A DC motor is used to drive a mechanical load. In this lab, a separately excited DC generator provides the load. The load on the motor is adjusted by varying the generator field current. By increasing the field current of the DC generator, the load on the DC motor increases and thus the armature current increases.

The operation of power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an AC voltage, a steady DC voltage is obtained by rectifying the AC voltage, Then filtering to a DC level, and finally, regulating to obtain a desired fixed DC voltage. The regulation is usually obtained from an IC voltage regulator Unit, which takes a DC voltage and provides a somewhat lower DC voltage, Which remains the same even if the input DC voltage varies, or the output Load connected to the DC voltage changes.

III. PROGRAMMING THE PIC

The PIC is a family of the microcontroller, which is manufactured by the different companies such as NXP, microchip, etc. The PIC stands for "peripheral interface controller", which contains memories, timers/counters, serial communication, interrupts and ADC converters built into a single integrated chip. The PIC microcontrollers are found in most electronic devices such as alarm systems, traffic control systems, RFID based security systems etc. The PIC microcontroller programming can be carried out to perform the huge range of tasks. Even though there are many types of PIC microcontrollers , the best and basic microcontroller is PIC 16f877a.The PIC microcontrollers is programmed by the embedded C language or assembly language by using appropriate dedicated software. Before going to build a PIC microcontroller project, we must become aware of developing a basic microcontroller (like 8051) based project. Once you get the idea, this controller based project building becomes easy, so let us look at the basic steps to build a PIC microcontroller based project.

The PIC microcontroller transmit and receive the data with respect to clock pulses, the PIC microcontroller operates with 4MHz crystal frequency. Two capacitors are connected to the crystal oscillator with range of 20pf to 40pf which is used to stabilize the clock signals.

At some times, the PIC microcontroller goes to block state or missing time calculation, at that time we need to reset the microcontroller. If a microcontroller is reset for 3sec time delay, 10k resistor and 10uf capacitor are connected to the respective pins. This circuit is designed with the help of Proteus software. The Proteus is a circuit designing software that contains a database of components, which we can use to build the circuit. Each and every component is available in the component library. This circuit is designed with the help of Proteus software. The Proteus is a circuit designing software that contains a database of components, which we can use to build the circuit. Each and every component is available in the component library.

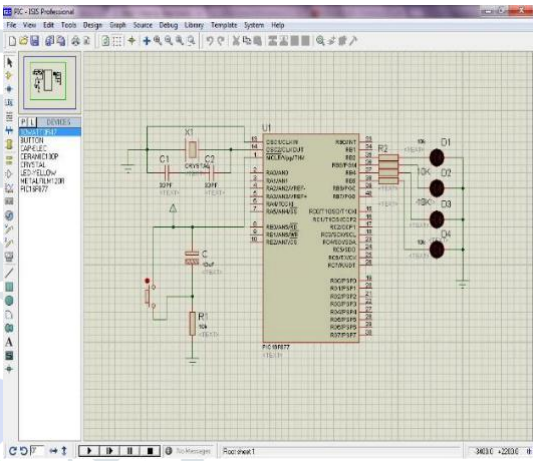

Fig. 2 Simulation using proteus

First open the MPLAB software. This shows the menu bar with file, edit, view, project and tools option. Select the project option and select the 'project wired option' from the drop-down menu. This will show the project wired window. Select a microcontroller for your project. Here 'PIC16f877A' microcontroller is selected. Select the compiler and path location for your project. Here 'CCS C compiler' is selected for the PIC microcontroller, then select the 'browse' option from the project wired window to select the 'ccsloader' in the PICC folder from the program files. A folder with the name 'source group' is created in the 'target' folder. Give a name to the project and click on 'NEXT' button to save the project. A folder with the name 'source group' is created in the 'target' folder.. Click on the 'file' menu on the menu bar. Select 'new file' from the drop- down menu.

IV. LOAD THE CODE TO PIC

Interface the hardware (programmer kit) to the computer through a serial cable.

Place the microcontroller in the socket of the hardware kit. Press the lock button to ensure the microcontroller is connected to the board. Open the software installed in the computer. This shows the menu bar with file, functions, open, save and setting options. Select the 'open' option from the drop-down menu and select the 'load file' Click on the 'load' button so that the hex file is loaded into the microcontroller.

Fig. 3 Code dumping device

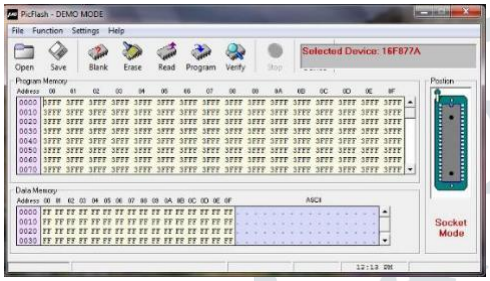

Fig. 4 code loading into pic

V. CHALLENGES AND FUTURE SCOPE

The injuries during and throughout the rescue operation also leads to the death of child. The lack of oxygen inside the deep hole makes it impossible for the child to survive for long time.

This Project can be expanded with additional components based upon the scenario such that Real-Time Rescue of Human Beings can be done. The additional enhancements to the Project may include end-end video transmission and reception to avoid mishandling of Human Beings due to dangerous materials inside the Manhole or Deep wells.

VI. CONCLUSION

The proposed system performs well in a hollow pipe while rescuing an object. This structural design makes it possible to have the adaptation to the diameter of pipe and to have adjustable attractive force towards the walls of pipe. The robot structure consists of power supply, switch pad and gear motors. Adding a claw or gripper was the initial hurdle for which additional power supply and DC gear motor were needed. The microcontroller is not sufficient to give the sufficient amount of current to the multiple gear motors, so in spite of using motor driver, direct supply is given to gear motors using switch pad as its control centre enables the robot to work smoothly. The operation of child rescue is done by using big machines with large manpower involvement. It takes more time to rescue a child from the bore well and to check any kind of irregularities in pipe.

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