

ABANDONED BORE WELL RESCUE SYSTEM FOR CHILDREN

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in

Electronics and Communication Engineering

by

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SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

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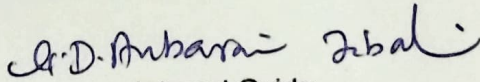
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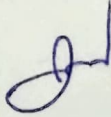
BONAFIDE CERTIFICATE

This is to certify that this Project Report is the Bonafide work of KORRAPATI VIDYA SAGARIKA (39130240) and B. BHUVANESWARI (39130073) who carried out the project entitled "ABANDONED BORE WELL RESCUE SYSTEM FOR CHILDREN" under our supervision from November 2022 to April 2023.



Internal Guide

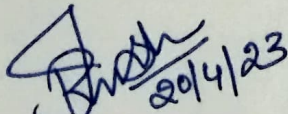
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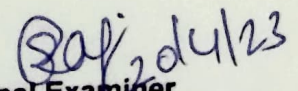


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We, KORRAPATI VIDYA SAGARIKA (39130240) and B. BHUVANESWARI (39130073), hereby declare that the Project Report entitled "ABANDONED BORE WELL RESCUE SYSTEM FOR CHILDREN" is done under the guidance of Dr.G.D.ANBARASI JEBASELVI, M.E. Ph.D., is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering/ Technology degree in Electronics and Communication Engineering.

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ABSTRACT

This project is specifically based on the child rescue in the bore well. Due to revealed bore well openings, mishaps including them are visit. It is greatly challenging and perilous to protect the caught children. The child's life may well be misplaced in case the protect exertion is deferred indeed marginally. Extracting the child from the confined area within the bore well is a challenging undertaking. After the accident, the child is confined to a small area which gradually leads to a reduction in oxygen levels. The main goal of this extend is to plan and construct a convenient robot that's reasonable, fast, and exact. This robot has all the vital sensors to screen the natural components and react fittingly. The Robot can move around interior the well and execute errands as coordinated by the client. The framework and gadget are wirelessly associated employing a remote sensor arrange (WSN). From his framework screen, the client can see the natural sensor information. The child can be protected from the bore well with the help of this system. Hence, innovation can keep a kid from getting bored. Innovation progressions are fundamental to safety-critical frameworks for distant better and improved quality of life.

Both the rescue and monitoring units employ a microcontroller to administer guidance based on data from sensors that detect the child's status and observe their well-being. The youngster was successfully saved with no consequential harm inflicted upon them. The present system is less accurate compared to the system having a higher accuracy rating.

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LIST OF ABBREVIATIONS

ADC	Analog to Digital Convertor
CAN	Controller Area Network
CCTV	Closed Circuit Television
CRC	Cyclic Redundancy Check
DLL	Dynamic Link Layer
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LR-WPAN	Low-Rate Wireless Personal Area Network
PCB	Printed Circuit Board
PIC	Programmable Interface Controllers
PIR	Passive Infrared Sensor
PWM	Pulse Width Modulation
RAM	Random Access Memory
SPI	Serial Peripheral Interface
TTL	Transistor Transistor Logic
UART	Universal Asynchronous Receiver Transmitter
WPAN	Wireless Personal Area Network
WSN	Wireless Sensor Network

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CHAPTER 1

INTRODUCTION

Nowadays children falling into the bore well seems common. Frequently we hear of news on children stuck in a bore well among various parts of India. In most of the cases of children falling into bore wells seems to occur in rural India. This says something about the bore well diameters. In the cities, bore wells are dug for domestic purposes. These are lesser in diameter. So, looks like the bigger bore wells are the problem. Some manufacturing companies to dig large diameter bore wells. These might be typically located in the villages.

However, this is not the primary reason - in the villages, people constantly seek groundwater. The moment a farm or company needs water, they try to dig a well. However, open wells are not always the solution (open wells are dug when you have groundwater available easily at shallow depths. Open wells are convenient. But then groundwater is not easily available - thus bore wells are due to a greater depth. Also, companies need more water and wells won't suffice).

People need water and rivers or lakes supplies water that is not always available to all areas. Thus, groundwater is the source. And people dig to great depths to get groundwater. Groundwater for various reasons - summer, over exploitation, less recharge etc. at times goes down deeper (water table).

Rescue methods for those hurt in such bore well accidents are inadequate. The current method, which entails excavating a parallel hole next to the bore well where the youngster is truly stuck, is to rescue the child. We always need a large area around the trapped hole so that we can dig a parallel bore, and it requires a lot of energy and expensive materials that are not readily available everywhere. These impromptu methods carry significant hazards, including the potential for the victim to sustain injuries while being rescued. A further body catch in the debris could worsen the crisis.

In order to save the life of the trapped child, the current procedure for rescuing children from borewells is not only challenging but also extremely perilous. Even a slight delay in the rescue effort could endanger a child's life.

Even when the proper rescue measures have been implemented, there are still

numerous risks to children's lives, including a lack of oxygen, rising temperatures, and high humidity at such depths. There is currently no appropriate remedy for providing alleviation to such accidents. According to Benjamin Franklin, a great scientist, "An Ounce of Prevention is Worth a Pound of Cure." A new mechanism called the Smart Child Rescue System is being developed to address these issues and prevent kids from going into borewells (SCRS).

The difficulties with the current system will be lessened by the suggested system. The temperature sensor will determine the temperature at which the victim is trapped inside the bore well, and the LCD display will show the number of poisonous gases that have been detected (Liquid crystal display). The robotic arm is lowered into the bore well using a pulley to grab the youngster, and the operator controls the arm's position from outside the bore well.

Robotic arms are a class of mechanical arms that are often programmable, have tasks similar to those of a human arm, and are primarily utilized in industrial, military, and medical settings.

In India, the ratio of young people who are dead and alive as of 2000 is 9:1. This demonstrates that the number of children who are trapped in bore wells and die at the opening due to insufficient oxygen levels or wounds sustained over the entire cycle has increased. Utilizing mechanical systems that can drop down the line and carry the caught target away from it safely and appropriately is an alternative solution to this problem. Robotics allows us to move the pipe more quickly to the desired location, saving the trapped individual and ensuring everyone's safety. By paying less for their operations, they can also cut back on their water usage.

CHAPTER 2

LITERATURE SURVEY

2.1 INFERENCES FROM LITERATURE SURVEY

S.Prakash, K.Narmadha Devi, J.Naveetha, proposed the environment inside the child is sensed by using sensors. LDR sensor is used for providing the light inside the dig which senses the light intensity and glows the light using high power LED driver. LM35, Temperature sensor is used to detect the temperature inside the bore well. This project uses ZIGBEE technology embedded systems and a mechanical unit for the rescue. Special graspers are used to lift the child from the pits or bore-well. Microcontroller controls two dc motors. Microcontroller controls LED. Wireless camera records child status and these records are sent back to controller unit through ZIGBEE Transceiver. The whole system will be tested by using a child model (toy) in a dry bore well. The control will be transmitted by the pc through ZIGBEE. The ZIGBEE is interfaced with PC using level converter (RS232). The instructions are provided by the pc to the robot such as moving forward and reverse direction and controlling the arm, balloon to lift the child.

Kavianand G, Gowri Ganesh K, proposed Smart Child Rescue System from Borewell (SCRS)his Smart Child Rescue System consists of PIR sensors which help to sense only humans irrespective of the external conditions. These sensors will be placed at the top of the borewell pipeline which helps to sense the human being if he/she fell in the pipeline. The construction of any embedded system consists of two parts namely hardware development and software development. Hardware development involved the designing the circuit of the project while the software developments is focused on designing coding to be embedded in the hardware.

PIR or a Passive Infrared Sensor can be used to detect presence of human beings in its proximity. Basically, motion detection uses light sensors to detect either the presence of infrared light emitted from a warm object or absence of infrared light when an object interrupts a beam emitted by another part of the device. A PIR sensor detects the infrared light radiated by a warm object. It consists of pyro electric sensors which introduce changes in their temperature (due to incident infrared radiation) into electric signal. When infrared light strikes a crystal, it generates an electrical charge.

Thus, a PIR sensor can be used to detect presence of human beings within a detection area.

L. David William Raj, R. Abinaya, A. Brundha, N. Durga Lakshmi, proposed Robotic arm for bore well rescue operation offers solution for the lives that are left inside the bore well. It has the facility to monitor trapped child and provide a supporting platform to lift up the child. This system will attach a harness to child using robotic arms for picking up. The Proposed system will easily rescue the child within short time without major injury. Visualizing the child is made possible with infrared waterproof camera and a high- resolution TV monitor. This is a light weight machine that will go down into the bore well pipe and save the victim's life systematically by performing the required action. A temperature sensor LM35 is used to measure temperature for surviving inside the bore well. The air quality sensor MQ135 is used to sense the toxic gases like NH₃, Methane, CO₂, Benzene. ATMEGA 328 is used to control the overall performance. An LCD display is used to display the temperature and the gas level. Robotic arm has motor attached to it for picking and placing.

Nandhitha Bala, Maria Anu.V, Prashanthi Niharika.k, discussed about Smart Borewell Child Rescue System Through Wireless Monitoring Using Artificial Intelligence. To stream image continuously we need to feed data into PC through PC organization. The image which is captured by camera and video might be saved to determine the web framework. The video will be saved, and this camera is linked to wi-fi internet.

Sen K Varghese, Tom Joseph, Sandra Ann Varughese, Lakshmi Anil, Reneesh C Zacharia, proposed Pangolin"-Animatronic Based Robotic Hand System for Human Rescue in Deep Mine Hole and Bore Well Accidents.. This is the most important section in the Robotic System. As it is impossible to pull the victim up without reaching the victim first, this forms a crucial element in the design. Here a chain-based system is used to push the hands down the bore well and to pull the hands along with the victim. Since the necessary movement is very precise a gear system is also necessary to limit the motor rotation. Stepper motor is used as it provides the necessary torque and power to push and to pull. Arduino module is used to control the working of the movement of the motor, thereby getting the necessary movement. There

are some instances where the bore-wells are very deep and the chains become too short.

In such cases the necessity to reach at that deep location is still at large. Hence there we can use rope system. Since ropes are long enough it can reach situations where the wells are even hundreds of feet deep. As an add on we also propose an airbag inflation system that gives an additional support while pulling the victim up. Since the force applied with the two hands against the gravitational force may be harmful, such a system will ensure that the pulling force will be distributed equally all over the body. For this a thin rigid tube is attached on the robotic system. Once the victim is located the tube is elongated to reach below the victim and then, an airbag which is placed inside the tube is inflated which gives fore mentioned additional support. The mechanical chain system and Gripping section was controlled using the same Arduino joystick with its x and y axis control. The animatronic based hands we made in the system consists of flex sensors in each hand which controlled the animatronic based robotic hands in robot. By adding more flex sensors, i.e., dedicated flex sensor to each hand and by enabling wrist rotation, the animatronic based hand's flexibility can be further increased. The animatronic based hands were also controlled with this Arduino which was a cost and energy efficient strategy.

Dr, M.L.Keote, Dr. P. T.Karule, Aakash Padole, Tejas Gawande, proposed Design and Development of Child Rescue System against an Open Bore well. This borewell system can easily go into the bore well where the victim has been trapped and can perform various tasks to save the deceased. C.C.T.V. camera is installed to check the victim's condition. This system also has high intensity and high-power LED light which can also help as a source of light since light intensity in the bore well is very low. The improvement in automation and technology with the help of mechanical design structure has a high impact on the current society. This project of rescue system contains many steps of processes which is controlled from outside with the help of a trained user. The latest components are used for different parts of the system, as the system performs many steps for rescuing activity and tasks. The low weighted servomotors are used for the bore well rescue system's operations. The bore well rescue system is controlled manually which is embedded with many additional safety features and safety devices. It also has the microphone which is helpful in giving instructions to a baby if he's at an understanding age. Small diameter pipe is also used

to provide oxygen supply. Fig. 1 shows block diagram of proposed system. The proposed system consists of LPC2148 Microcontroller, load sensor, GSM driver, Buzzer, IR sensors, LCD display, DC motor and motor plate. Figure 2 shows circuit diagram of the proposed system.

Kadirimangalam Jahnavi, Sivraj. P, proposed Teaching and Learning Robotic Arm Model. The robot arm section mainly consists of shoulder, elbow, wrist and gripper joints interconnected by links. The OWI robotic arm has 5 DOF, base provides 270° , rotation, shoulder joint gives 180° , elbow provides 300° and wrist joint has 120° rotation. Each joint is equipped with a DC motor which helps in desired movement of the arm. The microcontroller output through a driver circuit will drive the motors to achieve desired task.

Each joint is mounted with an accelerometer sensor for measuring amount of angle each motor has turned on actuation from the microcontroller to have a closed loop system. Based on feedback given to controller testing and validation of algorithms can be done.

Javad Amiryan, Mostafa Nazari, Eslam Nazemi, proposed Improvement of Robot Navigation Using Fuzzy Method The navigation procedure is performed by driving arbitrary number of electrical motors, and often these motors doesn't have independent effects on robot motion, hence the accurate effect of each motor on the entire system should be clear. This information always is provided by mechanic and electronic experts in the form of a series of equations. But in this way the electrical and mechanical parts of the robot should be assumed as ideal elements, while this assumption doesn't hold always. For example, imperfect assembling of robot, inaccuracy of its wheels, asymmetric friction between the robot's wheels and ground and etc. are some sources for this problem. Electrical motors also can be of fault sources in a robot.

One efficient way for improvement of entire system's motion is to use closed-loop controller on its electrical motors, but there is no an actual way to control every mechanical element in the robot e.g., sub-wheels mounted on an omni-directional wheel. A more appropriate way is to consider the whole system as an integrated system. with deterministic inputs and outputs and try to calculate the relation between them. So, system identification methods are suitable approaches for this problem.

Already it is very common to use supervised learning techniques such as artificial neural networks, Support vector machines and so on for this purpose. The big issue, for ANN-based approaches is that the behavior of the system should be known to create an efficient network.

Rasika Yenorkar, U.M.Chaskar, proposed GUI Based Pick and Place Robotic Arm for Multipurpose Industrial Applications Industrial automation has transformed as flexible and programmable automation from the fixed one. In which the field of electronics, mechanical, electrical, and computer-based control system replace a human being with machines for productivity and comfort. Because of upgradation and high- quality standard product design, research and development are moving at rapid pace.

Generally, Industrial arm is used to do repetitive pick and place task such as moving the Parts from a conveyor belt, CNC tools handling, loading – unloading the part from the machine and widely in the assembly line. In such a wide industrial environment, to accomplish a number of different tasks, grabbing the object is probably most demanding in all. Industrial robot offers more accurate results and speed up the operation to increase the production rate. To avoid the highly repetitive and tiring task researchers have found developing methods to control robots in an easier way. Nowadays, glove-based technique is very popular for recognizing the hand gesture. In to control the arm, fast gesture recognition system is presented, which is an automatic system that uses a simple video camera to monitor the gesture.

2.2 EXISTING SYSTEM

In the previous year several child deaths have been reported falling in the bore well. As the diameter of the bore well is quite narrow for any adult person and the lights goes dark inside it, so the child cannot be able to safeguard themselves. To rescue the children in those situations is a challenging task. To rescue the children, human will help for picking them up.

BLOCK DIAGRAM

BORE WELL SECTION

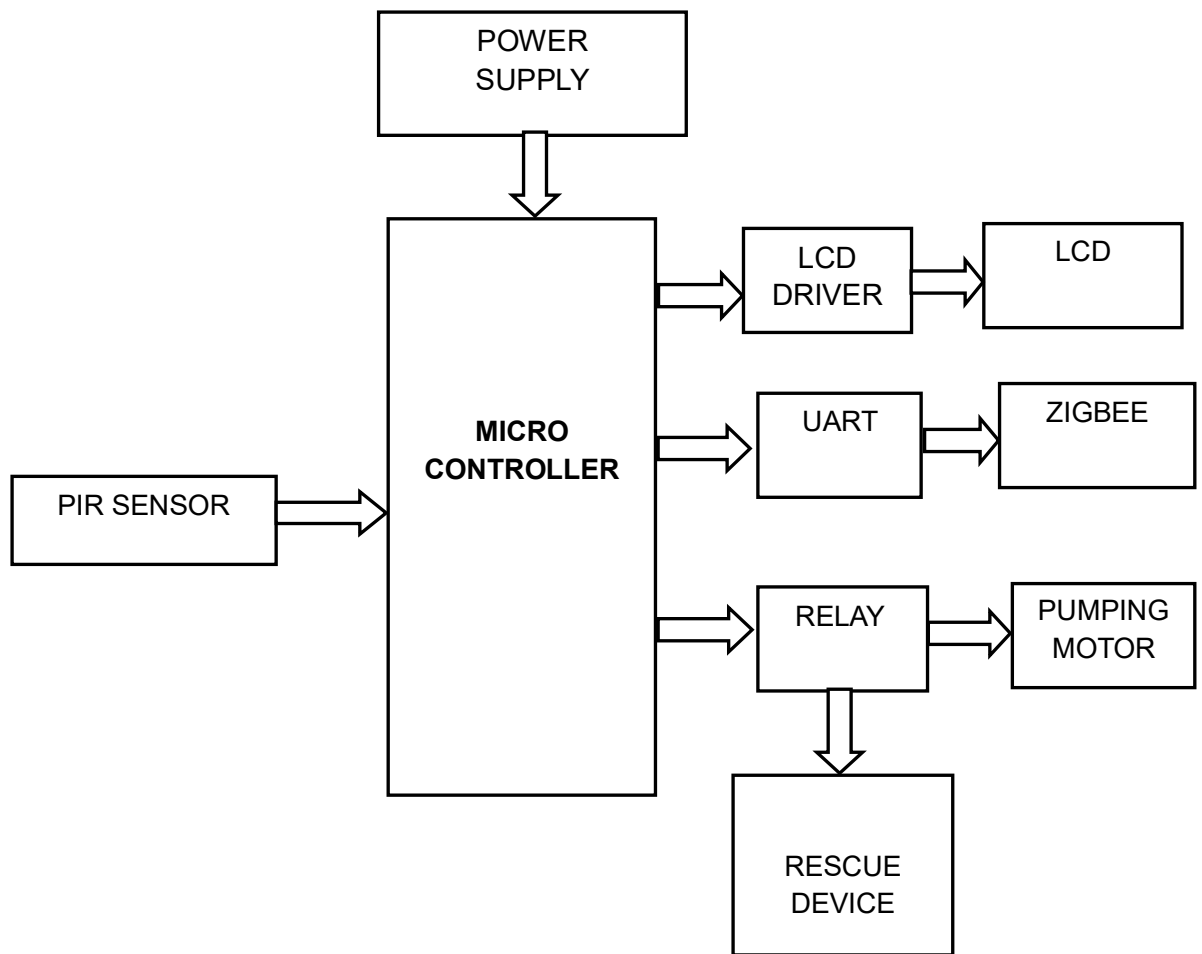


FIG.2.1 BLOCK DIAGRAM OF BORE WELL SECTION FOR THE EXISTING SYSTEM

MONITORING SECTION

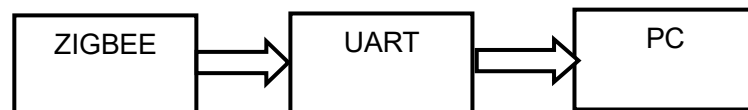


FIG.2.2 MONITORING SECTION OF THE EXISTING SYSTEM

CHAPTER 3

AIM AND SCOPE

3.1 FEASIBILITY STUDIES

The bore wells are sometimes left open without any proper covering. The rescue operations in many cases are riskier even to the rescue team members. A small delay in this whole process may reduce the chances of saving the child. If the area near the bore hole contains rocks below certain depth, chances of saving the child becomes very less. Whatever may be the case the rate of success depends on lot of factors like time taken for transportation of machinery to the situation, human resources and mainly the response time of various government organizations. At present there is no proper method for dealing with this problem.

In terms of technology, industrial automation has changed from fixed to flexible and programmable during the past 15 years. where machines that are controlled by mechanical, electrical, and computer-based control systems take the role of people in order to increase productivity and comfort. Research and development are progressing quickly as a result of upgrading and high-quality standard product design. Typically, an industrial arm is used for repeated pick-and-place tasks including transferring parts from a conveyor belt, handling CNC tools, loading and unloading parts from machines, and many other tasks found in an assembly line. Obtaining the object is perhaps the most difficult task of all in such a large industrial environment in order to complete a number of distinct tasks.

3.2 SOFTWARE REQUIREMENTS

- EMBEDDED C
- KEIL C
- VISUAL BASIC

3.2.1 EMBEDDED C

- As it is the high-level language it is shorter and easier to write. It is independent of the Processor. It is used more frequently than assembly

language.

- C language has two important advantages, because of which it is much easier for programmer to write quality programs that are easier to read, revise, and port to a different system. Built-in structure.

3.2.2 KEIL C SOFTWARE

- Keil is a software company that belongs to Arm Holdings, originating from Germany. Established in 1982 by Günter and Reinhard Keil, the enterprise initially operated as a German GbR.
- Keil Elektronik GmbH was established in April 1985 with the objective of promoting supplementary products for the development tools administered by numerous silicon vendors.
- Keil created the initial compiler for the 8051 microcontroller that was tailored and built specifically for this purpose. Keil MDK is a comprehensive software development platform designed for various microcontroller devices using Arm Cortex-M technology.
- The MDK package comprises of vital middleware elements, the Arm C/C++ compiler, and the μ Vision IDE debugger.
- With a database of over 9,500 devices from various silicon vendors, the Keil μ Vision Debugger provides an effortless learning experience.
- Additionally, the debugger can simulate on-chip peripherals, including Interrupts, A/D and D/A Converters, PWM Modules, I/O Ports, and communication protocols like I²C, CAN, UART, and SPI, for 8051 devices with accuracy.
- Simulation allows for an insightful comprehension of hardware configurations and eliminates the unnecessary consumption of time caused by setup complications.
- Simulation enables the writing and testing of applications prior to the availability of the targeted hardware.

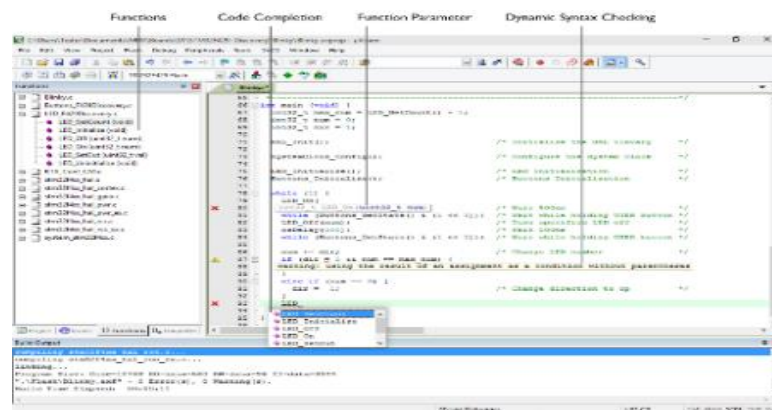


FIG.3.1 KEIL SOFTWARE

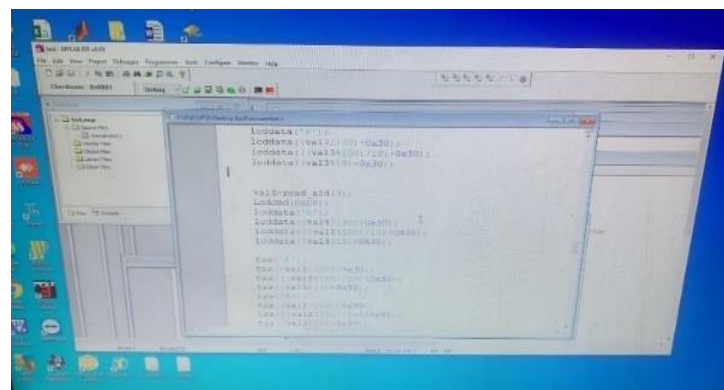


FIG.3.2 KEIL SOFTWARE EDITING WINDOW

3.2.3 VISUAL BASIC

- Visual Basic (VB) is an event-driven programming language and environment from Microsoft that provides a graphical user interface (GUI) which allows programmers to modify code by simply dragging and dropping objects and defining their behavior and appearance.
- VB is derived from the BASIC programming language and is considered to be event-driven and object-oriented.
- VB is intended to be easy to learn and fast to write code with; as a result, it is sometimes called a rapid application development (RAD) system and is used to prototype an application that will later be written in a more difficult but efficient language.

- In figure 3.3, it is the software module, in which the data can be monitored. Apart from monitoring, the robot can also be controlled using this software module.

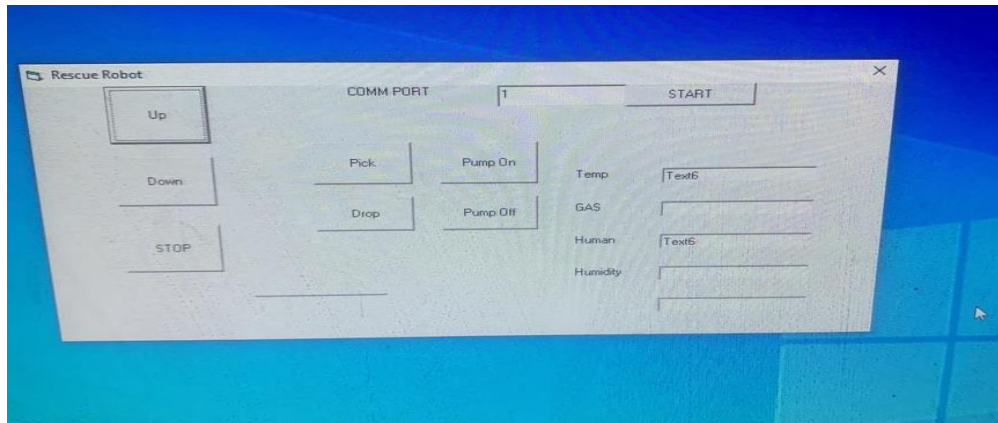


FIG.3.3 SOFTWARE MODULE IN SYSTEM

3.3 SYSTEM USE CASE

- Toddler rescuing from borewell.
- Man-hole rescue.
- Train tunnel accidents rescuing
- Coal tunnel accidents rescuing

CHAPTER 4

PROPOSED METHODOLOGY

4.1 SELECTED METHODOLOGY

Even though there are so many methods existing, still there is a need of more simple and sophisticated rescue equipment. Here we are proposing a system called Arduino based child rescue system from bore well. In this system, there is no need to dig big pit parallel to the bore well up to the depth where the child is stuck. Hence may not depend on the huge number of human resources (military, Para medical, etc.), and machinery (JCBs, Tractors, etc.). Therefore, the delay involved in this accumulation of resources may be reduced and the chances of saving child alive are increased. The exciting method uses a highly advanced microcontroller, well developed accurate hand gripping mechanism (capable of carrying a plastic sample doll for demo) and a visual feedback system using a high-resolution camera the project is implemented successfully.

4.1.1 HARDWARE REQUIREMENTS

- MICROCONTROLLER
- CO₂ SENSOR
- LCD
- PRESSURE SENSOR
- PIR SENSOR
- POWER SUPPLY
- PC
- RELAY
- TEMPERATURE SENSOR
- UART

- ZIGBEE
- SERVO MOTOR

HARDWARE DESCRIPTIONS

1.MICROCONTROLLER (PIC)

PIC is a (Peripheral Interface Microcontroller) which was developed in the year 1993 by the General Instruments Microcontrollers. It is controlled by software and programmed in such a way that it performs different tasks and controls a generation line. PIC microcontrollers are used in different new applications such as smartphones, audio accessories, and advanced medical devices.

There are many PICs available in the market ranging from PIC16F84 to PIC16C84. These types of PICs are affordable flash PICs. Microchip has recently introduced flash chips with different types, such as 16F628, 16F877, and 18F452. The 16F877 costs twice the price of the old 16F84, but it is eight times more than the code size, with more RAM and much more I/O pins, a UART, A/D converter and a lot more features.



FIG.4.1 PIC MICROCONTROLLER

PIC MICROCONTROLLER ARCHITECTURE

The PIC microcontroller is based on RISC architecture. Its memory architecture follows the Harvard pattern of separate memories for program and data, with separate buses.



In current technology scenario, monitoring of gases produced is very important. From home appliances such as air conditioners to electric chimneys and safety systems at industries monitoring of gases is very crucial. Gas sensors spontaneously react to the gas present, thus keeping the system updated about any alterations that occur in the concentration of molecules at gaseous state. The gas sensor module consists of a steel exoskeleton under which a sensing element is housed.

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PRODUCT DESCRIPTION

MQ-2 gas sensor is designed with sensitive material of SnO_2 , which with lower conductivity in clean air. When the target combustible gas exists, the sensor's conductivity is higher. Signal conditioning circuit is used to convert the change of conductivity to correspond output signal with the input gas concentration. MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application. The MQ-2 gas module is mounted on a pcb board which has an operating voltage of $5V_{DC}$. The sensor output values can be get by means of both analog and digital.



FIG. 4.3 CO₂ SENSOR

FEATURES

- Analog and Digital output
- Good sensitivity to Combustible gas in wide range
- High sensitivity to LPG, Propane and Hydrogen
- Operation voltage: $5V_{DC}$
- Simple drive circuit
- Long life and low cost

APPLICATIONS

- Domestic gas leakage detector
- Industrial Combustible gas detector

- Portable gas detector

3. PRESSURE SENSOR

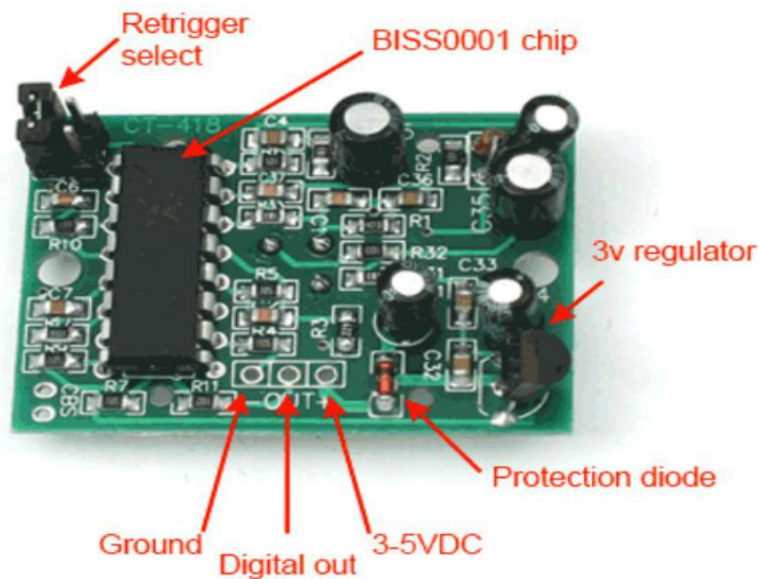
Pressure Sensor, also known as a newer form of the barometer, is an Arduino compatible tool used for atmospheric pressure measurement in environments. These measurements primarily enable the forecasting of transient weather changes. It is primarily used to find the pressure inside the bore well.

4. PIR (PASSIVE INFRARED SENSOR)

The PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects. This motion can be detected by checking for a high signal on a single I/O pin. Pyroelectric devices, such as the PIR sensor, have elements made of a crystalline material that generates an electric charge when exposed to infrared radiation. The changes in the amount of infrared striking the element change the voltages generated, which are measured by an on-board amplifier. The device contains a special filter called a Fresnel lens, which focuses the infrared signals onto the element. As the ambient infrared signals change rapidly, the on-board amplifier trips the output to indicate motion.



FIG:4.4 PIR SENSOR BACK VIEW



FRONT VIEW

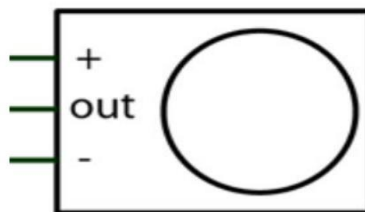


FIG.4.5 FRONT VIEW AND PIN DETAILS OF PIR SENSOR

FEATURES

- Single bit output
- Small size makes it easy to conceal.
- Compatible with all Parallax microcontrollers
- 3.3V & 5V operation with <100uA current draw

5. WSN- WIRELESS SENSOR NETWORK

WSN is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used for wireless networking. It is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power wireless M2M networks. WSN (CC2500) is a low-cost true single chip 2.4 GHz transceiver designed for very low power wireless applications. The RF transceiver is integrated with a highly configurable baseband modem.

PRODUCT DESCRIPTION

WSN devices are required to conform to the IEEE 802.15.4-2003 Low-Rate Wireless Personal Area Network (LR-WPAN) standard. The standard specifies the lower protocol layers are the physical layer (PHY), and the Media Access Control portion of the data link layer (DLL). The technology defined by the WSN specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi. Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. WSN devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. WSN is typically used in low data rate applications that require long battery life and secure networking. WSN has a defined rate of 250 kbit/s, best suited for intermittent data transmissions from a sensor or input device.

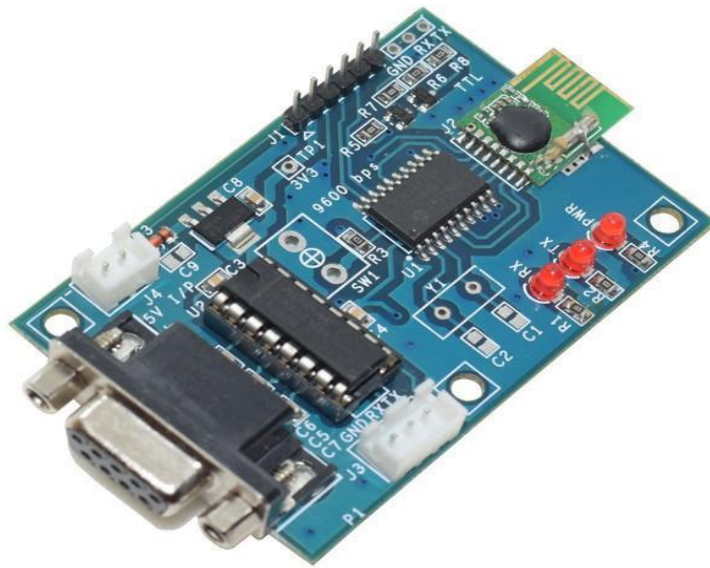


FIG. 4.6 WSN 2.4GHZ TI CC2500

FEATURES

- Supply voltage: 5v DC
- Detection range: (10-30) m
- RS232 Output
- TTL part also provided.

- Frequency: 2.4GHz
- Tx and Rx Status LEDs
- Low power

APPLICATIONS

- Lighting controls
- Switching
- Wireless keyboard and mouse
- Consumer electronics

6. RELAY

Relays are electromechanical switches that are primarily used for switching high-voltage or low-voltage applications. They may also be used with microcontrollers like the Arduino to control high-voltage devices.

7. TEMPERATURE SENSOR

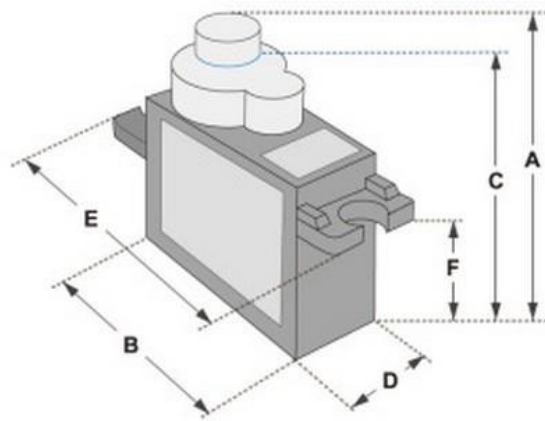
The Arduino temperature sensor transforms the ambient temperature to electricity. The temperature in Fahrenheit is then printed on the LCD screen after further conversions from voltage to Celsius and from Celsius to Fahrenheit. We'll make use of a low voltage temperature sensor (TMP 36).

8. LCD

A type of flat panel display known as an LCD (Liquid Crystal Display) operates primarily using liquid crystals. Since they are frequently used in cellphones, televisions, computers, and instrument panels, LEDs offer a wide range of applications for consumers and enterprises.

9. SEVRO MOTOR SG90

Tiny and lightweight with high output power. Servo can rotate approximately 180 degrees (90 in each direction) and works just like the standard kinds but smaller. You can use any servo code, hardware, or library to control these servos. Good for beginners who want to make stuff move without building a motor controller with feedback & gear box, especially since it will fit in small places. It comes with 3 horns (arms) and hardware.



Dimensions & Specifications	
A (mm) :	32
B (mm) :	23
C (mm) :	28.5
D (mm) :	12
E (mm) :	32
F (mm) :	19.5
Speed (sec) :	0.1
Torque (kg-cm) :	2.5
Weight (g) :	14.7
Voltage :	4.8 - 6

FIG. 4.7 SERVO MOTOR

Position “0” (1.5 ms pulse) is middle, 90 (~2ms pulse) is middle, is all the way to the right, “-90” (~1ms pulse) is all the way to the left.



FIG. 4.8 SERVO MOTOR SG90

4.2 ARCHITECTURE AND PROPOSED SYSTEM

Rescue system has various sensors to measure the environment inside the hole. Carbon dioxide level is monitored, if it exceeds certain level, oxygen will be pumped, the entire process is automatic. Temperature, pressure is also measured for safety of the child. PIR is used to know depth of the child availability. Measured values are transferred to PC for monitoring. In this proposed system more importance is given for child's safety. So that child can be rescued safely.

Any embedded system is built from two components: hardware development and software development. While software development is focused on designing coding to be embedded in the hardware, hardware development involved designing the project's circuit.

BLOCK DIAGRAM OF BORE WELL SECTION

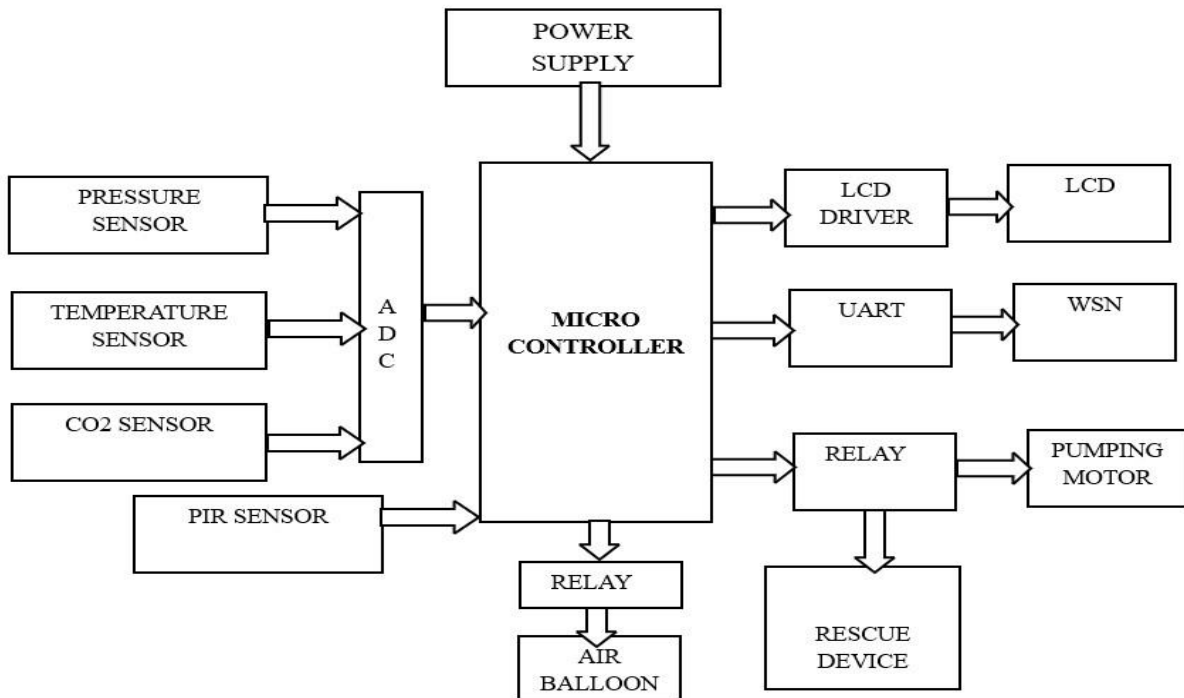


Fig: 4.9 BLOCK DIAGRAM OF BORE WELL SECTION FOR THE PROPOSED SYSTEM



FIG. 4.10 MONITORING SECTION OF THE PROPOSED SYSTEM

4.3 DESCRIPTION OF SOFTWARE FOR IMPLEMENTATION AND TESTING PLAN OF THE PROPOSED SYSTEM

4.3.1 SOFTWARE TOOLS

- Development tool – MPLAB IDE v7.42
- Hardware Compiler - HI-Tech PIC C
- Programmer - PIC Flash
- Hardware Simulation tool - Proteus v7.6Sp0

4.3.2 INTRODUCTION TO EMBEDDED ‘C’

Ex: Hitec – c, Keil – c

HI-TECH Software makes industrial-strength software development tools and C compilers that help software developers write compact, efficient embedded processor code.

For over two decades HI-TECH Software has delivered the industry's most reliable embedded software development tools and compilers for writing efficient and compact code to run on the most popular embedded processors. Used by tens of thousands of customers including General Motors, Whirlpool, Qualcomm, John Deere and many others, HI-TECH's reliable development tools and C compilers, combined with world-class support have helped serious embedded software programmers to create hundreds of breakthrough new solutions.

Whichever embedded processor family you are targeting with your software, whether it is the ARM, PICC or 8051 series, HI-TECH tools and C compilers can help you write better code and bring it to market faster.

HI-TECH PICC is a high-performance C compiler for the Microchip PIC micro 10/12/14/16/17 series of microcontrollers. HI-TECH PICC is an industrial-strength ANSI C compiler - not a subset implementation like some other PIC compilers. The PICC compiler implements full ISO/ANSI C, except for recursion. All data types are supported including 24- and 32-bit IEEE standard floating point. HI-TECH PICC makes full use of specific PIC features and using an intelligent optimizer, can generate high-quality code easily rivaling hand-written assembler. Automatic handling of page and bank selection frees the programmer from the trivial details of assembler code.

4.3.3 EMBEDDED “C” COMPILER

- ANSIC - full featured and portable
- Reliable - mature, field-proven technology
- Multiple C optimization levels
- An optimizing assembler
- Full linker, with overlaying of local variables to minimize RAM usage.
- Comprehensive C library with all source code provided.
- Includes support for 24-bit and 32-bit IEEE floating point and 32-bit long data types.
- Mixed C and assembler programming
- Unlimited number of source files
- Listings showing generated assembler.
- Compatible - integrates into the MPLAB IDE, MPLAB ICD and most 3rd-party development tools.
- Runs on multiple platforms: Windows, Linux, UNIX, Mac OS X, Solaris

4.3.4 MPLAB INTEGRATION

MPLAB Integrated Development Environment (IDE) is a free, integrated toolset for the development of embedded applications employing Microchip's PIC micro and dsPIC microcontrollers. MPLAB IDE runs as a 32-bit application on MS Windows, is easy to use and includes a host of free software components for fast

application development and super-charged debugging. MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third-party software and hardware development tools. Moving between tools is a snap and upgrading from the free simulator to MPLAB ICD 2 or the MPLAB ICE emulator is done in a flash because MPLAB IDE has the same user interface for all tools.

Choose MPLAB C18, the highly optimized compiler for the PIC18 series microcontrollers, or try the newest Microchip's language tools compiler, MPLAB C30, targeted at the high performance PIC24 and dsPIC digital signal controllers. Or use one of the many products from third party language tools vendors. They integrate into MPLAB IDE to function transparently from the MPLAB project manager, editor, and compiler.

4.3.5 EMBEDDED DEVELOPMENT ENVIRONMENT

This environment allows you to manage all of your PIC projects. You can compile, assemble, and link your embedded application with a single step.

Optionally, the compiler may be run directly from the command line, allowing you to compile, assemble and link using one command. This enables the compiler to be integrated into third party development environments, such as Microchip's MPLAB IDE.

4.3.6 EMBEDDED SYSTEM TOOLS

ASSEMBLER

An assembler is a computer program for translating assembly language — essentially, a mnemonic representation of machine language — into object code. A cross assembler (see cross compiler) produces code for one type of processor but runs on another. The computational step where an assembler is run is known as assembly time. Translating assembly instruction mnemonics into opcodes, assemblers provide the ability to use symbolic names for memory locations (saving tedious calculations and manually updating addresses when a program is slightly modified), and macro facilities for performing textual substitution — typically used to encode common short sequences of instructions to run inline instead of in a

subroutine. Assemblers are far simpler to write than compilers for high-level languages.

ASSEMBLY LANGUAGE HAS SEVERAL BENEFITS

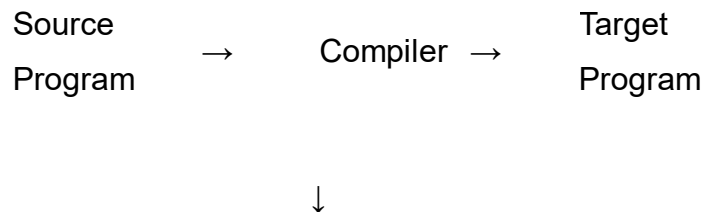
- **SPEED** Assembly language programs are generally the fastest programs around.
- **SPACE** Assembly language programs are often the smallest.
- **CAPABILITY** You can do things in assembly which are difficult or impossible in High level languages.
- **KNOWLEDGE** Your knowledge of assembly language will help you write better programs, even when using High level languages. An example of an assembler we use in our project is RAD 51.

4.3.7 SIMULATOR

Simulator is a machine that simulates an environment for the purpose of training or research. We use a UMPS simulator for this purpose in our project.

4.3.8 COMPILER

A compiler is a program that reads a program in one language, the source language and translates into an equivalent program in another language, the target language. The translation process should also report the presence of errors in the source program.



Error Messages

There are two parts of compilation. The analysis part breaks up the source program into constant piece and creates an intermediate representation of the source program. The synthesis part constructs the desired target program from the intermediate representation.

COUSINS OF THE COMPILER ARE

1. Preprocessor
2. Assembler
3. Loader and Link-editor

A naive approach to that front end might run the phases serially.

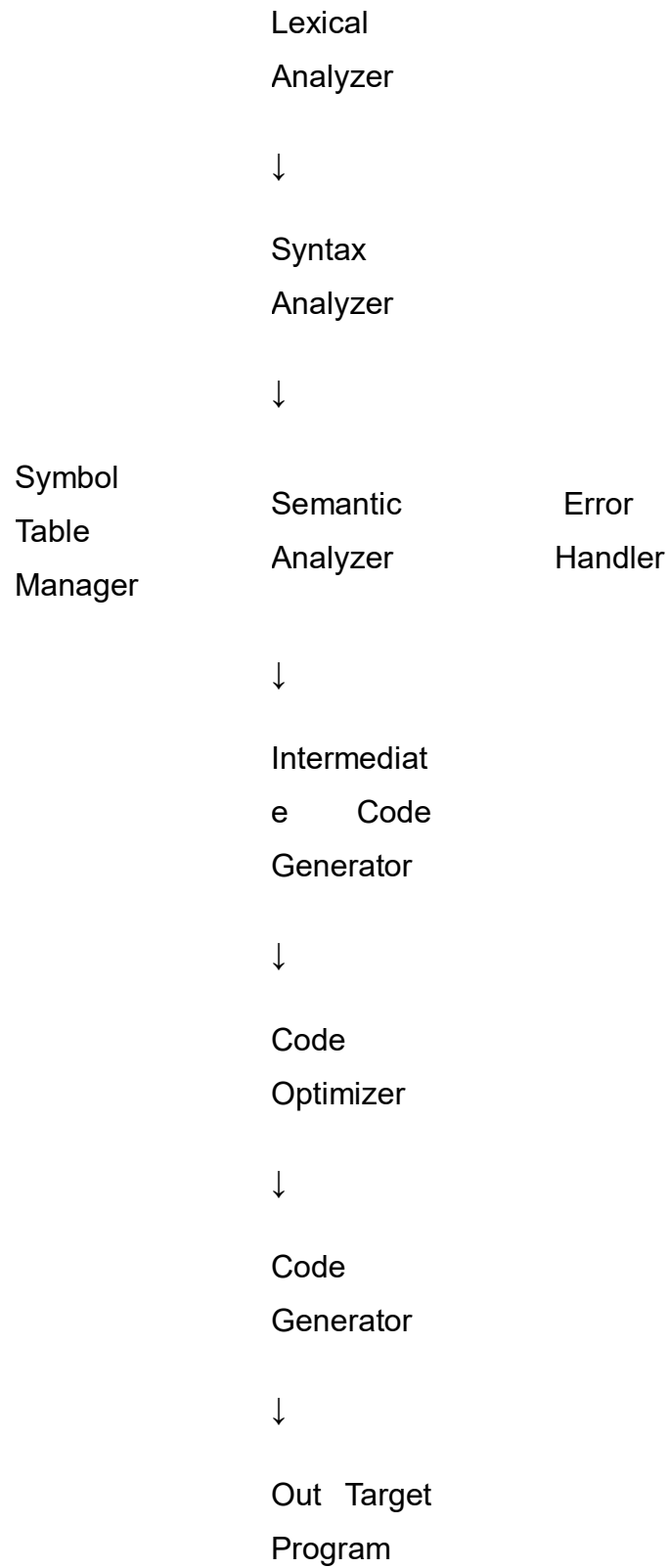
1. Lexical analyzer takes the source program as an input and produces a long string of tokens.
2. Syntax Analyzer takes an out of lexical analyzer and produces a large tree.
3. Semantic analyzer takes the output of syntax analyzer and produces another tree. Similarly, intermediate code generator takes a tree as an input produced by semantic analyzer and produces intermediate code

PHASES OF COMPILER

The compiler has a few phases plus symbol table manager and an error handler.

Input
Source
Program

↓



4.3.9 FABRICATION DETAILS

The fabrication of one demonstration unit is carried out in the following sequence.

- Finalizing the total circuit diagram, listing out the components and sources of procurement.
- Procuring the components, testing the components and screening the components.
- Making layout, repairing the interconnection diagram as per the circuit diagram.
- Assembling the components as per the component layout and circuit diagram and soldering components.
- Integrating the total unit, interwiring the unit and final testing the unit.

4.3.10 DESIGN OF EMBEDDED SYSTEM

Like every other system development design cycle embedded system too have a design cycle. The flow of the system will be like as given below. For any design cycle these will be the implementation steps. From the initial state of the project to the final fabrication the design considerations will be taken like the software consideration and the hardware components, sensor, input and output. The electronics usually uses either a microprocessor or a microcontroller. Some large or old systems use general-purpose mainframe computers or minicomputers.

USER INTERFACES

User interfaces for embedded systems vary widely, and thus deserve some special comment. User interface is the aim for an embedded module as to the user to check the output with complete convenience. One standard interface, widely used in embedded systems, uses two buttons (the absolute minimum) to control a menu system (just to be clear, one button should be "next menu entry" the other button should be "select this menu entry").

Another basic trick is to minimize and simplify the type of output. Designs sometimes use a status light for each interface plug, or failure condition, to tell what

failed. A cheap variation is to have two light bars with a printed matrix of errors that they select- the user can glue on the labels for the language that he speaks. For example, most small computer printers use lights labeled with stick-on labels that can be printed in any language. In some markets, these are delivered with several sets of labels, so customers can pick the most comfortable language.

In many organizations, one person approves the user interface. Often this is a customer, the major distributor or someone directly responsible for selling the system.

PLATFORM

There are many different CPU architectures used in embedded designs such as ARM, MIPS, Coldfire/68k, PowerPC, X86, PIC, 8051, Atmel AVR, H8, SH, V850, FR-V, M32R etc.

This in contrast to the desktop computer market, which as of this writing (2003) is limited to just a few competing architectures, mainly the Intel/AMD x86, and the Apple/Motorola/IBM PowerPC, used in the Apple Macintosh. With the growing acceptance of Java in this field, there is a tendency to even further eliminate the dependency on specific CPU/hardware (and OS) requirements.

Standard PC/104 is a typical base for small, low-volume embedded and ruggedized system design. These often use DOS, Linux or an embedded real-time operating system such as QNX or Inferno.

A common configuration for very-high-volume embedded systems is the system on a chip, an application-specific integrated circuit, for which the CPU was purchased as intellectual property to add to the IC's design. A related common scheme is to use a field-programmable gate array, and program it with all the logic, including the CPU. Most modern FPGAs are designed for this purpose.

TOOLS

Like typical computer programmers, embedded system designers use compilers, assemblers, and debuggers to develop embedded system software. However, they also use a few tools that are unfamiliar to most programmers.

Software tools can come from several sources:

- Software companies that specialize in the embedded market.
- Ported from the GNU software development tools.

Sometimes, development tools for a personal computer can be used if the embedded processor is a close relative to a common PC processor. Embedded system designers also use a few software tools rarely used by typical computer programmers.

One common tool is an "in-circuit emulator" (ICE) or, in more modern designs, an embedded debugger. This debugging tool is the fundamental trick used to develop embedded code. It replaces or plugs into the microprocessor, and provides facilities to quickly load and debug experimental code in the system. A small pod usually provides the special electronics to plug into the system. Often a personal computer with special software attaches to the pod to provide the debugging interface.

Another common tool is a utility program (often home-grown) to add a checksum or CRC to a program, so it can check its program data before executing it.

An embedded programmer that develops software for digital signal processing often has a math workbench such as MathCad or Mathematics to simulate the mathematics.

Less common are utility programs to turn data files into code, so one can include any kind of data in a program. A few projects use Synchronous programming languages for extra reliability or digital signal processing.

DEBUGGING

Debugging is usually performed with an in-circuit emulator, or some type of debugger that can interrupt the microcontroller's internal microcode. The microcode interrupt lets the debugger operate in hardware in which only the CPU works. The CPU-based debugger can be used to test and debug the electronics of

the computer from the viewpoint of the CPU. This feature was pioneered on the PDP-11.

As the complexity of embedded systems grows, higher level tools and operating systems are migrating into machinery where it makes sense. For example, cell phones, personal digital assistants and other consumer computers often need significant software that is purchased or provided by a person other than the manufacturer of the electronics. In these systems, an open programming environment such as Linux, OSGi or Embedded Java is required so that the third-party software provider can sell to a large market.

OPERATING SYSTEM

Embedded systems often have no operating system, or a specialized embedded operating system (often a real-time operating system), or the programmer is assigned to port one of these to the new system.

4.3.11 BUILT IN SELF TEST

Most embedded systems have some degree or amount of built in self test.

There are several basic types.

1. Testing the computer
2. Test of peripherals
3. Tests of power
4. Communication tests
5. Cabling tests
6. Rigging tests
7. Consumables test
8. Operational test
9. Safety test.

4.3.12 START UP

All embedded systems have start-up code. Usually it disables interrupts, sets up the electronics, tests the computer (RAM, CPU and software), and then starts the application code. Many embedded systems recover from short-term power failures by restarting (without recent self-tests). Restart times under a tenth of a second are common.

Many designers have found a few LEDs useful to indicate errors (they help troubleshooting). A common scheme is to have the electronics turn on all of the LED(s) at reset (thereby proving that power is applied and the LEDs themselves work), whereupon the software changes the LED pattern as the Power-On Self Test executes. After that, the software may blink the LED(s) or set up light patterns during normal operation to indicate program execution progress or errors. This serves to reassure most technicians/engineers and some users. An interesting exception is that on electric power meters and other items on the street, blinking lights are known to attract attention and vandalism.

CHAPTER 5

IMPLEMENTATION DETAILS

5.1 DEVELOPMENT AND DEPOLYMENT SETUP

CIRCUIT DIAGRAM

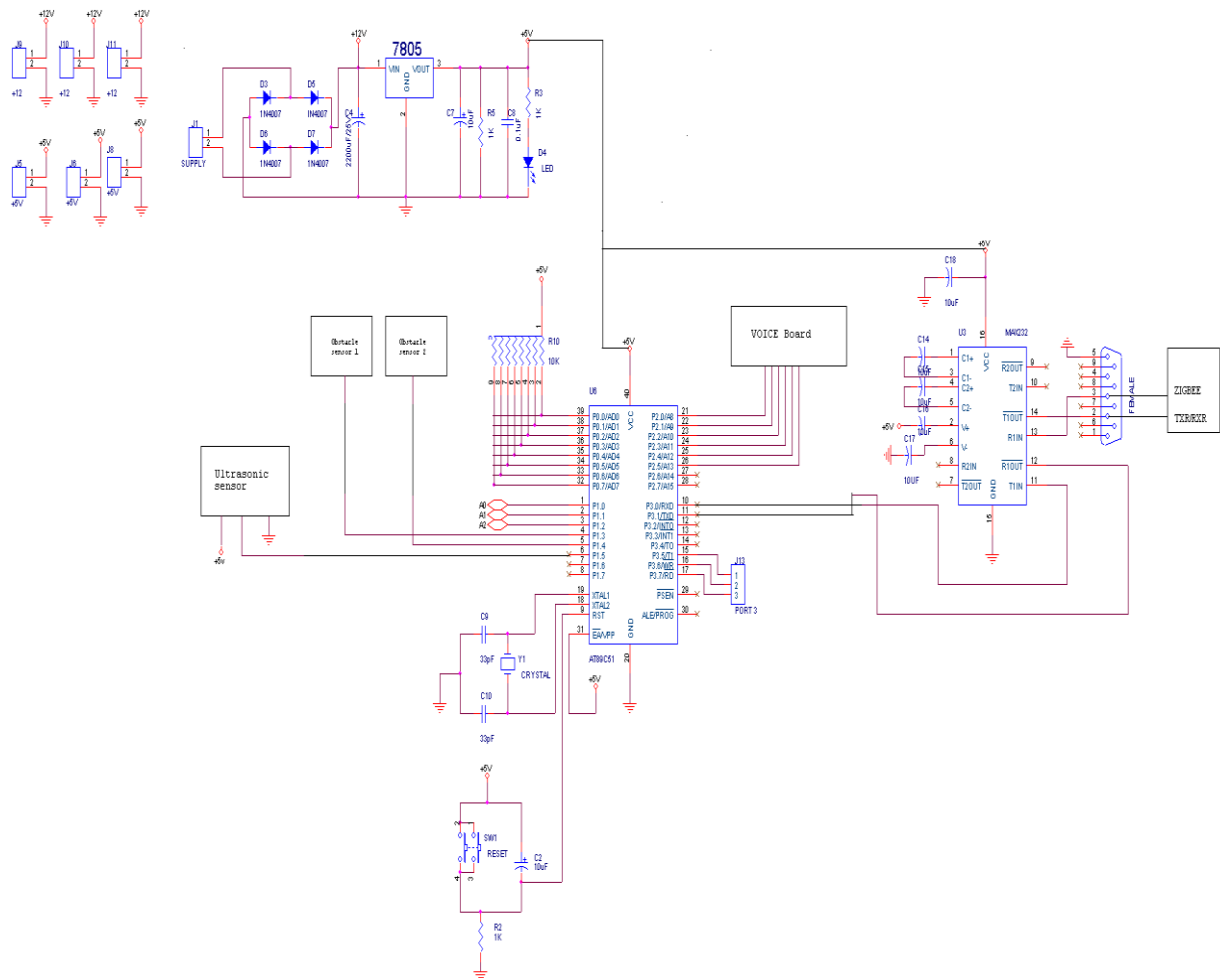


FIG.5.1 CIRCUIT DIAGRAM IN MPLAB

AREA 1

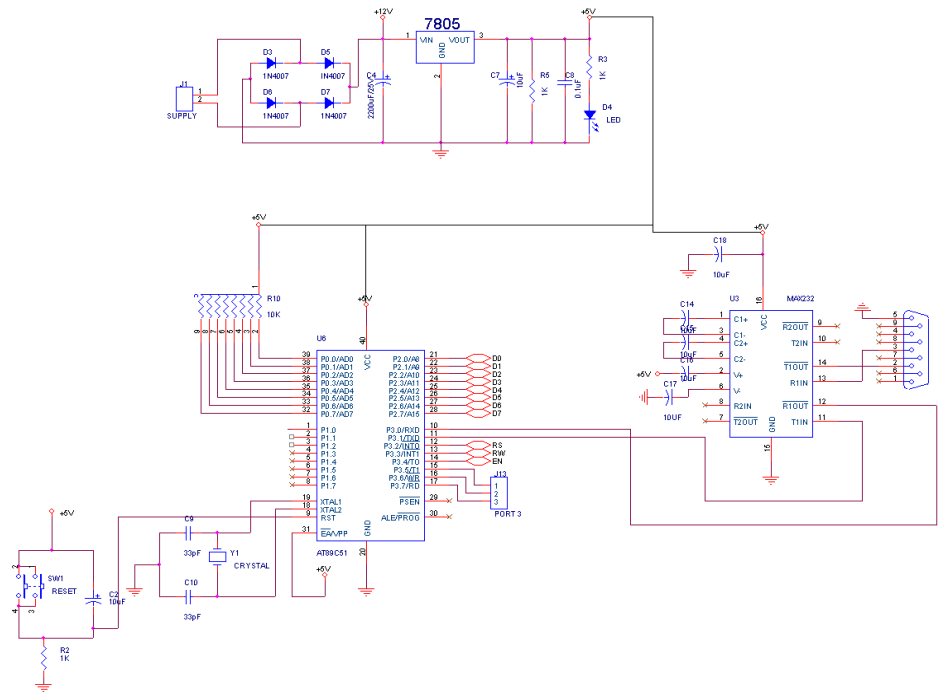


FIG.5.2 AREA 1

AREA 2

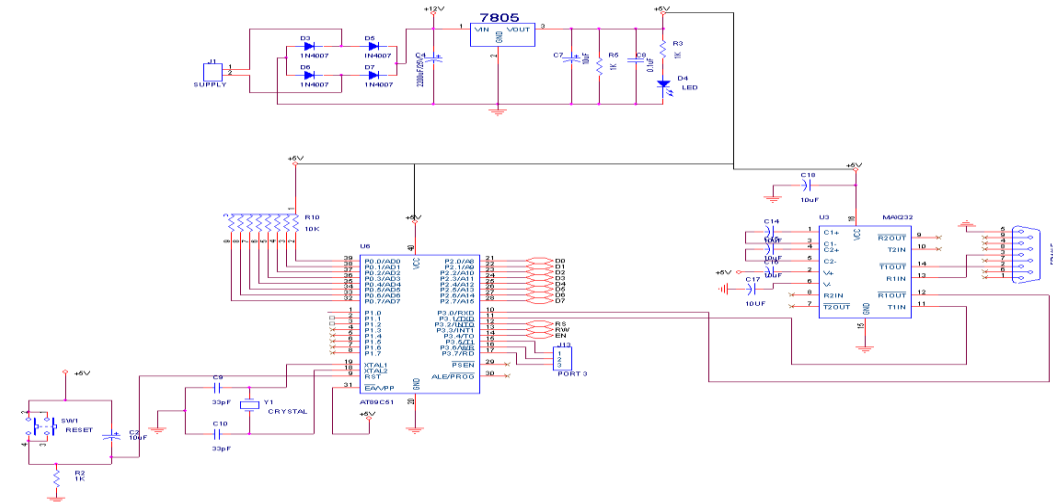


FIG.5.3 AREA 2

PCB LAYOUT OF HARDWARE

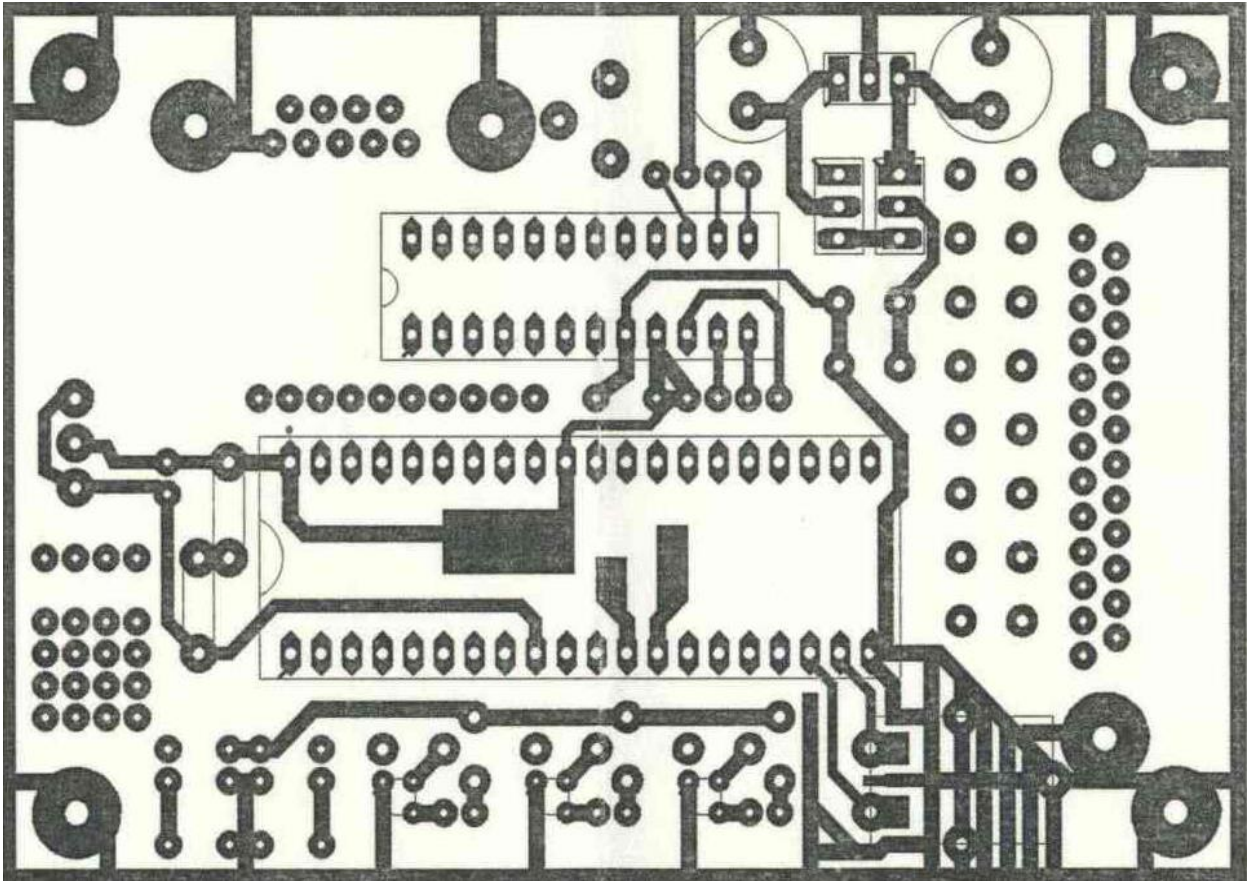


FIG.5.4 PCB LAYOUT

5.2 ADVANTAGES

- Cost effective.
- Wireless technology is used.
- Portable to anyplace
- Efficient monitoring

CHAPTER 6

RESULTS AND DISCUSSION

In Figure 6.1, the hardware kit is demonstrated. The kit is having PIC Microcontroller connected with temperature sensor, Pressure Sensor, CO2 sensor and PIR Sensor. Apart from the Relay is connected to it, which is connected to the actuators. In Figure 6.2, It is a child rescue robot model, Which will go inside the borewell to bring the child out.

Despite the fact that there are numerous methods, there is still a need for more simple and sophisticated rescue equipment. In this section, we propose a PIC based child rescue system from a bore well. There is no need to dig a large pit parallel to the bore well up to the depth where the child is stuck in this system. As a result, it may not be necessary to rely on many human resources (military, paramedical, etc.) and machinery (JCBs, Tractors, etc.). As a result, the delay in accumulating resources may be reduced, and the chances of saving the child alive are increased. The exciting method makes use of a highly advanced microcontroller, a well-developed accurate hand gripping mechanism (capable of carrying a plastic sample doll for demonstration), and a high-speed motor.

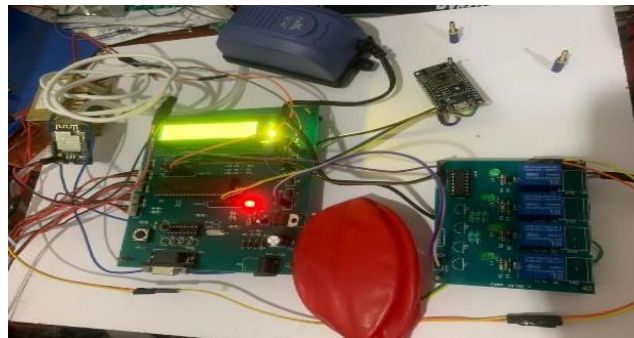


FIG.6.1 CHILD RESCUE ROBOT FIG.6.2 SNAPSHOT OF HARDWARE KIT

CHAPTER 7

CONCLUSION

7.1 CONCLUSION

The proposed system is tested with a test object (stuff doll) and is observed the performance of the system is quite satisfactory in rescuing operation also completed in very less time compared to traditional methods. The prototype has been designed keeping the possible practical issues in mind. The structure can be made strong enough to sustain all possible loads. A high-resolution camera is used in the system to identify the position of the baby. The gripper mechanism is operated using a switch to rotate the arm (to align in proper position) and to open and close the grippers on the arm.

7.2 FUTURE WORK

The present system had few limitations. Durability of the sensor may be minimum, Continuous power supply is required for the system, proper network connection should be present, Internet speed limits should be adequate to send data. Sensors can't store data by itself. Sensors like components are expensive, as scope for the future work we can look into these limitations and can resolve or eliminate or minimize in-order to build up an efficient system. Also, there is a scope to develop the system to protect the person or object without falling into bore well. These can be carried out as future work.

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