VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI – 590 018, KARNATAKA

Shri Bhagwan Mahaveer Jain Educational & Cultural Trust ®

JAIN COLLEGE OF ENGINEERING, BELAGAVI

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

FINAL YEAR
(2021 – 2022)

PROJECT REPORT

On

"WIRELESS MULTIFUNCTIONAL ROBOT FOR MILITARY APPLICATION"

PROJECT GUIDE

Prof. Vinayak Dalavi
Dept. of E&CE

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

This is to certify that the **Project Work** entitled **"Wireless Multifunctional Robot For Military Application"** carried outby **Mr.Patil Sudhir (2JI18EC055), Ms.Rama Kamble (2JI18EC067),Ms.Pooja Salunke (2JI18EC058) and Ms.Laxmi Chintappanavar (2JI18EC041)** are bonafide students of **Department of Electronics and Communication Engineering, Jain College of Engineering, Belagavi,** in partial fulfilment for the award of **Bachelor of Engineering** of the **Visvesvaraya Technological University, Belagavi** during the academic year **2021-2022**. It is certified that all corrections/suggestions indicated for project assessment have been incorporated in the report. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the Bachelor of Engineering degree.

Prof. Vinayak Dalavi	**Dr. Krupa R Rasane**	**Dr. J. Shivakumar**
Project Guide	HOD, Dept. of E&CE	Principal & Director
Dept. of E&CE, JCE BGM	JCE, Belagavi	JCE, Belagavi

19/7/22

Name of the examiner's	Signature with date
1. S.J. Gaonkar	
2. Praveen Chitti	28/7/22

DECLARATION

We **Mr. Patil Sudhir (2JI18EC055), Ms. Rama Kamble (2JI18EC067), Ms. Laxmi Chintappanavar (2JI18EC041) and Ms. Pooja Salunke (2JI18EC058)** students of **8th semester B.E. Electronics & Communication Engineering, Jain College of Engineering, Belagavi** hereby declare that the dissertation entitled **"Wireless Multifunctional Robot for Military Application"** has been carried out in a batch and submitted in the partial fulfillment of the requirement for the award of Bachelor's Degree in Electronics & Communication Engineering under Visvesvaraya Technological University, Belagavi during the academic year **2021 – 22.**

Name	**USN**	**Sign**
Mr. Patil Sudhir	2JI18EC055	_____
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Ms. Laxmi Chintappanavar	2JI18EC041	_____
Ms. Pooja Salunke	2JI18EC058	_____

Place : Belagavi

Date :

VISION

"To impart quality technical education for developing globally competent, ethically sound Electronics & Communication Engineers"

MISSION

1. To provide conducive environment through structured student centric, teaching learning process.
2. To nurture needs of society by infusing scientific temper in students and to grow as a center of excellence with efficient industry-institute interaction.
3. To inculcate self-learning skills, entrepreneurial ability and professional ethics.

Program Educational Objectives (PEO's)

1. Graduates will be able to contemplate real-time social problems and deliver efficient solutions.
2. Graduates will be able to lead and succeed in professional careers.
3. Graduates will contribute through research and entrepreneurship.

Program Specific Outcomes (PSO's)

Graduates in the UG program in Electronics and communication engineering will be able to

1. Design, verify and develop analog and digital systems by using state of art technology to contribute to the societal needs.
2. Apply knowledge in various domain of IoT, real time systems, communication systems, VLSI and embedded systems, image and signal processing using hardware and software tools.

PROGRAM OUTCOME'S (PO'S)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complexengineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineeringproblems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural,societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the **engineering and management principles and apply these to one's own work, as a member and** leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (CO's)

Course Outcome	Course Outcome Statement	Bloom's Level
18ECP83.01	Design and develop an electronic system using modern tools by following professional ethics to exhibit the academic skills acquired.	L3, L4, L6
17ECP83.02	Develop employer valued skills such as teamwork, communication skills and technical write-up.	L3
17ECP83.03	Understand the design factors to be considered that impact society, safety and environment.	L2, L3

Bloom's Cognitive Levels

L1: Remembering; L2: Understanding; L3: Applying; L4: Analyzing; L5: Evaluating; L6: Creating

STRENGTH OF CO MAPPING TO PO/PSOS WITH JUSTIFICATION:

1. Slight (Low) 2. Moderate (Medium) 3. Substantial (High)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	3	-	-	2	-	-	-	2	3	2
CO2	-	-	-	-	-	-	-	-	3	3	2	-	-	-
CO3	-	-	-	-	-	2	2	-	-	-	-	-	-	-

CO – PO - PSO	Justification
CO1 → PO1 (3) CO1 → PO2 (3) CO1 → PO3 (3) CO1 → PO4 (1) CO1 → PO5 (3) CO1 → PO8 (2) CO1 → P12 (2) CO1 → PSO1(3) CO1 → PSO2(2)	- Students apply the electronics and communication engineering skills and design products to solve complex engineering problems. - Students gain the knowledge of modern tools and skill usage. - Students can use research-based knowledge and methods including design of experiments, analysis and interpretation to provide valid conclusions. - Students can work ethically and professionally in the industry. - Students can be employable in the core as well as multi-disciplinary organizations.
CO2 → PO9 (3) CO2 → P10 (3) CO2 → P11 (2)	- Students can effectively act as an individual, and as a member or leader and work in a team. - Students can comprehend and write effective reports and make documentation with effective presentation. - Learn to management and financial skills required for the execution of project.
CO3 → PO6 (3) CO3 → PO7 (3)	- Students can able to understand the impact of professional engineering solutions in societal and environmental contexts. - Students can be able to apply reasoning of contextual knowledge to assess societal, health and safety issues.

ACKNOWLEDGEMENTS

Although a single sentence hardly suffices, we would like to thank almighty God for blessing us with his grace and taking our endeavour to a successful culmination.

We express our gratitude to our guide **Prof. Vinayak Dalavi, Dept. of E&CE, JCE, Belagavi,** for his valuable guidance and continual encouragement and assistance throughout the project work**.** We greatly appreciate the freedom and collegial respect. We are grateful to him for discussions about the technical matters and suggestions concerned to our topic.

We extend our sense of gratitude to **Prof. Salma S S, Project Coordinator, Dept. of E&CE, JCE, Belagavi,** for extending support and cooperation which helped us in completion of the project work.

We extend our sense of gratitude to **Dr. Krupa R Rasane, Professor & Head, Dept. of E&CE, JCE, Belagavi,** for extending support and cooperation which helped us in completion of the project work.

We would like to express our sincere thanks to **Dr. J. Shivakumar, Principal, JCE Belagavi,** for extending support and cooperation which helped us in the completion of the project work.

We would like to extend our gratitude to all staff of the **Department of Electronics and Communication Engineering** for the help and support rendered to us.

We would like to extend our gratitude to all our family members and friends especially for their advice and moral support.

ABSTRACT

Robotics has been a staple of advanced manufacturing for over half a century. As robots and their peripheral equipment become more sophisticated, reliable, and miniaturized, these systems are increasingly being utilized for military and law enforcement purposes. Replacing humans in the places of combat or warfare, this robot detects the presence of humans, unusual objects, temperature, and the presence of metal pieces in the field. The latest internet of things smart technology helps all connected devices to update themselves according to the changes in the surroundings and to be able to adapt to any environment, we can visualize the conditions of the field accurately. The movement of the robot can be controlled both manually and in automated control. "With suitable sensors to perform different missions, mobile robots are operated remotely for reconnaissance patrol an operator. According to commands received from android the robot motion can be controlled.

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ABBREVIATIONS

RAM	-Random access memory
EEPROM	-Electrical Erasable Programmable Read Only Memory
CMOS	-Complementary Metal Oxide Semiconductor
PPM	-Parts per Million
ADC	-Analog to Digital Converter
Aout	-Analog Output
Dout	-Digital Output
UART	-Universal Asynchronous Receiver/Transmitter
RISC	-Reduced Instruction Set Computer
PCB	-Printed Circuit Board
PCH	-Program Critical Hardware
PCM	-Pulse Code Modulation
WSN	-Wireless Sensor Network

CHAPTER 1

INTRODUCTION

A robot is an automatic electronic device that is capable of performing programmed activities, thus replacing human work, providing highly accurate results and easily overcoming the limitations of human beings. In this project, the focus is surveillance of war fields or places with no human reach.

In India, most of the cost/income is invested in military forces as there are many border threats in places like Kashmir, Ladakh and terrorism threats in places like Mumbai. The military uses Daksh military recently in combat fields.

One of the main advantage of this robot is it helps to keep the place under control by providing 24x7 surveillance and also overcomes the drawback of limited frequency range by using the concept of Internet of Things for receiving the data from the bot and also to control the movement of the bot. Also the second advantage being that the robot can be used in automatic mode where the bot changes its direction when an obstacle is detected in front of it with the help of ultrasonic sensors.

The night vision camera provides the live streaming of the metal detector sensor placed under the robot[1].It also sends the exact location of the robot with the help of GPS used on the botand also helps us to find the exact location of land mines.

Military Robots are used to detect bombs, weapons, fire and gas etc. in the war fields. The advantage is that the cost per hour to operate a robot is a fraction of the cost of the human labor needed to perform the same function. Including this, they are reprogrammed and perform functions with a high accuracy. Human operators are far more versatile so they can switch to any pre-defined job tasks easily. Robots are built and programmed to be job specific. Robots are in the infancy stage of their evolution. As robots evolve, they will become more versatile, emulating the human capacity and ability to switch job tasks easily. While the personal computer has made an ineffaceable mark on society, the personal robot hasn't made an appearance. Robotics is element of science of automation which are operated under control of mini or micro-computer. Robots require a combination of elements to be effective: sophistication of intelligence, movement, mobility, navigation, and purpose. Without risking human life, robots can replace humans in some hazardous duty service.

1.1 Motivation

- To provide automation in hospital, office and factory. Besides automation this technology also used in Defence forces, Entertainment, Space exploration and Security systems.
- To save the human life, robots can be used in battlefield.
- To get the information about war field.

1.2 Objectives

- To develop the Robot vehicle which works manually using internet as This communication medium .
- Robot used to detect human, bombs, Temperature, fire at remote areas.
- To avoid the loss of soldiers in Battlefield. Using WiFi Technology.
- Used to explore hazardous areas and used for espionage purposes.
- This robotic vehicle is designed for reconnaissance as well as surveillance under certain circumstances.

CHAPTER 2
LITERATURE SURVEY

T asha, Nischitha B Lavanya K N, Ramya Shree D, and C Gururaj "Vision Interfaced War Field Robot With Wireless Video Transmission" Proceedings of the 2nd International Conference on Trends in Electronics and Informatics (ICOEI 2018) IEEE Conference Record: # 42666; IEEE Xplore ISBN:978-1-5386- 3570

The aim of the paper is to design and implement a real time surveillance system which functions a substitute for the humans in defence sector.

The vision based interface functions by giving gestures to control robot which overcomes the lacunae of speech recognition algorithms. This work consists of four stages i.e. capturing of the image, gesture recognition, navigation of robot, metal and fire detection. The implementation is achieved by stopping of the robot by either fire or metal detection. The impact of the work aspires at achieving more safety and reduced loss of lives in the battle field.

Md. Baijid Hasan Shorif Shekh Nuruzzaman ,Ahsanul Hoque,Md.Eftekhar Alam, "Arduino based Battlefield assistive Robot" 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC) 21 - 23Dec 2017-

Sophisticated technology advancing day by day and robotics has become a promising field for research in this race. Military forces now using robots for reducing causalities and to defeat their enemies.

The major focus of this project, is on the use of robot in war, peace and as well as their impact on society. Here Radio Frequency modules signals are used in wireless remote-control system for transmitting and receiving wireless signals to control the motors and actuators of robot control system. Night vision monitoring system has been added which will capture and transmit the information surrounding the robot to the operator. With this feature the robot can not only transmit real time videos with night vision capabilities but cannot also be identified by the enemies in war zone. A metal detector and GSM module has also been added which will inform us about any bomb underneath the robot vehicle. Another assistive feature here added that, is a robotic arm has

been installed to pick or drop some object if needed. Keywords— Robot, Radio Frequency module, act

Borole. P.B. and Mohammad Shoeb Shah "Surveillance And Rescue Robot Using Android Smart Phone And Internet". International Conference on Communication And Signal Processing, India. (2016).

The main objective behind this paper is to develop a robot to perform the act of surveillance in domestic areas. Nowadays robot plays a vital role in our day to day life activities thus reducing human labour and human error. Robots can be manually controlled or can be automatic based on the requirement. The purpose of this robot is to roam around and provide audio and video information from the given environment and to send that obtained information to the user. In this project, one can control the robot with the help of mobile or laptop through Internet of Things (IoT) and also can get the live streaming of video both in daytime as well as at night with the help of wireless camera from the robot. The robot can be controlled both in manual as well as in automated mode with the help of Arduino microcontroller. This robot also uses various sensors that collects data and sends it to the Arduino microcontroller which controls the robot behaviour.

Dilip Kumar,Tarunpreet Kaur "Wireless Multifunctional Robot for Military Applications" Proceedings of 2015 RAECS UIET Punjab University Chandigarh 21-22nd December 2015. 978-1-4673-8253- 3/15 ©2015 IEEE.

This paper presents a modern approach for surveillance at remote and border areas using multifunctional robot based on current 3G technology used in defence and military applications. This robotic vehicle has ability to substitute the solider at border areas to provide surveillance.

The robotic vehicle works both as autonomous and manually controlled vehicle using internet as communication medium. This multisensory robot used to detect human, bombs, harmful gases and fire at remote and war field areas. Conventionally, wireless security robot obsoletes due to limited frequency range

and limited manual control. These limitations are surmounted by using 3G technology which has limitless range.

This system also enhances the use of renewable resource of energy by equipping with solar panel. An autonomous operation is controlled by ultrasonic sensor and infrared sensors. Manual operation is controlled by DTMF decoder and cell phones used as video camera by initializing 3G video call and change the path of robot according to real time information of surrounding.

Minal S. Ghute, Kanchan P. Kamble, Mridul Korde et. al. described a military robot which monitors the environment and provides live video feedback. This model used gyrosensors for the movement of the robot. It uses bluetooth connectivity for wireless communication with the help of mobile device which make it range limited.

Shudha Chowdhury et. al. designed a robot that was used to serve during the natural calamities like earthquake and cyclones etc. This robot uses a PIR sensors which helps in detecting human beings or animals being trapped inside a place or in a collapsed building. But the major drawback being that the location of the robot wasn't being able to detect.

Tarunpreet Kaur et. al. proposed a robot which uses solar panel to charge the batteries.This robot was also able to detect any obstacle placed in front of it and brought in the RF technology into robots for transmitting live video.

Dr.Shreedhar A Joshi et. al. developed a robot with speed varying facilities by giving different gears to the robot. This robot was also provided with a gas detection facility.The only drawback of this project was the use of arduino uno as their heart of the project.

CHAPTER 3
HARDWARE DESIGN

3.1 BLOCK DIAGRAM

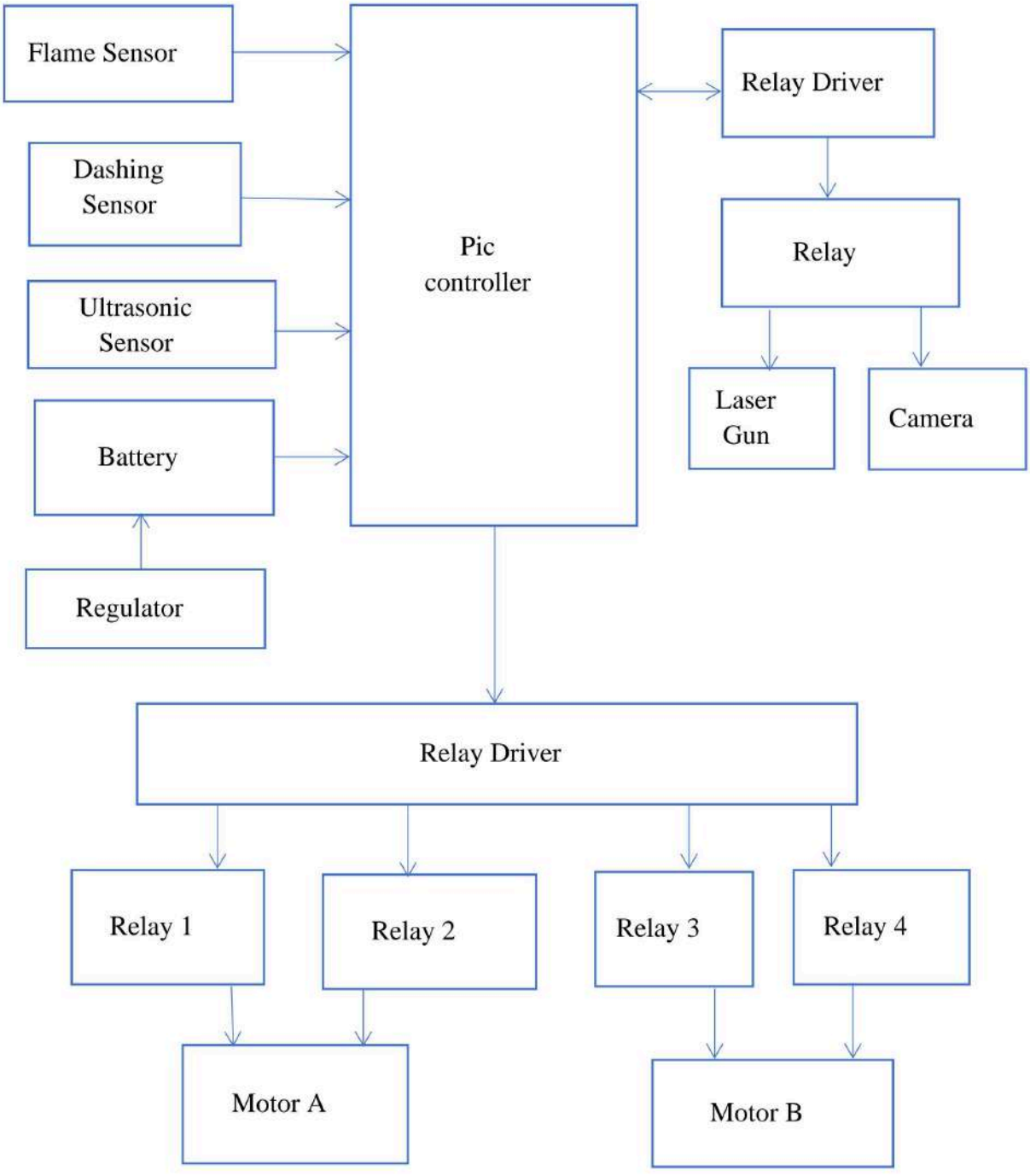


Fig 3.1 Block Diagram

3.2 CIRCUIT DIGRAM

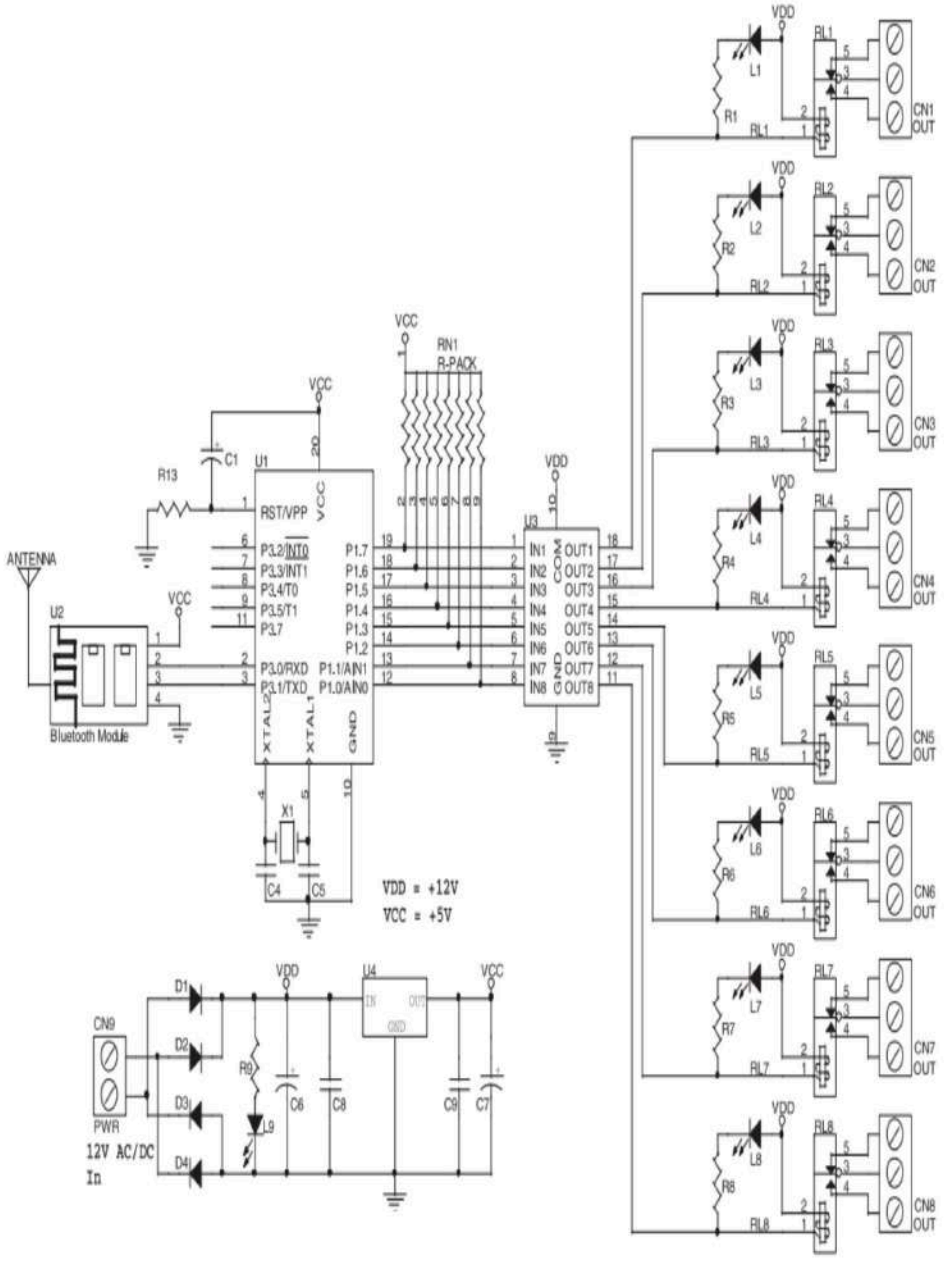


Fig 3.2:Circuit Diagram

3.3 PIC CONTROLLER 16FF72

The PIC16F72-I/SP is an 8-bit CMOS Flash Microcontroller with 5-channel analogue-to-digital converter with 2 additional timers, capture/compare/PWM function and the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI™) or the 2-wire Inter-Integrated Circuit (I²C™) bus. There are two memory blocks in this device. These are the program memory and the data memory. Each block has separate buses so that concurrent access can occur. Program memory and data memory are explained in this section. Program memory can be read internally by the user code.converter[2]. This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS flash-based 8-bit microcontroller packs Microchips powerful PIC® architecture into a 28-pin package. It features 5 channels of 8-bit Analogue-to-Digital (A/D)

3.3.1 PIC 16F877A Specification

RAM	368 bytes
EEPROM	256 bytes
Flash Program Memory	8k words
Operating Frequency	DC to 20MHz
I/O port	Port A,B,C,D,E

This is the specification for PIC16F877A from Microchip. A single microcontroller which is very easy to be assembled, program and also it is economical. It cost less than Rs.800. The good thing is that single unit can be purchased at that Rs. 8000 . Unlike some other Integrated Circuit that must be bought at a minimum order quantity such as 1000 units or 2000 units or else you won't be able to purchase it.

One unit of PIC16F877A microcontroller can be programmed and erased so many times. Some said about 10 000 times. If you are doing programming and downloading your code into the PIC 20 times a day that means you can do that for 500 days which is more than a year!

The erasing time is almost unnoticeable because once new program are loaded into the PIC, the old program will automatically be erased immediately.

RAM:

PIC16F877A already made with 368 bytes of Random Access Memory (RAM) inside it. Any temporary variable storage that we wrote in our program will be stored inside the RAM. Using this microcontroller you don't need to buy any external RAM.

EEPROM:

256 bytes of inbuilt EEPROM is available within this microcontroller. This is very useful to store information such as PIN Number, Serial Number and so on. Using EEPROM is very important because data stored inside EEPROM will be retained when power supply is turn off. RAM did not store data permanently. Data inside RAM is not retained when power supply is turn off.

The size of program code that can be stored is about 8k words inside PIC16F877A ROM. 1 word size is 14 bits. By using the free version of the CCS C compiler only 2k words of program can be written and compiled. To write 8k words of C program you have to purchase the original CCS C compiler and it cost less than Rs. 55,710.

Crystal oscillator:

The crystal oscillator speed that can be connected to the PIC microcontroller range from DC to 20Mhz. Using the CCS C compiler normally 20Mhz oscillator will be used and the price is very less. The 20 MHz crystal oscillator should be connected with about 22pF capacitor. Please refer to my circuit schematic.

There are 5 input/output ports on PIC microcontroller namely port A, port B, port C, port D and port E. Each port has different function. Most of them can be used as I/O port.

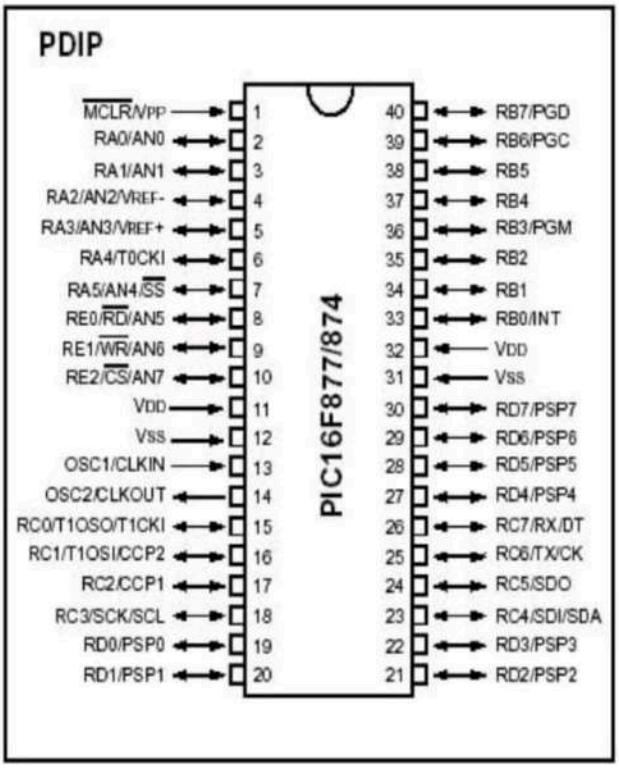


Fig3.3 Pin Configuration

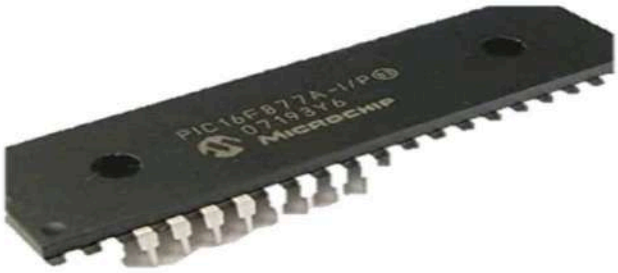


Fig 3.4 PIC CONTROLLER 16FF72

3.3.2 Functions of PIC 16FF72

- Used for coding and data storage.
- Reading data from sensors.

3.4 ULTRASONIC SENSOR

- Ultrasonic sensors are used to detect obstacles in the surroundings.
- The bot is able to find its own path with integration of the sensors.
- Ultrasonic sensors work by sending ultrasonic sound waves which are reflected after striking the obstacle.
- It also helps to determine the distance between the bot and obstacles

Ultrasonic sensors work by emitting sound waves at a frequency too high for humans to hear. They then wait for the sound to be reflected back, calculating distance based on the time required. This is similar to how radar measures the time it takes a radio wave to return after hitting an object.

While some sensors use a separate sound emitter and receiver, it's also possible to combine these into one package device, having an ultrasonic element alternate between emitting and receiving signals[3]. This type of sensor can be manufactured in a smaller package than with separate elements, which is convenient for applications where size is at a premium.

While radar and ultrasonic sensors can be used for some of the same purposes, sound-based sensors are readily available—they can be had for just a in some cases—and in certain situations, they may detect objects more effectively than radar.

For instance, while radar, or even light-based sensors, have a difficult time correctly processing clear plastic, ultrasonic sensors have no problem with this. In fact, they're unaffected by the color of the material they are sensing.

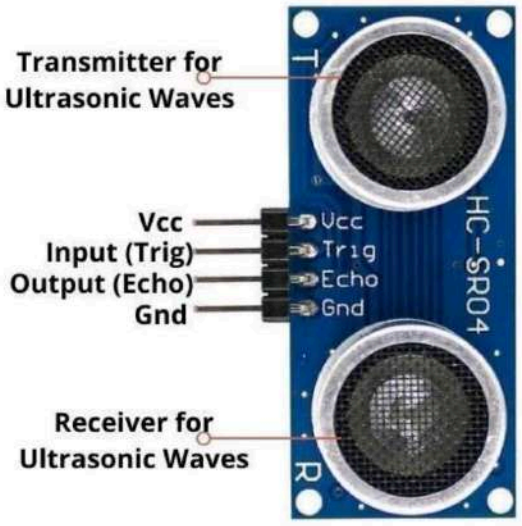


Fig 3.5 Obstacle sensor

3.4.1 Specifications of Ultrasonic Sensor

- 5VDC Operating voltage
- I/O pins are 5V and 3.3V compliant
- Range: Up to 20cm
- Adjustable Sensing range
- Built-in Ambient Light Sensor

3.4.2 Functions of Ultrasonic Sensor

- An obstacle detection system uses ultrasonic sensors mounted on the front and/or rear bumpers.
- These sensors can measure the distance between your car and nearby obstacles directly around the front or rear bumper.
- The beeps become faster as the vehicle moves closer to the obstacle.

3.5 MQ135 GAS SENSOR

MQ-135 detects smoke and other harmful gases. It's of lower cost and this makes an ideal choice of different applications of gas detection. **Air quality click** carries an MQ-135 sensor for **detecting poisonous gases that impact air quality** in homes and offices and in vehicles. The click is designed to run on a 5V power supply

When tin dioxide (semiconductor particles) is heated in air at high temperature, oxygen is adsorbed on the surface. In clean air, donor electrons in tin dioxide are attracted toward oxygen which is adsorbed on the surface of the sensing material. This prevents electric current flow.

In the presence of reducing gases, the surface density of adsorbed oxygen decreases as it reacts with the reducing gases. Electrons are then released into the tin dioxide, allowing current to flow freely through the sensor.

Fig 3.6 Gas sensor

3.5.1 Features

The MQ135 sensor is powered by +3.3VDC supply. The output of MQ135 sensor is connected to analog pin (A2) of inbuilt ADC in ARDUINO UNO board. The ADC value is converted to PPM is then read and printed on the serial

monitor. A pre-defined C02 threshold level if fixed .If the threshold value is crossed then car window level gets opened

- Senses sensitive gases like ammonia, nitrogen oxide, alcohols, aromatic compounds, sulphide and smoke.
- Boost converter chip PT1301.
- Operating voltage 2.5V -5.0V.

3.5.2 Pin Configuration

VCC-Operating voltage is +5V.

Ground -Used to connect the module to system ground.

Digital Out-To get digital output from this pin.

Analog Out-This pin outputs 0-5V analog voltage based on the intensity of the gas.

3.6 FLAME SENSOR

A sensor which is most sensitive to a normal light is known as a flame sensor. That's why this sensor module is used in flame alarms. This sensor detects flame otherwise wavelength within the range of 760 nm – 1100 nm from the light source. This sensor can be easily damaged to high temperature. So this sensor can be placed at a certain distance from the flame. The flame detection can be done from a 100cm distance and the detection angle will be 600. The output of this sensor is an analog signal or digital signal. These sensors are used in fire fighting robots like as a flame alarm.

A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame[4]. The flame detection response can depend on its fitting. It includes an alarm system, a natural gas line, propane & a fire suppression system. This sensor is used in industrial boilers. The main function of this is to give authentication whether the boiler is properly working or not. The response of these sensors is faster as well as more accurate compare with a heat/smoke detector because of its mechanism while detecting the flame.

Working Principle

This sensor/detector can be built with an electronic circuit using a receiver like electromagnetic radiation. This sensor uses the infrared flame flash method, which allows the sensor to work through a coating of oil, dust, water vapor, otherwise ice.

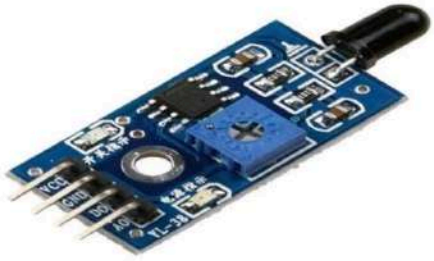


Fig 3.7 Flame Sensor

3.6.1 Features

- Photosensitivity is high
- Response time is fast
- Simple to use
- Sensitivity is adjustable
- Detection angle is 600,
- Operating voltage of this sensor is 3.3V to 5V
- Analog voltage o/ps and digital switch o/p

3.6.2 Pin Configuration

Pin1 (VCC pin): Voltage supply rages from 3.3V to 5.3V

Pin2 (GND): This is a ground pin

Pin3 (AOUT): This is an analog output pin (MCU.IO)

Pin4 (DOUT): This is a digital output pin (MCU.IO)

3.7 MOTOR DRIVER

Fig 3.8 Motor Driver

This module is a medium power motor driver perfect for driving DC motor sand Stepper motors. It uses the popular L293D H-bridge motor driver IC.

It can drive 4 DC motors in one direction, or drive 2 DC motors in both the directions with speed control. The driver greatly simplifies and increases the ease with which we may control motors, relays, etc. from microcontrollers. It can drive motors up to 12V with a total DC current of up to 600mA. This board has a feature of On board 5V regulator 7805.

A magnetic field arises in the air gap when the field coil of the DC motor is energised. The created magnetic field is in the direction of the radii of the armature. The magnetic field enters the armature from the North pole side of the field coil and "exits" the armature from the field coil's South pole side.

3.7.1 Specifications:

- Operating Voltage: 7V to 12V DC.
- 4 channel output (can drive 2 DC motor bi-directionally).
- 600mA output current capability per channel.
- PTR connectors for easy connections.
- Uses assessable enable pins facility

Fig 3.9 Gear Motors

An **electric motor** converts electrical energy into mechanical energy. Most electric motors operate through interacting magnetic fields and current-carrying conductors to generate force, although electrostatic motors use electrostatic forces.

Electric motors are found in applications as diverse as industrial fans, blowers and pumps, machine tools, household appliances, power tools, and disk drives. They may be powered by direct (e.g., a battery powered portable device or motor vehicle), or by alternating current from a central electrical distribution grid.

Brushless DC motors use a rotating permanent magnet in the rotor, and stationary electrical magnets on the motor housing. A motor controller converts DC to AC. This design is simpler than that of brushed motors because it eliminates the complication of transferring power from outside the motor to the spinning rotor. Advantages of brushless motors include long life span, little or no maintenance, and high efficiency. Disadvantages include high initial cost, and more complicated motor speed controllers.

3.7.2 FEATURES

- Voltage Rating : 12V
- Gearbox : 6mm shaft diameter with internal hole.
- Weight : 125gm.
- Stall Torque : 1kgcm torque (No-load)
- Current : 60 mA (Max).
- Load current : 300 mA (Max)

3.8 RELAY MODULE

The relay is the device that open or closes the contacts to cause the operation of the other electric control. It detects the undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area through ON or OFF.

It works on the principle of an electromagnetic attraction. When the circuit of the relay senses the fault current, it energises the electromagnetic field which produces the temporary magnetic field[5].This magnetic field moves the relay armature for opening or closing the connections.

The inner section of the relay is shown in the figure below. It has an iron core which is wound by a control coil. The power supply is given to the coil through the contacts of the load and the control switch. The current flows through the coil produces the magnetic field around it.

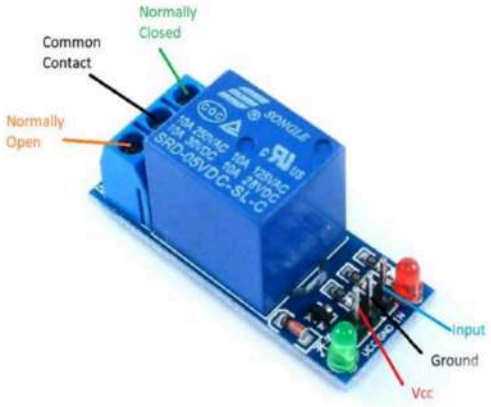


Fig 3.10 Relay Module

3.8.1 Features

- voltage – 3.75V to 6V
- Quiescent current: 2mA
- Current when the relay is active: ~70mA
- Relay maximum contact voltage – 250VAC or 30VDC
- Relay maximum current – 10A

3.8.2 Pin Configuration

Pin1 (End 1): It is used to activate the relay; usually this pin one end is connected to 5Volts whereas another end is connected to the ground.

Pin2 (End 2): This pin is used to activate the Relay.

Pin3 (Common (COM)): This pin is connected to the main terminal of the Load to make it active.

Pin4 (Normally Closed (NC)): This second terminal of the load is connected to either NC/ NO pins. If this pin is connected to the load then it will be ON before the switch.

Pin5 (Normally Open (NO)): If the second terminal of the load is allied to the NO pin, then the load will be turned off before the switch.

3.9 ESP8266 Wi-Fi MODULE

- Espressif Systems' Smart Connectivity Platform (ESCP) is a set of high performance, high integration wireless SOCs, designed for space and power constrained mobile platform designers.
- It provides unsurpassed ability to embed WiFi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement.
- ESP8266EX offers a complete and self-contained WiFi networking solution; it can be used to host the application or to offload WiFi networking functions from another application processor.
- When ESP8266EX hosts the application, it boots up directly from an external flash. It has integrated cache to improve the performance of the system in such applications.

- Alternately, serving as a WiFi adapter, wireless internet access can be added to any micro controller- based design with simple connectivity (SPI/SDIO or I2C/UART interface).
- ESP8266EX is among the most integrated Wi Fi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

Fig. 3.11 ESP8266 Wi-Fi MODULE

3.9.1 SPECIFICATION

- It is a powerful Wi-Fi module available in a compact size at a very low price.
- It is based on the L106 RISC 32-bit microprocessor core and runs at 80 MHz
- It requires only 3.3 Volts power supply
- The current consumption is 100 m Amps
- The maximum Input/Output (I/O) voltage is 3.6 Volts.
- It consumes 100 mA current
- The maximum Input/Output source current is 12 mA
- The frequency of built-in low power 32-bit MCU is 80 MHz
- The size of flash memory is 513 kb
- It is used as either an access point or station or both
- It supports less than 10 microAmps deep sleep

- It supports serial communication to be compatible with several developmental platforms such as Arduino
- It is programmed using either AT commands, Arduino IDE, or Lua script
- It is a 2.4 GHz Wi-Fi module and supports WPA/WPA2, WEP authentication, and open networks.
- It uses two serial communication protocols like I2C (Inter-Integrated Circuit) and SPI (Serial Peripheral Interface).
- It provides 10- bit analog to digital conversion

3.10 WIRELESS CAMERA

Fig3.12 Wireless Camera

A night vision audio-video camera is used for surveillance of the place all time. separate battery is used to provide power supply to the camera. The AV camera transmits the data which will be received by the AV receiver on the receiver side.

3.10.1 Wireless Video Transmitter Features

- Outdoor Range Up to 1500 feet through Trees
- Creates a Non-Direct Line of Sight WIFI Bridge
- System Includes Transmitter & Receiver Antennas
- Uses 900 Mhz wireless frequencies
- Data Transfer Rate of up to 1.5 Mbps RF / 935Kbps Ethernet
- Transmit multiple IP Security Cameras (limited to 1.5 Mbps total)

- Transmit multiple CCTV Cameras using video servers
- Perfect for both Point-to-Point & Point-to-MultiPoint applications
- CAT-5 / RJ-45 Ethernet Interface
- 128 bit AES Data Encryption for Maximum Security

3.11 DC MOTOR

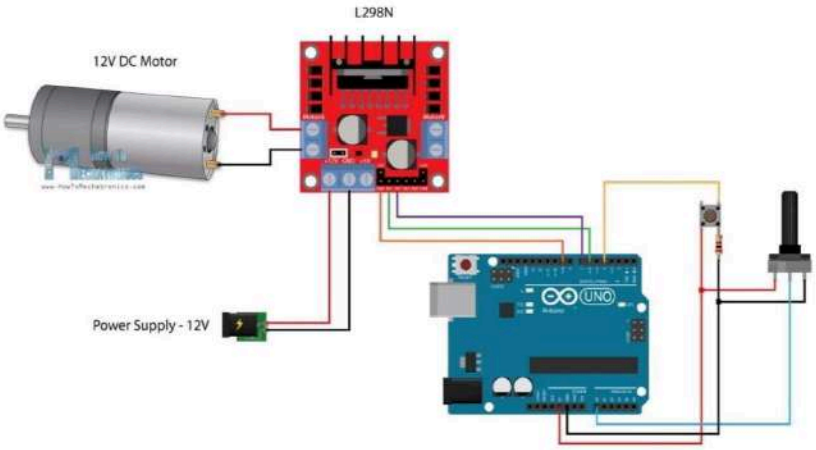


Figure. 3.13: DC Motor

A DC motor (Direct Current motor) is the most common type of motor. DC motors normally have just two leads, one positive and one negative. If you connect these two leads directly to a battery, the motor will rotate. If you switch the leads, the motor will rotate in the opposite direction.

A magnetic field arises in the air gap when the field coil of the DC motor is energised. The created magnetic field is in the direction of the radii of the armature. The magnetic field enters the armature from the North pole side of the field coil and "exits" the armature from the field coil's South pole side.

3.11.1 DC Motor Specification

- Operating Voltage: 4.5V to 9V.
- Recommended/Rated Voltage: 6V. • Current at No load: 70mA (max)

- No load Speed: 9000 rpm. Loaded
- current: 250mA (approx) Rated
- Load: 10g*cm.
- Motor Size: 27.5mm x 20mm x 15mm

3.11.2 Functions of DC Motor

- A direct current (DC) motor is a type of electric machine that converts electrical energy into mechanical energy.

- DC motors take electrical power through direct current, and convert this energy into mechanical rotation.

CHAPTER 4

SOFTWARE DESCRIPTION

This project is implemented using following software tools:

- PIC C compiler - for compilation part
- Proteus 7 (Embedded C) – for simulation part

4.1 PIC Compiler:

PIC compiler is software used where the machine language code is written and compiled.

After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. PIC compiler also supports C language code. The PCB, PCM, and PCH are separate compilers. PCB is for 12-bit opcodes, PCM is for 14-bitopcodes, and PCH is for 16-bit opcode PIC microcontrollers. Due to many similarities, all three compilers are covered in this reference manual. Features and limitations that apply to only specific microcontrollers are indicated within. These compilers are specifically designed to meet the unique needs of the PIC microcontroller. This allows developers to quickly design applications software in a more readable, high-level language. When compared to a more traditional C compiler, PCB, PCM, and PCH have some limitations. As an example of the limitations, function recursion is not allowed.

This is due to the fact that the PIC has no stack to push variables onto, and also because of the way the compilers optimize the code[6]. The compilers can efficiently implement normal C constructs, input/output operations, and bit twiddling operations. All normal C data types are supported along with pointers to constant arrays, fixed point decimal, and arrays of bits. PIC C is not much different from a normal C program.

In PIC, we have a main function, in which all application specific work will be defined. In case of embedded C, there is no operating system running. So, make sure that the program or main file should never exit. This can be done

with the help of simple while (1) or for (;;) loop as they are going to run infinitely.

Header file for controller are needed to access registers related to peripherals.

```
#include <16F877A.h> // header file for PIC 16F877A//
```

4.2 Proteus:

Proteus is software which accepts only hex files. Once the machine code is converted into hex code, that hex code has to be dumped into the microcontroller and this is done by the Proteus. Proteus is a programmer which itself contains a microcontroller in it other than the one which is to be programmed. This microcontroller has a program in it written in such a way that it accepts the hex file from the pic compiler and dumps this hex file into the microcontroller which is to be programmed. As the Proteus programmer requires power supply to be operated, this power supply is given from the power supply circuit designed and connected to the microcontroller in proteus. The program which is to be dumped in to the microcontroller is edited in proteus and is compiled and executed to check any errors and hence after the successful compilation of the program the program is dumped in to the microcontroller using a dumper.

4.2.1 Procedural steps for compilation, simulation and dumping:

Compilation and simulation steps:

For PIC microcontroller, PIC C compiler is used for compilation. The compilation steps are as follows:

- Open PIC C compiler.
- You will be prompted to choose a name for the new project

Dumping steps:

The steps involved in dumping the program edited in proteus 7 to microcontroller are shown below:

1. Initially before connecting the program dumper to the microcontroller kit the window is appeared as shown below.

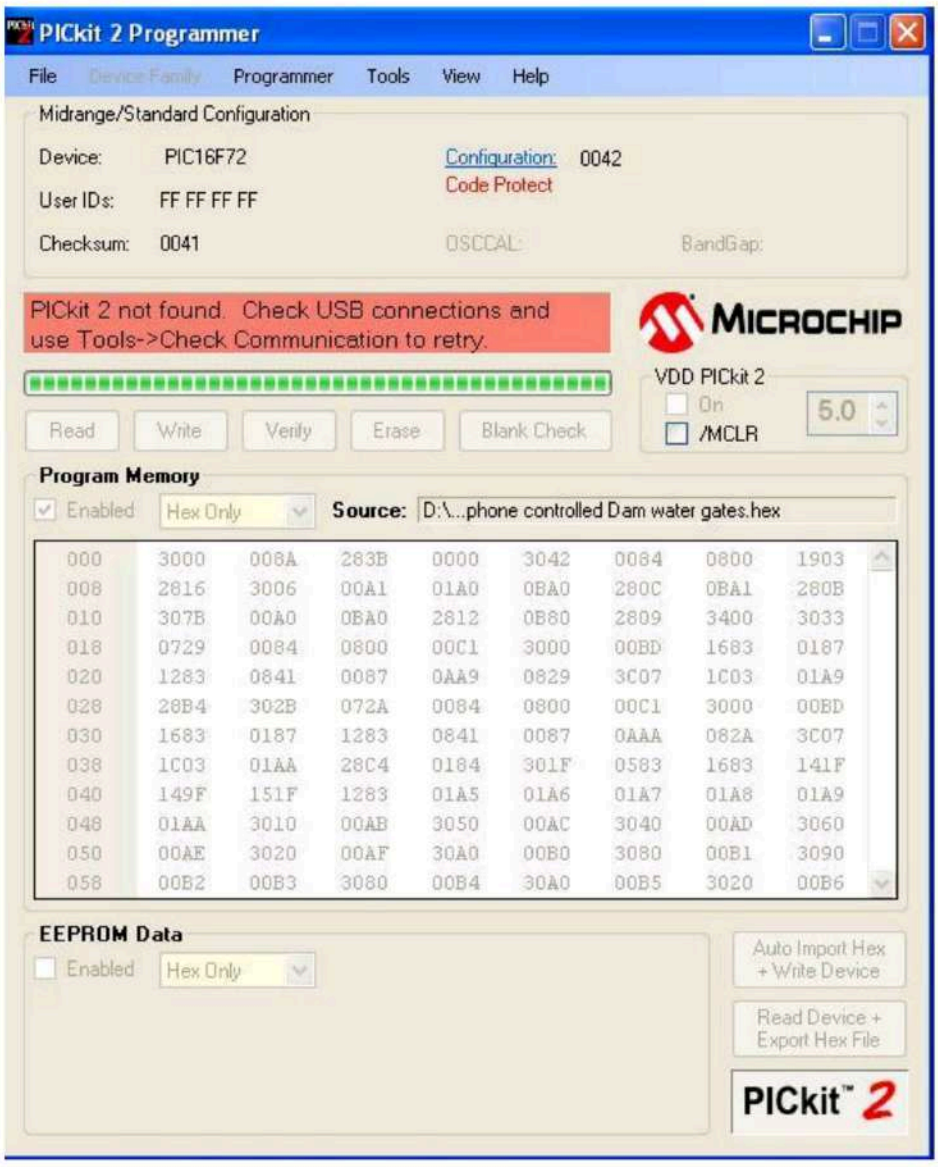


Fig 4.1: Picture of program dumper window

2. Select Tools option and click on Check Communication for establishing a connection as shown in below window

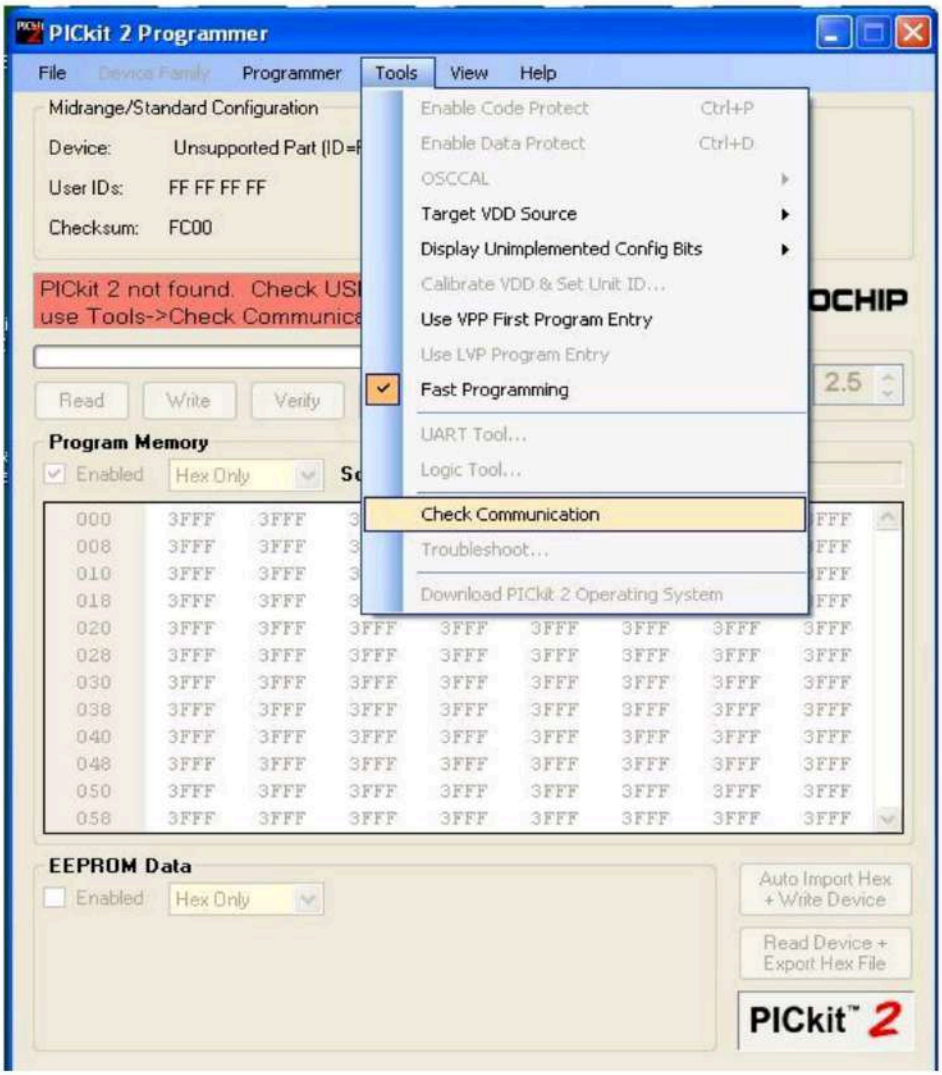


Fig 4.2: Picture of checking communications before dumping program into microcontroller

3. After connecting the dumper properly to the microcontroller kit the window is appeared as shown below.

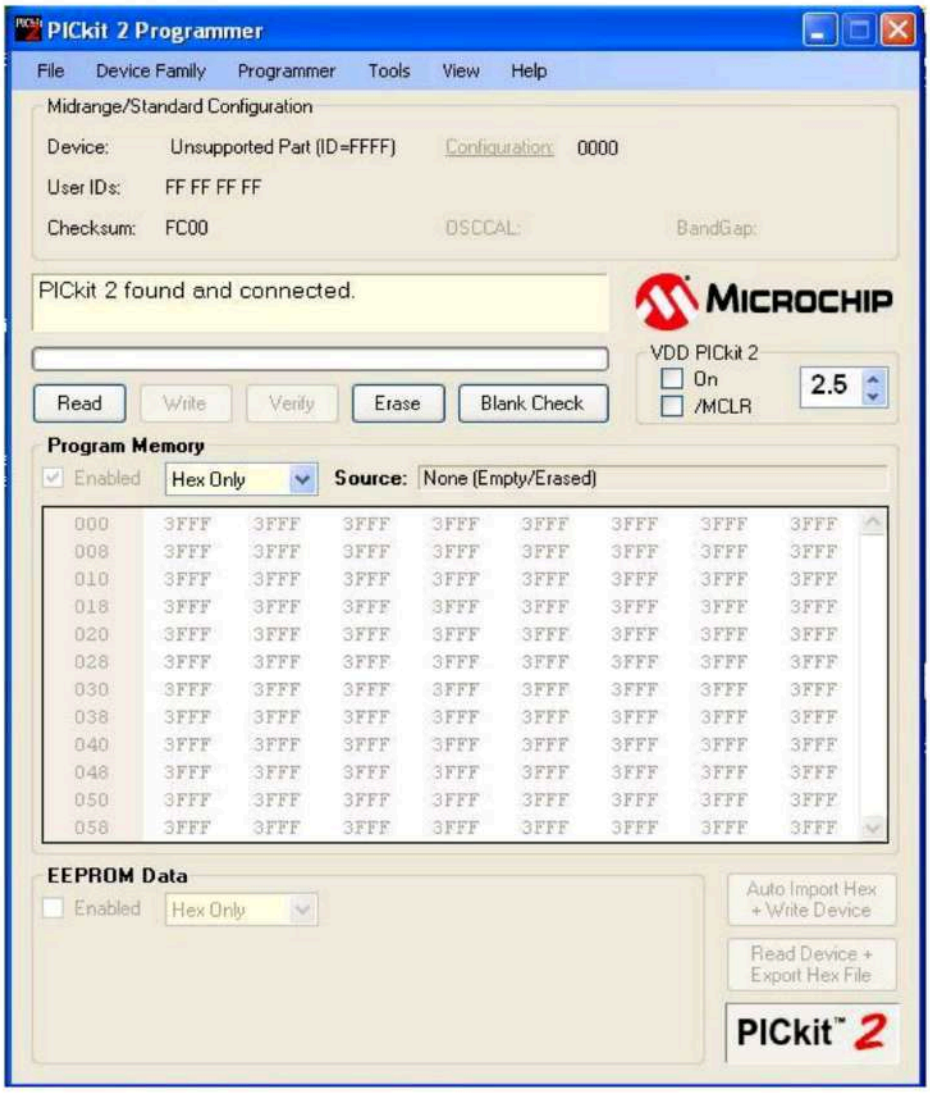


Fig 4.3: Picture after connecting the dumper to microcontroller

4. Again by selecting the Tools option and clicking on Check Communication the microcontroller gets recognized by the dumper and hence the window is as shown below.

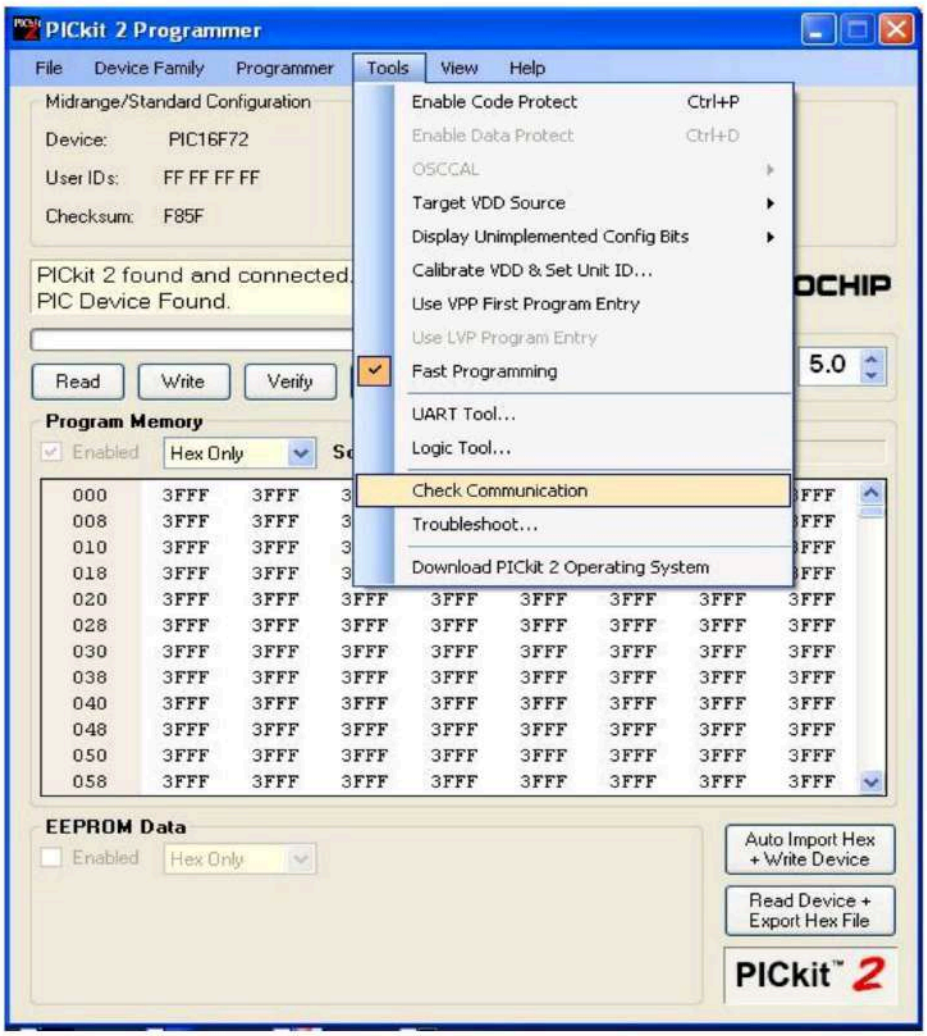


Fig 4.4: Picture of dumper recognition to microcontroller

5. Import the program which is '.hex' file from the saved location by selecting File option and clicking on 'Import Hex' as shown in below window.

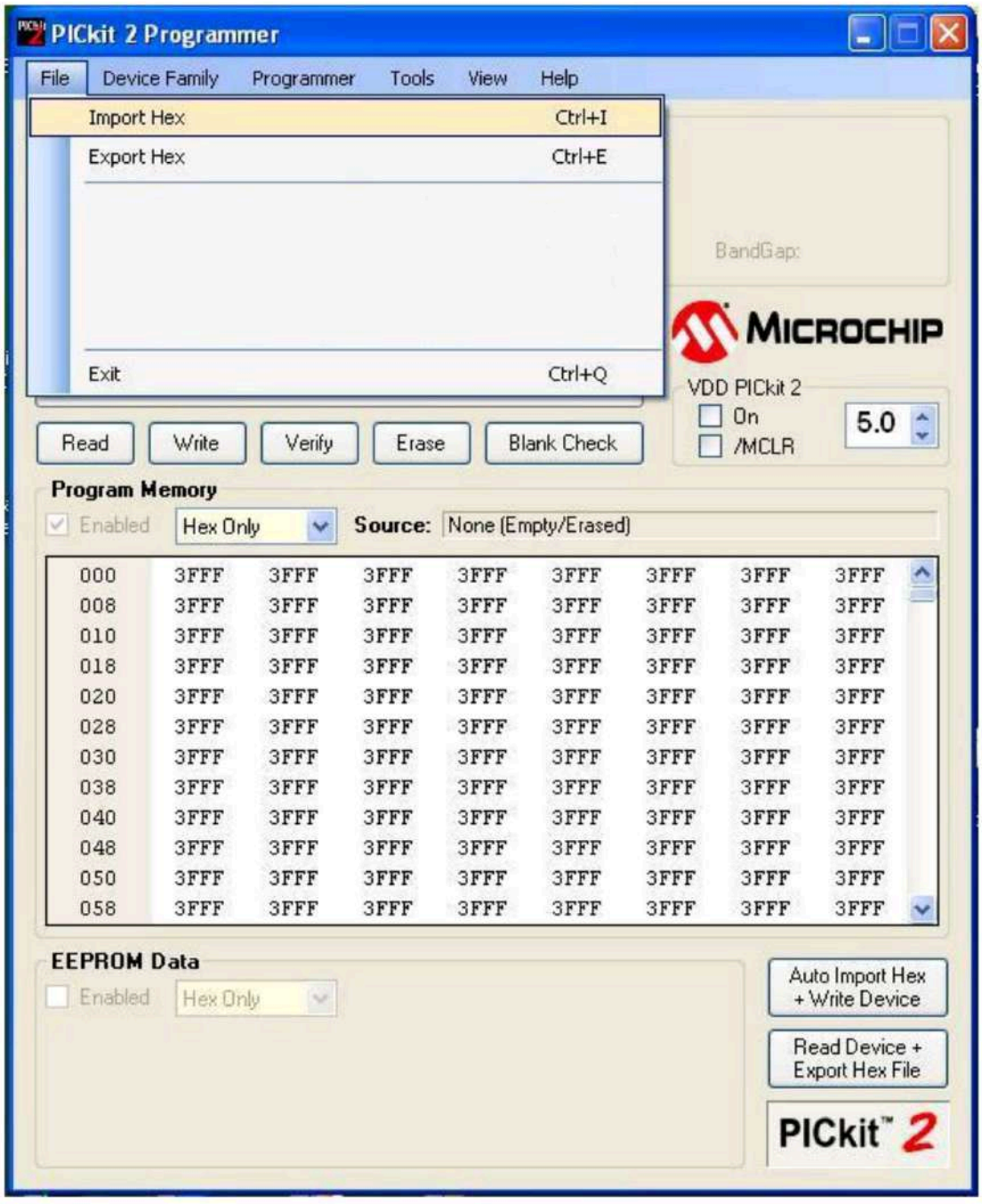


Fig 4.5: Picture of program importing into the microcontroller

6. After clicking on 'Import Hex' option we need to browse the location of our program and click the 'prog.hex' and click on 'open' for dumping the program into the microcontroll

7. After the successful dumping of program the window is as shown below.

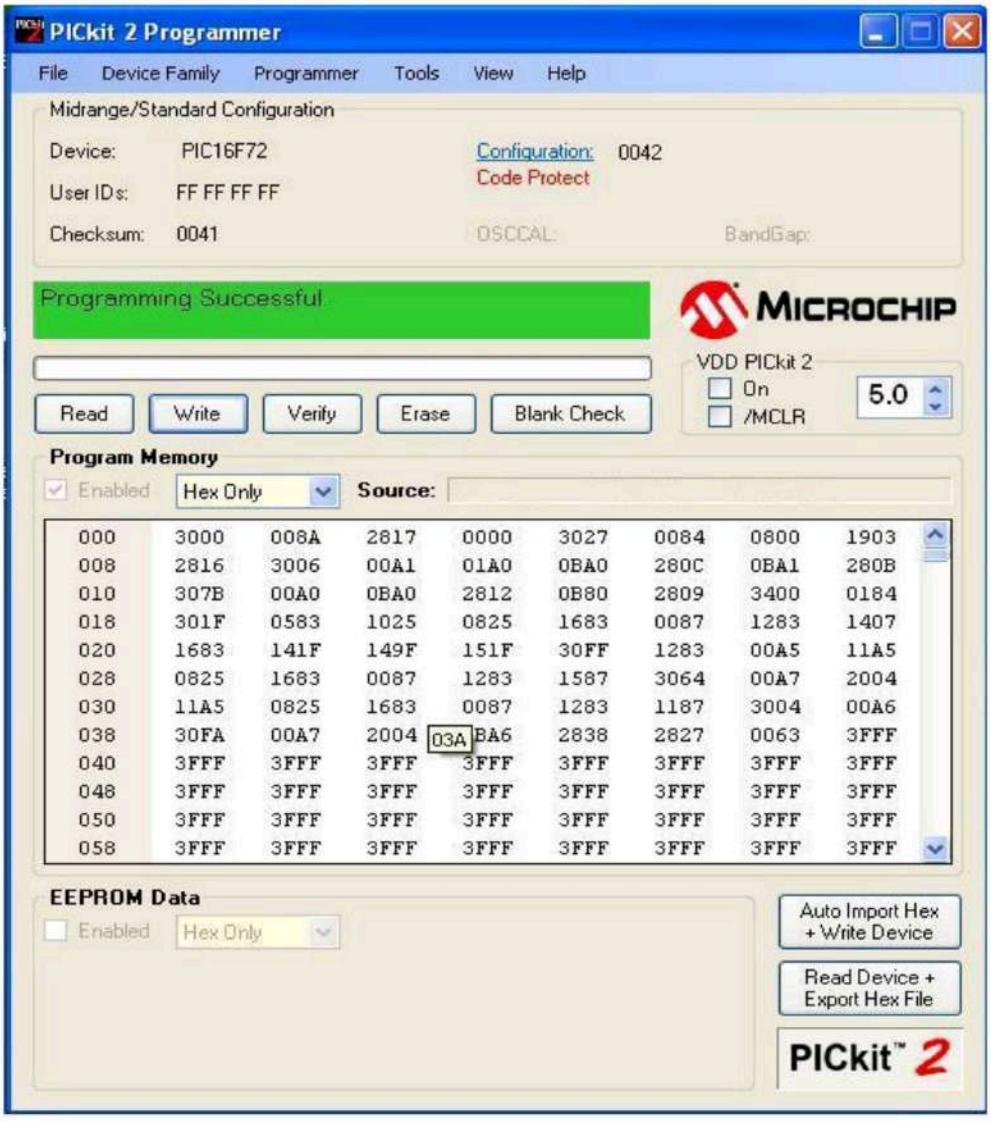


Fig 4.6: Picture after program dumped into the microcontroller

4.2 EMBEDDED C

- Embedded C is the programming language used for coding the micro controller.

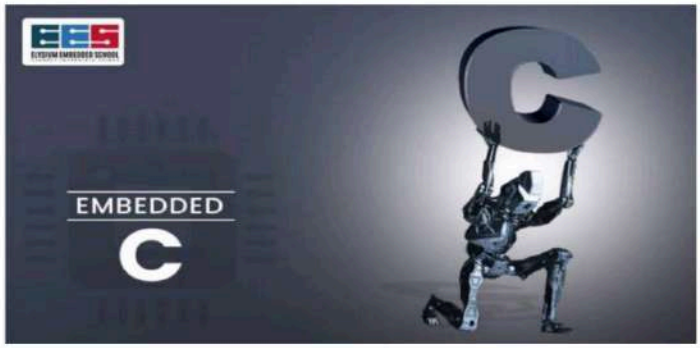


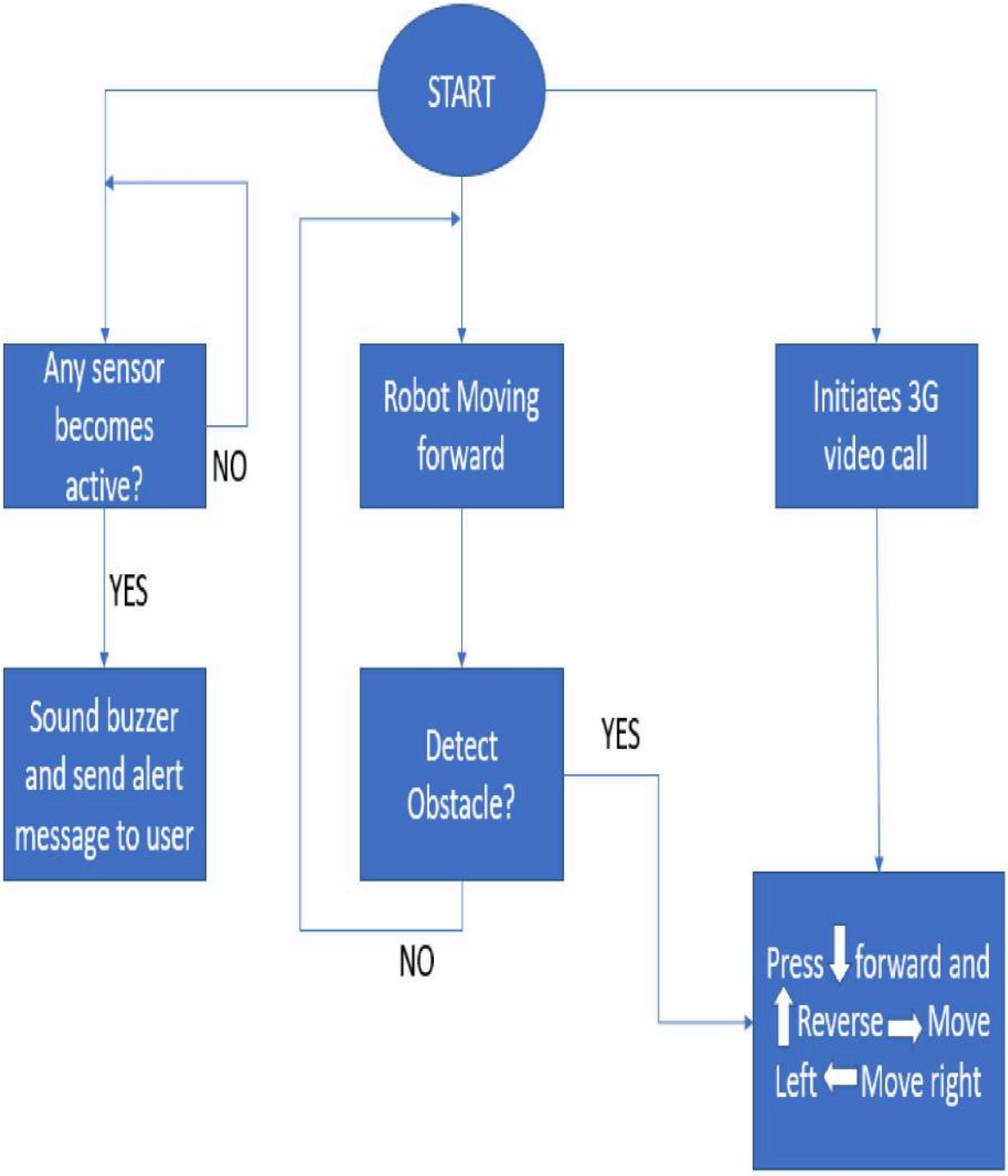
Fig 3.7: Embedded C

- Embedded C is actually the extension of c language. It consists of C language sets that can be used for different purposes. It was extending by the standard committee C in 2008 for solving the issues provide by C language.
- It mostly used the syntax and standard C semantics. This language has so many features as compared to C language such as it used the fixed-point arithmetic[7], spaces between maned address and hardware input, output addressing. As we look around ourselves, we have so many embedded systems such as washing machine, digital camera and mobile phones all these the examples of embedded system, in all these things embedded C language is used. So many extra characteristics have added in embedded C such as operation or mapping register, number of memory area and representation of fixed point.

CHAPTER 5

METHODOLOGY

FLOW CHART



As soon as the robotic vehicle gets a power supply it starts moving forward. We can control the robot by an Andriod Application via wifi module. When the robot gets power supply it Initiaties 3G video call through wireless camera. If obstacle is detected base station will get the alert message regarding that and it can change the direction by pressing the keys in android app. Then the Robot will check for the sensor data if any sensor becomes active buzzer sound will come and it will send the alert message to base station. If fire or any type of gas is detected base station can take the required action by tracking the location through 3G video. If any enemy tries to destroy the robot dashing sensor will inform to base station if not then Robot will continue to move forward.

CHAPTER 6

APPLICATIONS

War field robots gains its advantage due to its all-time surveillance and also because of the different modes available to the user which makes the robot highly appropriate to be used at different places for security purpose.

- As the name suggests it is mainly used to in war fields in order to reduce the risk of the humans lives at the borders where the tension as always
- It can be used in airports for detecting any metals placed and also act as a moving surveillance camera to enhance the security of the place.
- The robot can also be used to check the presence of any terrorist after the attack has been made which may also bring threat to humans lives

ADVANTAGES

- Robots can make quick decisions in fast-paced combat situations.
- Human lives can be saved if robots are sent into frontline combat.
- They can be mass-produced and upgraded instead of being trained.
- Military robots can traverse hazardous environments that are otherwise fatal to humans.
- Military robots are often lifesaving, they can perform duties similar to human duties without the actual danger to human lives.
- They can be easily replaceable.

DISADVANTAGE

- Military robots can be hacked and turned against their original users.
- Governments can find ways to make military robots a tool of oppression.
- Military robots, without the right kind of restrictions in place, can make unethical decisions during military operations that might result in a high count of civilian casualties.

CHAPTER 7

RESULT:

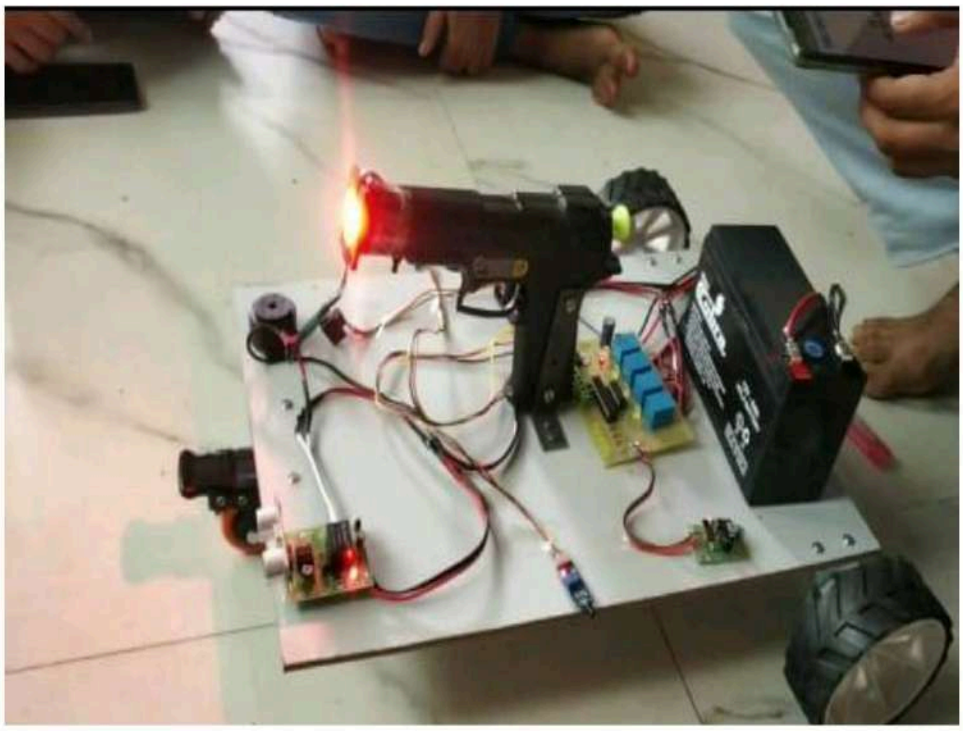


Fig 7.1 Working Model

The Above diagrams shows the working model of Our Project and the Actual circuit which we worked to accomplish the objective of Our project. The robot model can be controlled from a far distance and overcomes the limitations of the other robots that uses Wi-Fi Technology. The wireless night sensor camera is used to live stream the video and can be viewed on the hyper terminal on our Devices. The metal detector sensor used in the robot senses the metal components and mines present in the fields.

Fig 7.2 Android Application

The data is sent via Wi-Fi module to the Android Application .When any Flame or gas is detected the message is sent to application such as Fire Blast ,LPG GAS LINK or when the robot dashes any object then the dashing sensor send message that there is an Obstruction .

CHAPTER 8

CONCLUSION AND FUTURE SCOPE

The proposed system is aimed towards the welfare of our infantry and the surveillance of warzone areas to minimize the causalities to a great extent. It detects all metal objects like land mines using a metal detector. Our system will also be able to detect smoke and fire and take evasive action. It can measure infrared (IR) light radiating from objects in its field of view using the PIR sensor and thus detect any heat radiations emitting from humans or animals alike. The robot can be manually controlled but it will be able to take precautionary measures to protect itself and remain undetected. Hence, our system is sure to create a revolution in its own field and ensure complete support from people of different societies.

This system has greater scope in future and current conditions for saving the life of soldiers. Using Robots in Military can be next level evaluation in the defence field. which will increase the security of the border line without taking the risk of soldier's life in critical conditions. This Robot performs multifunction's in defence base station controls the Robot manually.

Irrespective of certain advantages of this system require certain amendments which requires control through internet and more user friendly. WSN technology is used in future robots.

Further research can be carried out on the proposed robot to overcome the limitation like the inability of the robot to rove in the water. Also the size and wight of the robot can be minimised by using advance materials and innovative techniques.

CHAPTER 9

REFERENCES

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[7] Dheeraj Mishra, Dhiraj Singh Patel, Devendra Pandey, Ankit Sume,Prof. Ishwar Rathod," Mobile Operated Spy Robot".

APPENDIX A – COMPONENT LIST

Table 1 : List of Components Per Prototype

Sl. No.	Component Name	Specifications	Part Number	Price/Unit	Total Price
01	Pic Controller	16FF72	-	Rs.500/-	Rs.500/-
02	Power Supply Adaptor	+5V, 2A	-	Rs.250/-	Rs.250/-
03	Power Supply Adaptor	+12V, 2A	-	Rs.250/-	Rs.250/-
04	Flame Sensor	-	LM393	Rs.200/-	Rs.200/-
05	Ultrasonic sensor	-	HC-SR04	Rs.200/-	Rs.200/-
06	Gas Sensor	-	MQ2	Rs.100/-	Rs.100/-
07	Relay module	5V,3mA	-	Rs.1000/-	Rs.400/-
08	Motor Driver	-	L293D	Rs.250/-	Rs.250/-
09	Dc Motor	12V	RS385	Rs.200/	Rs.800/
10	Wireless Camera			1500/	1500/
11	Connecting Wires	Male – Female	-	Rs.10/-	Rs.50/-
12	Connecting Wires	Male – Male	-	Rs.10/-	Rs.50/-
				TOTAL	4500/-

APPENDIX B – CODE

```
// 4 Input / Output IOT MCU-------------------------


unsigned int Rx_chr;

void main() {

  UART1_Init(9600);

  do {
  WIFI_Setup()
  Rx_iot()

     if(PORTA <> &B111())
        {
     Val1 = PORTA.0;
     Val2 = PORTA.1;
     Val3 = PORTA.2;
     Val4 = PORTA.3;
     Delay_ms(100);
     Send_To_iot(){
        }
   }

  void Send_To_iot(){

     UART1_Write ["AT+CIPSTART=TCP,www.uckits.com,"80"];
     UART1_Write ["AT+CIPSEND=176"];
     UART1_Write ["POST /iot7/a_sensor.php HTTP/];
   UART1_Write ["zon1=", Val1, "&zon2=", Val2, "&zon3=", Val3,
   "&zon4=",Val4];
        B_LED = 1;
        Delay(2000);
  }

  void Rx_iot(){
     UART1_Write ["AT+CIPSTART=TCP,www.uckits.com,"80"];
     UART1_Write ["AT+CIPSEND=176"];
     UART1_Write ["GET /iot7/RLY.json HTTP/]

  if((Rx_Chr == "AT")){
     Rx_Val== Rx_Chr;
  }

   if((Rx_Chr == 11))
     {
     PORTB.1 ==1;
 Delay_ms(1000);
```

```
    }

  if((Rx_Chr == 10))
    {
    PORTB.1 ==0;
    Delay_ms(1000);
    }

  if((Rx_Chr == 21))
    {
    PORTB.2 ==1;
    Delay_ms(1000);
    }

  if((Rx_Chr == 20))
    {
    PORTB.2 ==0;
    Delay_ms(1000);
    }

  if((Rx_Chr == 31))
    {
    PORTB.3 ==1;
    Delay_ms(1000);
    }

  if((Rx_Chr == 30))
    {
    PORTB.3 ==0;
    Delay_ms(1000);
    }

  if((Rx_Chr == 41))
    {
    PORTB.4 ==1;
    Delay_ms(1000);
    }

  if((Rx_Chr == 40))
    {
    PORTB.4 ==0;
    Delay_ms(1000);
    }
}
  void WIFI_Setup(){
     UART1_Write ["AT+CWMODE=1"];
  Delay_ms(1000);
     UART1_Write ["AT+CWJAP=IOT_KITS_HK4U","12345678"];
  Delay_ms(1000);
}
```

Wireless Multifunctional Robotic Vehicle For Military Applications

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Abstract— **This paper explains the use of Robots in military Applications. using the concept of the internet of things in today's technologized world Robots in the military can perform various combat roles, including rescue tasks, explosive disarmament, fire support, reconnaissance, logistics support, fire explosion, and more. The robot's movement can be controlled automatically and manually in the field of war.**

Keywords—Automotive,Terrorism,Watercraft.

I. INTRODUCTION

This Robot is designed to replace humans in various Hazardous areas. Military Robots are used to detect bombs, weapons, fire, gas, etc. in the war field. This Robot can be controlled both automatically and manually. The project's main aim is to implement a wireless multifunctional Defence Robot that can be controlled through the computer by the base station. In today's Automotive world Robotics has become an important part of human life.[1] There are so many fields like hospitals, Industries offices, etc. where various Robots are used. As terrorism will always be India's number-one threat, robots will be used to save lives. Nikola Tesla (1856–1943), a pioneering electrical engineer and Thomas Edison's adversary, made the first significant strides in what we now refer to as "military robotics." Tesla showed a government official a radio-controlled watercraft in 1898 to illustrate the potential military use of his technology. Additionally, where a human would need to wear a bulky suit and protective equipment, robotic systems may work in environments that have been contaminated by biological, chemical, or radioactive weapons.of his technology. Robotic systems can also operate in environments contaminated by biological, chemical, or radiological weapons, where a human would have to wear a bulky suit and protective gear.

II. LITERATURE SURVEY

Paper on wireless robot Published in 2015 2nd International Conference on Recent Advances in Engineering & Computational Sciences (RAECS).by Tarunpreet Kaur and Dilip Kumar this paper explains the use of multisensory robots in defense Maintaining the Integrity of the Specifications.

Minal S. Ghute, Kanchan P. Kamble, and Mridul Korde Described a military Robot that monitors the environment and provides live video feedback. this model used Bluetooth connectivity for wireless communication with the help of mobile devices, which limits its range.

"Designing Embedded System with PIC Microcontrollers "by Tim Wilmshurst this book describes the concept of an embedded system with a pic microcontroller as the main component.

"Gas Sensors based on Nanostructured materials "published in Dec 2007 by Giselle Jimenez-Cadena, Jordi Riu, and F Xavier Rius this paper explains the gas detection control and its importance in various fields.

"Spy Robot for Military Applications using Wi-Fi Model" published in October 2018 by Anita Jadhav, Prachi Jadhav, Pooja Magadum, Kiran Patil Dnyanshree institute of engineering and technology Satara. This paper explains about controlling the Robotic vehicle using an android app via a Wi- Fi model.

"Multipurpose Military service Robot using Wireless network setup" published in May 2020 by Mohd Owais, Mohammed Abdul Rahman, Mohammed Aqeel Pasha, Shaik Feroze, Miss

G Sapna Lords institute of engineering and technology Hyderabad. The main aim of this paper is to detect humans and land mines.

III. BLOCK DIAGRAM

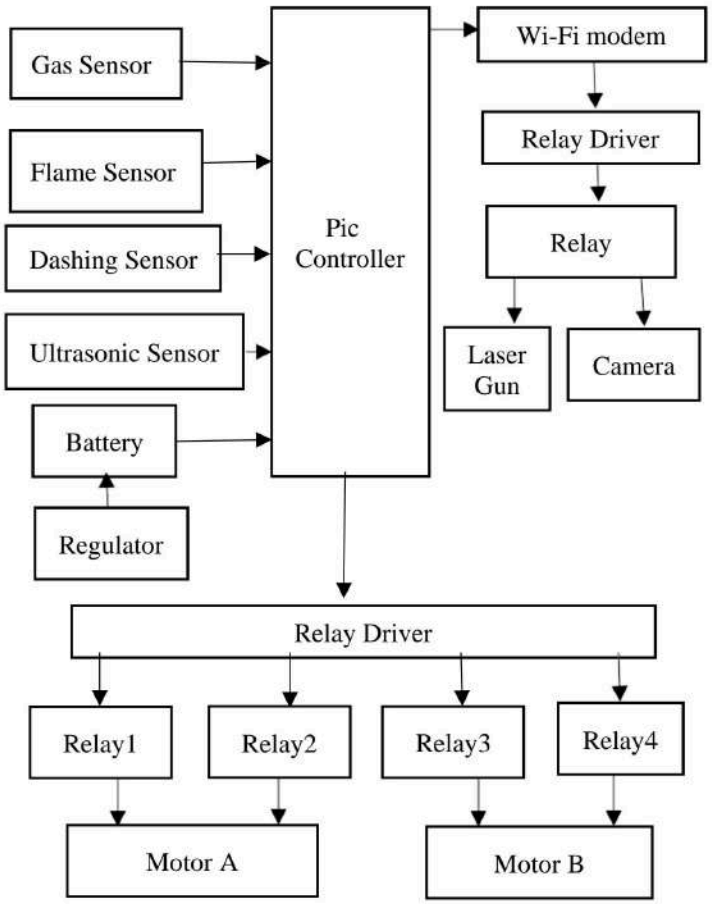

Figure. Block Diagram

1. Pic Controller:

It's the heart of the model. used to upload the code and control the functionality of the Robot. In this project, we have used a 16F72Pic Controller.

2. Ultrasonic Sensor:

This Sensor is used to detect the obstacles. if the obstacle is detected it will send that information to the Base station using the controller via the Wi-Fi model.

3. Gas Sensor:

This sensor is used to detect hazardous gases such as LPG, Nitrogen, Carbon monoxide Etc. If the concentration of the gas is above the level of harmfulness, then it will inform the base station via Wi-Fi.

4. Flame Sensor:

This sensor is used to detect the presence of fire. Which can be further used to detect the bomb explosion.

5. Dashing Sensor:

If an enemy tries to destroy the Robot, then the Dashing sensor will send a warning message to the base station.

6. Wi-Fi Modem:

This component is a transmission medium to transfer the data from different sensors and cameras to the base station.

7. Laser Gun and Camera:

The camera is used for live streaming if the presence of the enemy is detected base station will take control over the gun and can take required actions.[3]

8. Relay Driver and Motors:

Are employed to steer the robot in different ways.

9. Battery:

Provides required power supply to the various components here we have used 12V battery.

IV. RESULT AND CONCLUSION

The Robotic Vehicle detects the presence of an enemy by using a UV camera for live streaming, the presence of harmful gases, and fires in hazardous areas. If the presence is detected base station will get a notification for that. This system has greater scope in future and current conditions for saving the lives of soldiers. Using Robots in the Military can be a next-level evaluation in the defense field. which will increase the security of the borderline without taking the risk of a soldier's life in critical conditions. This Robot performs multifunction's in the defense base station and controls the Robot manually.

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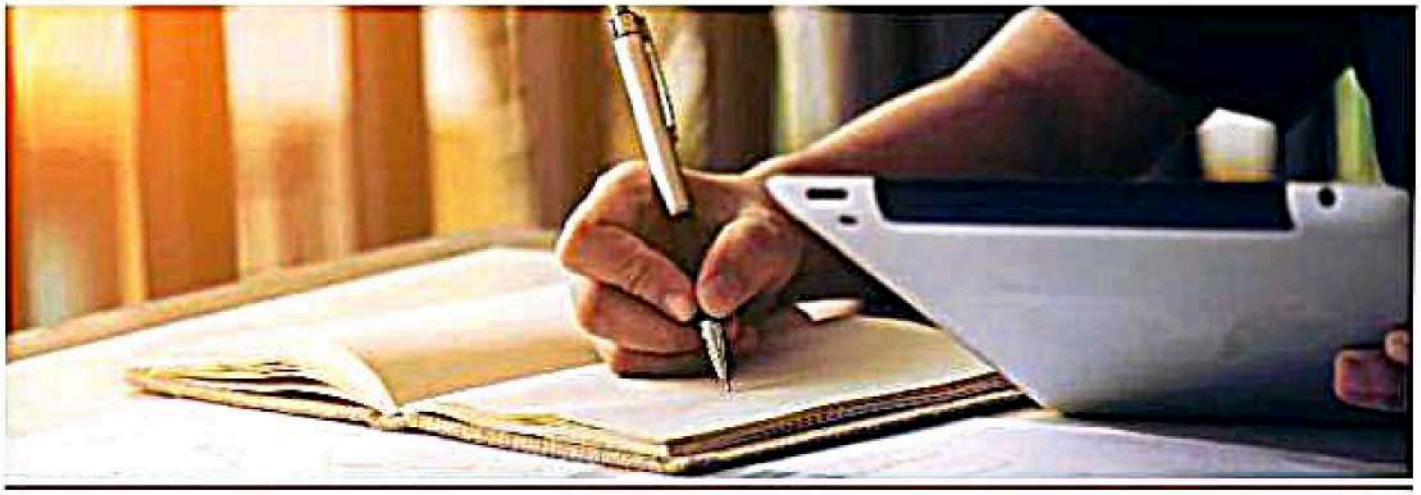

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