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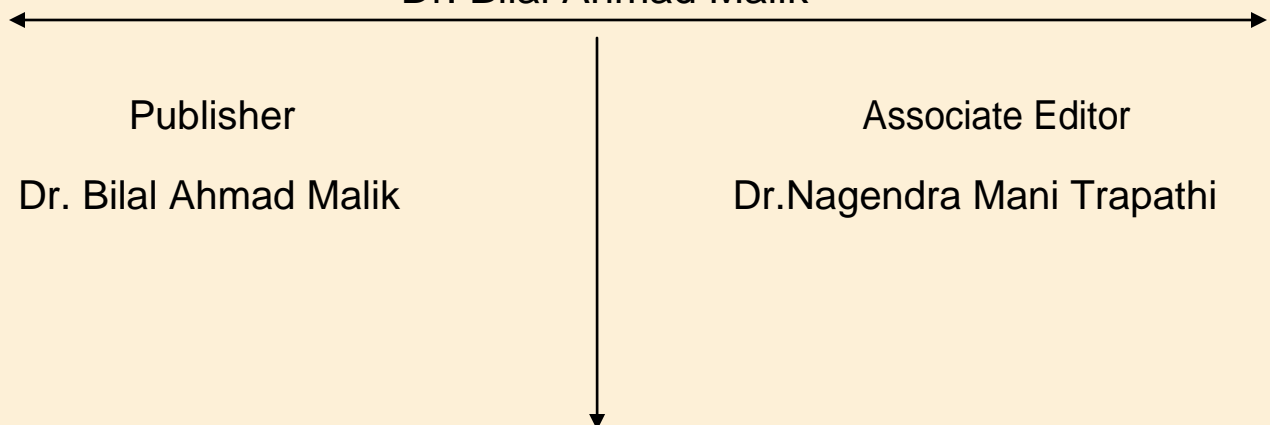
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A RESEARCH ON UNMANNED DEFENSE ROBOT WITH BUGS WHEELS

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ABSTRACT:

Some of the risky and various tasks cannot be done by human. Thus there is need for change in present era. So, robot can be a good and effective option for risky purposes. Robot plays various roles in different fields of industries, medical, colleges, home appliances and military and defense. This paper is used to design" AN Unmanned Defense robot with bug wheels". In this paper a defense robot which is having different sensors such as Infrared Sensor, Passive Infrared Sensor and Ultrasonic Sensor are used to perform various task such as obstacle and depth detection, human detection and distance measurement. The proposed work uses a Laser Shooter Assembly which consist of a Laser shooter gun which shoot traitors with the help of servo motor which is controlled through Arduino development board. Arduino Development Board is used which act as a heart of the robot and control all the function of the robot such as motor movement, laser shooter control and sensors control. This Robot uses Bluetooth Technology for wireless communication between Robot and control unit. Robot unit consist of Arduino Development Board, Motors for movement, sensors, Laser Shooter Assembly and Bluetooth Module. Control unit consist of a Smart phone which is having an Android Application and it is used to provide wireless communication to Arduino Board through Bluetooth Module. Thus in simpler way control unit act as remote control for robot. This Robot instead of using simple wheels it has a bug wheels which is specially designed and develop to work in rough terrains such as forest, hilly and rocky areas. In hostile situation this robot is effective and can save lives. Hence this paper proposed a defense robot with bugs wheel and uses low voltage power supply

Keywords: Arduino, Bluetooth, Defense Robot, Passive Infrared Sensor, Laser Shooter Assembly, Ultra-Sonic Sensor.

1. INTRODUCTION:

Modern world is getting addicted with different types of robots. These robots are used to help the human being and make their work easy. Robots are using in almost every fields. In this research paper we are focusing on the field of defense. In defense field our soldiers are giving their lives for our country safety and their sacrifices are increasing day by day. So for our nation pride we are proposing a defense robot which can work on hostile situation and can fight enemies without any loss of life and can easily work on rough terrains by using bug wheels. This robot is also used for spying because of its small in size and beetle like structure it can be used for spying and can give the exact information of intruder and even attack the intruder.

In this paper we are discussing various previous models and our proposed work regarding the following papers. All previous research papers are using different technologies such as RF Module, Zig-Bee Module and DTMF Module and different types of sensors such as fire sensor, gas detection sensor and humidity sensor etc.

PIR Sensor:

PIR Sensor also known as Passive Infrared Sensor. It is an electronic device that measures infrared (IR) light radiating from objects in its field of view.

Fig1. Passive Infrared Sensor

In this proposed model PIR sensor work as a human detector. The principle behind this sensor is that all objects with a temperature above absolute zero emit heat energy in the form of radiation. For Example- The nonliving things have zero absolute temperature but living things have non-zero absolute temperature. So only living object can be detected by this sensor.
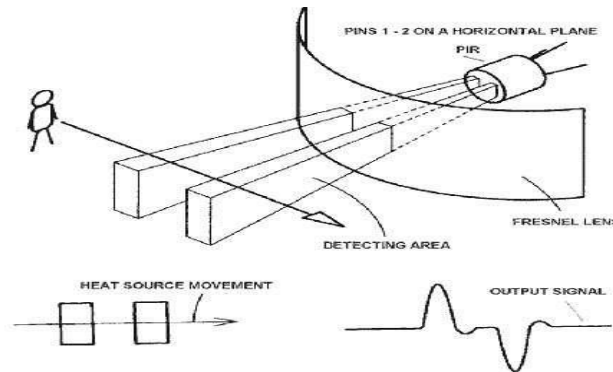
Fig2. Working of PIR

Usually this radiation isn't visible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose.

Ultra-Sonic Sensor:

An Ultra-Sonic Sensor is a device that can measure the distance to an object by using sound waves. It can measure distance by sending out a sound waves at a specific frequency and listening for that sound wave to bounce back.
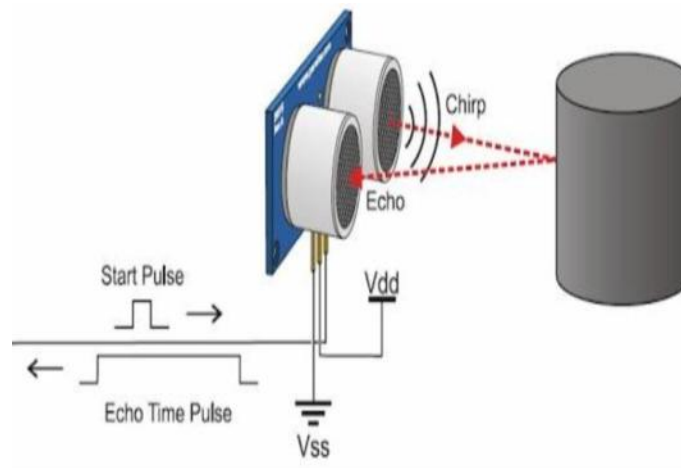
Fig3. Working View of Ultrasonic Sensor

Hence by recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object. So this sensor is used for distance measurement.

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IR SENSOR:

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations.

Fig4. Infrared Sensor

These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.

BLUETOOTH MODULE HC-05:

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.


Fig5. Bluetooth Module

2. LITERATURE SURVEY:

[1]. SMART PHONE BASED ROBOTIC CONTROL FOR SURVEILLANCE APPLICATIONS BY M.SELVAM.

For overcome the problem of DTMF and the Cable standards he proposed a system. The existing system is control by a smart phone. In this system the mobile acts as a transmitter unit and it is interfaced with robot by Bluetooth module. Meanwhile this system also uses a camera and its on and off controlling has carried out by android application. The whole system has divided into two parts as RF transmitter and Receiver. In the Transmitting end they had RF Encoder capable to cover 100meters distance and unidirectional nature is used which operates the frequency on 433MHZ. "To control the RF encoder and Transmitter Atmel 89c2051 is used which is 20pin version of 8051 microcontroller. In Receiver section Atmel 89c51 microcontroller was used to perform the motor control according to the Bluetooth commands. HC-06 Bluetooth reciever module is used in slave configuration which interfaced with UART module of the 8051 microcontroller. [1][2]
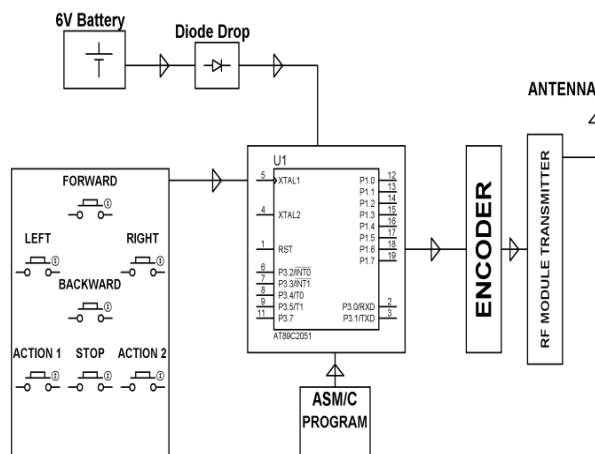
Fig6. Surveillance Robot transmitter diagram [1]

The Bluetooth characters and received by RXD pin of 8051 microcontroller. For Receiving RF signal the HT 12D RF decoder and Receiver is used". They had placed a wireless camera on the Robot clamps to capture the video up to 50metres distance. To control the Robot L293D motor driver controller is used in this system. It is used to make the rotation on the DC motor which is used as the Robot wheel according to the commands such as forward, backward, left and Right. The whole system is controlled by an Android application but the microcontroller they

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used is of 8051 series. The overall project uses various applications for surveillance of home, industry shops and malls etc. [1][2]
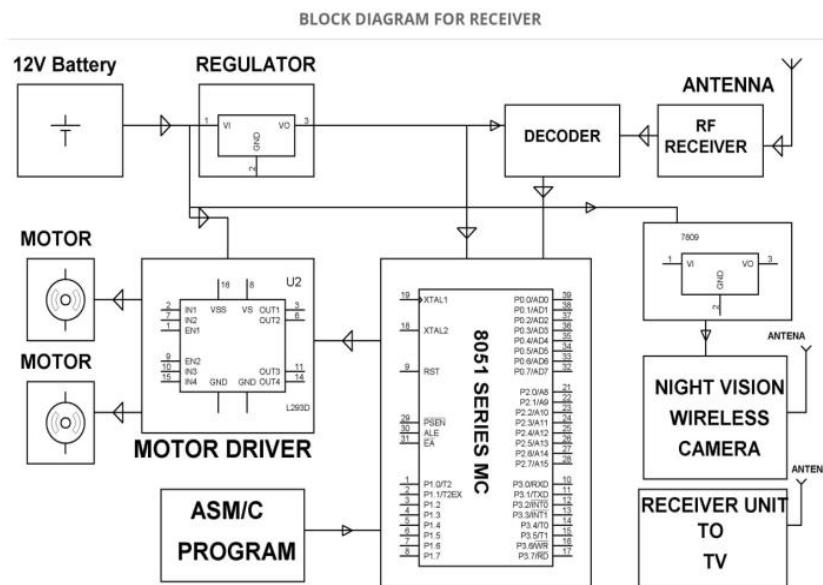
Fig7. Surveillance robot transmitter diagram [1]

[2]. Wireless Video Surveillance Robot Controlled Using Android Mobile Device by Shoeb Maroof Shaikh, Khan Sufiyan, Asgar Ali, Mir Ibrahim, Prof. Kalpana Bodke.

In this proposed system their main focus is on the implementation of the application for controlling the mobile devices using android application. They used Wi-fi technology for transmitting the real time video. In this proposed system they used Arduino Mega2560 board as a heart of robot. In this model the robot establish a connection with Bluetooth module to android application.[5][6]

Fig8. Wireless Video Surveillance Robot [5]

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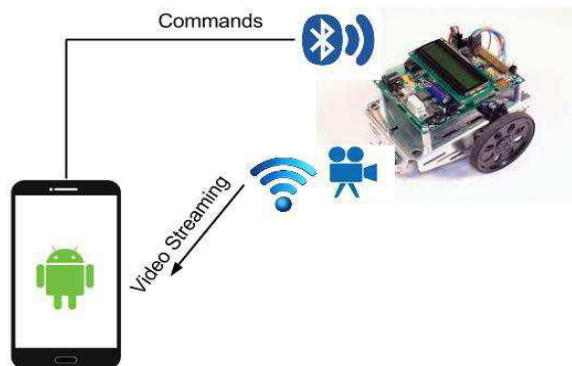They used Bluetooth module for serial communication. The android application is designed in such a way that it controls two modules i.e. the control module and the video streaming module. So, they has two results i.e. the robot had successfully controlled using the android application through the wireless Bluetooth technology. Even they successfully achieved real time video using the Wi-Fi technology on their designed android application. [5][6][7]

[3]. DESIGN OF ARMED ROBOTIC SYSTEM FOR DEFENSE AND MILITARY APPLICATIONS by KARTHIKEYAN.P, TAMILSELVAN.S, SELVAKUMAR.S, SRIDHARAN.P

In this paper they focused on the saving the human life in the war base. In this proposed model they gave a system of armed robots for the environment of war fields. The system can be used for detection of landmines, bombs or can be used as a surveillance robot. This system has control unit which consists of atmega328, touch screen, LCD display and Zigbee module for transmitting and receiving unit. On the other hand it is also having the Rover Unit which consists of Flasher, motor driver, metal detector, servo motor, Zigbee module, camera and a gun.[8][9]
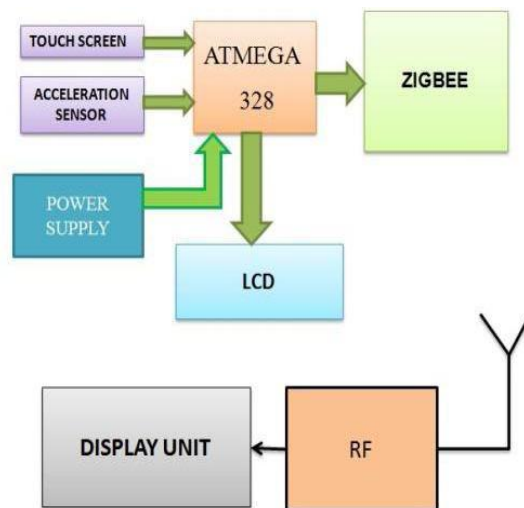
Fig9. Control unit of Armed Robot [8]

The touch screen is used to control the direction and movement of the rover. Acceleration sensor is used here to drive the servo motor which in turn changes the direction of the camera as well as the position of the gun. The driving of servo motor is done by using processor. LCD unit displays the acknowledgement for the corresponding actions performed by the receiver and also in the transmitter. [10][11]
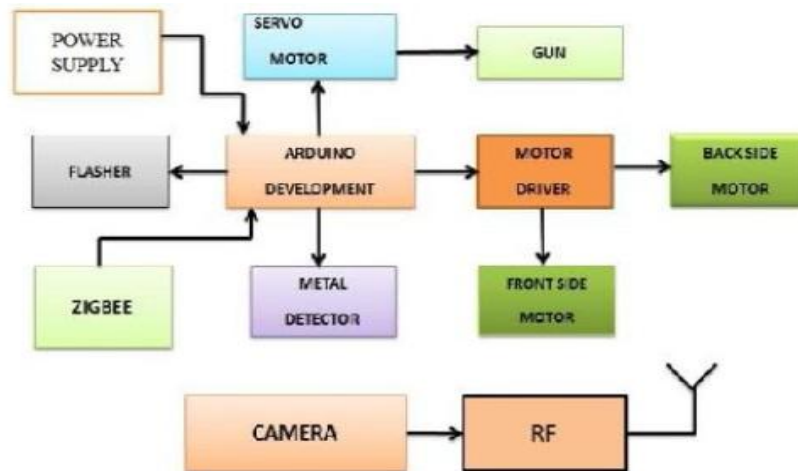
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Fig10. Robot Unit of Armed Robot [8]

[4]. DEFENCE SURVEILLANCE ROBOT BASED ON RF AND DTMF TECHNOLOGY BY GAURAV VASHISHT, RAHUL DHOD

In this paper they proposed a system which can be used in that environment which is hazardous to human life. This system used three controlling modes RF mode, DTMF mode, Automatic mode. In RF frequency mode it is controlled by a remote which is made with the help of RF module of operating frequency of 433Mhz and its range of approximately 200metres. In the GSM module it will be operated by a GSM mobile phone, when it will get out of the RF frequency range to get it back in the range of RF. When the user did not want to operate the robot manually, then user will set it into the autonomous mode. But it will still operate in the range of the RF frequency module. All the sensors will work automatically according to the conditions and will take the required action as well. [17][18]
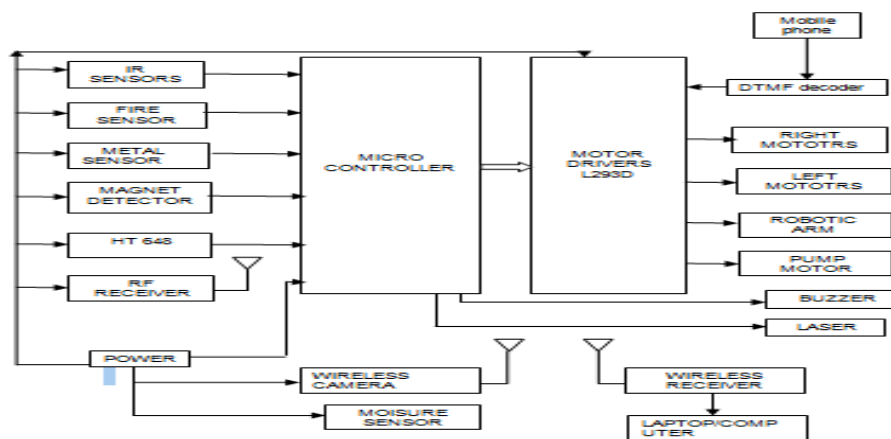

Fig11. Block diagram of DSR Receiver end [17]

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The DSR consists of power supply, robotic arm; radio frequency module (433 MHz), DTMF module, LDR sensor for night vision and Flash light, audio and videos camera, Metal and magnetic field detector and thermistor for fire detection, moisture detector unit, laser gun as a weapon, robotic arm, IR sensors for path finding and obstacle avoidance are used in it. The wireless camera is used to capture the live video present in the surveillance area and it will be transferred RF receiver at the operator end which is further interfaced to the computer system using interface card. AT89S52 is used as a controller to accept and sends the corresponding data to the other section. Two hardware sections are designed that are receiver end and RF transmitter. [17]
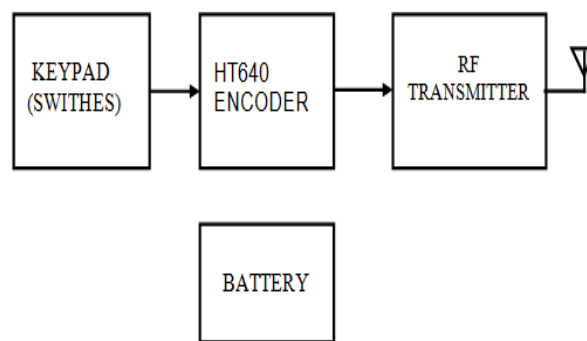
Fig12. Block diagram Of Remote (Transmitter End) [17]

"Robotic arm is successfully embedded on the robot for pick and place operation in the surveillance area. Thermistor senses the fire and make robot to stop and pump motor to sprinkle water until the fire got extinguished. IR sensors attached find path by detecting obstacles on the way in the automatic mode of DSR. Metal and magnetic detection sensors detect bombs and mines. Laser gun attached works when any adverse condition happens or robot is being attacked by any personnel. Moisture sensor basically indicates the contents of water by injecting the needle in soil attached to robotic arm. The level is indicated using the LEDs interfaced with the sensor. Some feature of DSR is: Distance sensing and position logging & transmission, Radar implementation, Equipped with Missiles, Can be operated on 3G technology with the video calling". [17][18]

3.   COMPARISION FROM OTHER RESEARCHES:

Literature survey shows that different researches are done in the field of defense robots but our proposed work is quite different from other researches. Many researches uses RF module and Zig-Bee technology for wireless communication but we are using Bluetooth technology which is quite familiar and easy to use and have some

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advantages from other technologies such as now a day's all the devices have built Bluetooth module such as smart-phone, Laptops etc.

The previous researches focuses on using the Robot only on plain surfaces but in hostile situation the robot has to deals with rough surfaces such as forest, hilly and rocky areas so to ensure these types of surfaces our proposed model uses a curled bug wheels and can easily navigate through any surface easily.
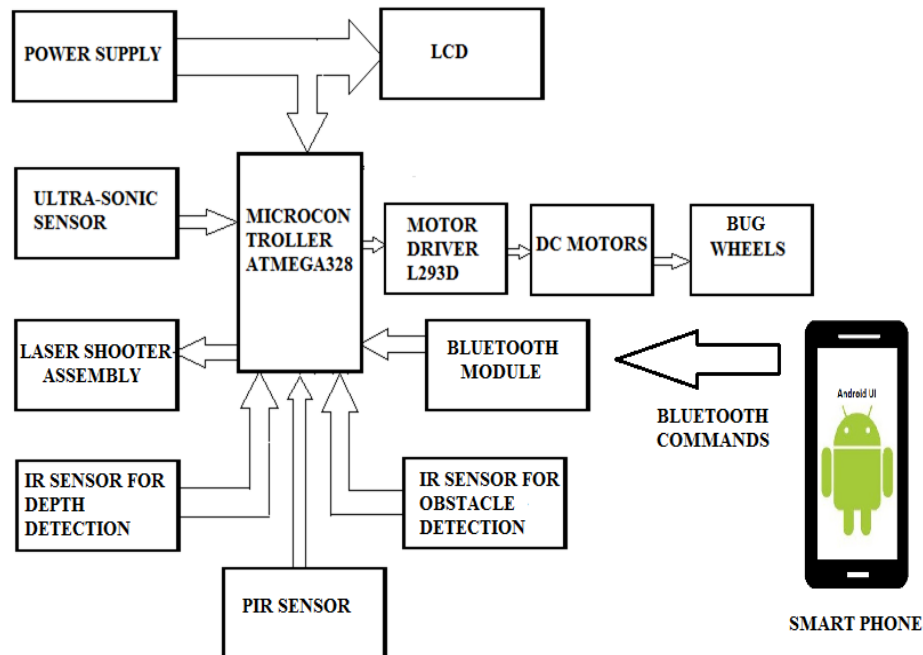
4. PROBLEM IDENTIFICATION:

Under problem identification the problem and difficulty faced in development of technologies like interfacing of different sensors, programming of PIR and Ir sensor so both condition cannot collapse each other, the major problem in its defensive application means gun is placed in such a way so we will easily load bullet in gun. The problems that were faced are as follows:

- Components availability
- Designing of circuit
- Choosing of right component at right place
- Programming of each sensor
- Placing the component at the robot body in such a way robot can easily understand surrounding and gives output according to it.
- Problem in designing of wheels

The major problem in this research is that it can work on rough terrains but can't climb the stairs.

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5. DESIGN AND IMPLEMENTATION OF PROPOSED WORK

PROPOSED WORK:

Fig13. Block Diagram of Proposed Work

In this proposed model contains two units one is Robot unit and Control unit.

Robot unit: The heart of the system is Arduino Uno board with ATMEGA 328 Microcontroller, which controls all the activities of the robot section. Sensors such as PIR, Ultra-Sonic, and two Infrared sensors are used. Six motors have been used in this project. Four DC Motors for wheel control and two for laser Shooter control. Also L293D IC's are used to drive the motors. Bluetooth module is used for wireless communication between Robot and Control unit. A 12V power supply is used to drive the L293D IC and 5V is given to the Microcontroller and all the sensors to start them.

Control unit: The robot is controlled by Smart phone which is having an Android Application. An Android application uses Bluetooth technology to Communicate with Microcontroller through Bluetooth Module so that Microcontroller accepts commands. This allows the user to control the directional movement as well as Laser Shooter Movement of the robot. The Android Application is installed on Smart phone and due to which user can easily control the robot at any time.

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MODULE-1: BLUETOOTH CONTROLLED CAR

Bluetooth controlled car is consist of a Bluetooth Module HC-05, Arduino Nano with Atmega328 Microcontroller, Motor Driver IC L293D, Robot Wheels, four DC Motors and Power Supply. Microcontroller act as a heart of robot and it control all the function of the robot through Bluetooth Module HC-05.
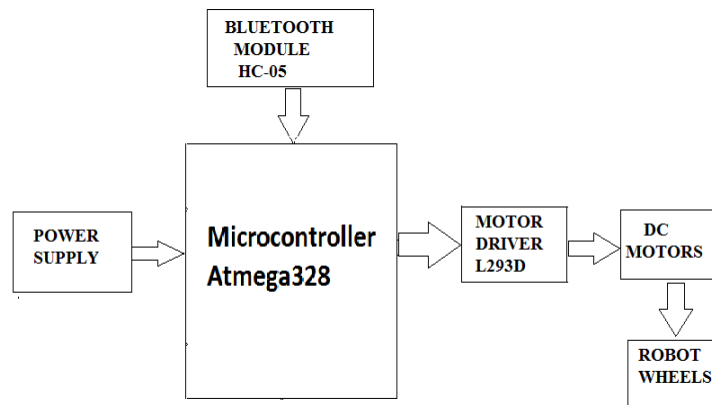

Fig14. Block diagram of Module-1

Bluetooth Module is used to receive the Bluetooth commands coming from smart-phone which is having an android application "Bluetooth Controller" which give commands to microcontroller to perform a particular function. The various functions such as:
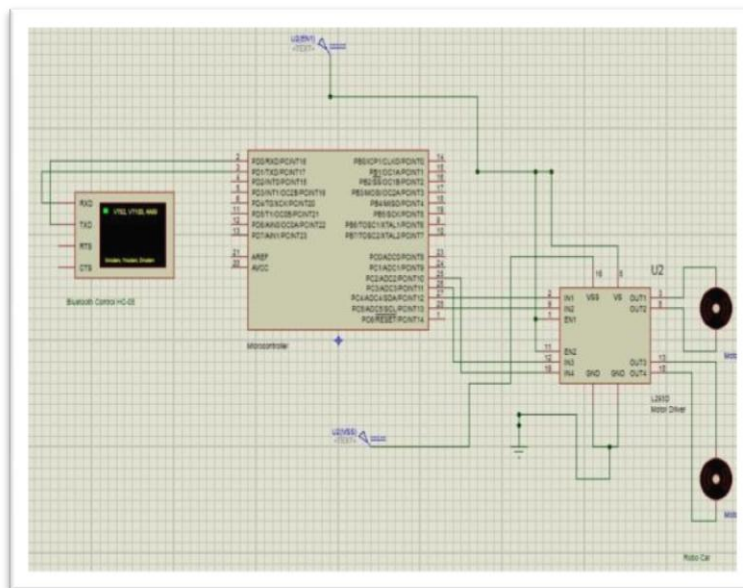

Fig15. Proteus View of Module-1

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FORWARD- This command is used to move motors in Forward Direction.

BACKWARD- This command is used to move motors in Backward Direction.

STOP- This command is used to stop the motors.

LEFT- This command is used to move motors in Left Direction

RIGHT- This command is used to move motors in Right Direction

6. CONCLUSION:

The proposed robot has scope of widespread industrial, defense and home applications. It can be used to analyze the environment of a coal mine without any human intervention. It can also be employed in a hostage situation to pin point the exact location of terrorists with the help of ultrasonic and pir sensor, saving many lives during rescue mission. Another application is home security system to sense movement of intruder through PIR sensor. Various advantages of this system are its range of operation up to 100m, secure data transfer can be done with the help of Bluetooth module and android application. Entire project will help in military and defense operations such as human detection, distance measurement and obstacle detection. Also due to their bug like wheels it can travel in all terrains.

7. FUTURE WORK:

1. We can install camera on robot for capturing images, videos & live recordings of surroundings.
2. We can use various sensors like fire sensor, bomb detection sensor etc on robot for monitoring.
3. We can use this robot underwater monitoring by doing some modification in its legs and body parts.

8. ACKNOWLEDGEMENT:

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