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Smart Gun War Field Spy Robot using Arduino and Zigbee

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Abstract: ***In this highly developing technical world there a lot of inventions. In the field of military the inventions are more, but still we lose a lot of human lives. This paper deals with the surveillance in war fields where the human intervention is dangerous. Through this system we can control the robot from our PC with the help of low power zigbee sensor network and the laser gun can be used to attack the enemies. This robot acts as a companion to our soldier with the sensor based robotic system. Even if they are found by the combatant they may not know to whom it belongs. This system will help the soldiers to make further actions based on the opponents move.***
Keywords: Arduino UNO, Laser Gun, Ultrasonic Sensor, Zigbee, Embedded C.

I. INTRODUCTION

Robotics is a major area of development over the past few years. Security is a major concern especially in border areas. Our country has experienced many terrorist attacks mainly in border areas. The Indo-Pak border is of great concern where a lot of soldier's die. There are many a borders which cause lot of concern. Our main idea is to replace soldier with the robot. The robot is basically a device which is mounted on a platform and which can be controlled remotely. Today, many a systems which we use are wireless, which reduces the cost of laying wires of long distances as we cannot lay wires in border areas. Wireless systems are also easy to maintain and has low cost. Whenever we develop a system the major concern is on cost and size of the system. This system is cost efficient since components used are simple and the size of the system is not so big which helps the system to be affordable and portable. If a soldier is involved in surveillance then there ia a lot of risk as they might be attacked by the enemies, but when we replace them with a robot then we can save a human life as well as we can increase the area of surveillance

Zigbee is used as the transmission device which is easy to install and low cost .It is also easy to transmit data over a stipulated distance. The ultrasonic sensor provides indication in our system whenever it finds an intrusion. Through mobile phone we can get a view of the war field. Provision for firing and for accurate pointing using is also provided with the help of servo motors. The whole system is controlled by the software in our system.

II. EXISTING SYSTEM

Spy robots which are used in the war field should be compatible and cost efficient. The robot must be capable of full time surveillance and it should help us in getting the idea of war field. The existing doesn't contain provision for laser gun and firing mechanism. The robot has to operated manually by the soldiers at the field which may cause risk. The system doesn't provide any information about the war field and object detection is not present. The existing system has used raspberry pi and IP camera for surveillance which may not be cost efficient. The system consists of a number of sensors which may increase the computational load and might cause panic in the war field areas.

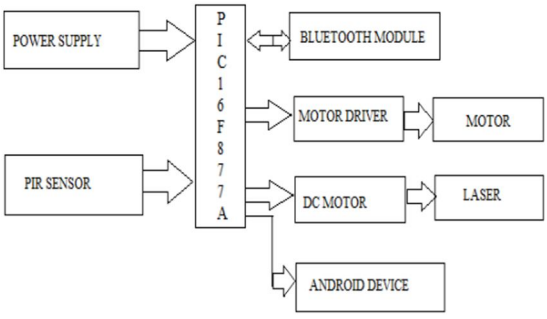

Fig 2.1:Block diagram of existing system Reference Number:6

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III. PROPOSED SYSTEM

In this system, we use ARDUINO UNO (ATmega328P) microcontroller which acts as brain of the system, because the entire system program instruction stored in it. Here we have ultrasonic sensor to know the status of the robot and to detect the enemy. Controller gets the data through zigbee and triggers the laser gun by controlling the servomotor. The mechanism of robot is done by using robotic chase with two dc motor driven by motor driver and the another servo motor will act as a trigger. All the instruction to drive the robot is done by using ZIGBEE technology.The mobile phone attached to the robotic chase can help in the live streaming of video and to know the status of the area. All the status is displayed in the LCD.

A. Commands To Control The Robot

8-MOVE FORWARD
2-MOV BACKWARD
4-MOVE LEFT
6-MOVE RIGHT
5-STOP
7-LASER IN CLOCKWISE DIRECTION
9-LASER IN ANTICLOCKWISE DIRECTION

B. Receiver

The block diagram of the proposed system is shown as follows:

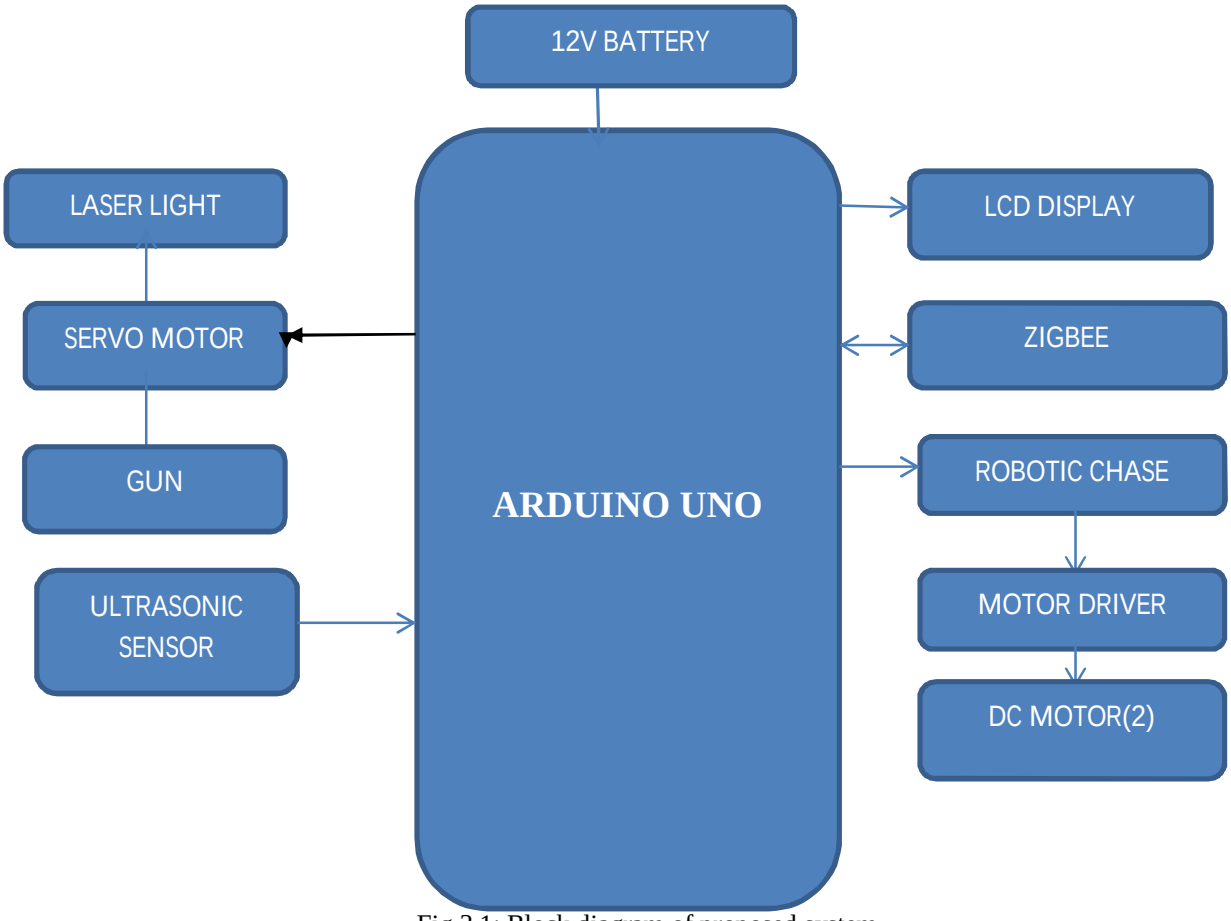


Fig 3.1: Block diagram of proposed system

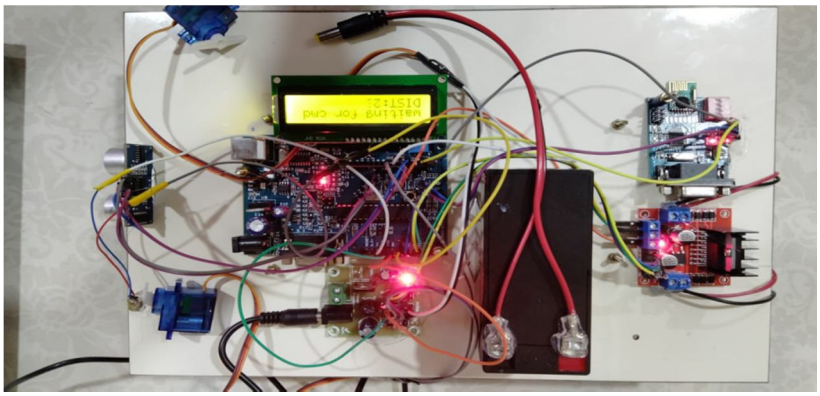


Fig 3.2: Practical implementation of proposed system

The receiver section consists of the following components:

1) *Arduino UNO:* Arduino is a open source hardware. Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default boot loader of the Arduino UNO is the optiboot bootloader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor-transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header. Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. When used with traditional microcontroller tools, instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used.An official Arduino Uno R2 with descriptions of the I/O location

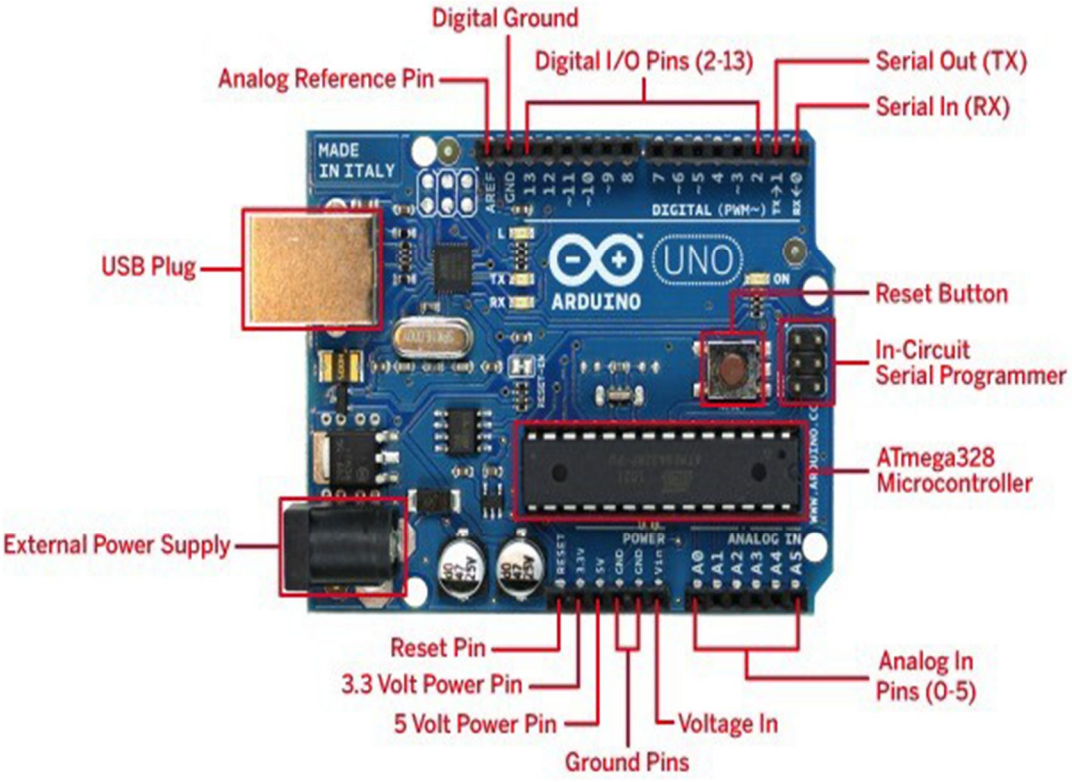


Fig 3.3: ARDUINO UNO

2) *Liquid Crystal Display:* LCD screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters(unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

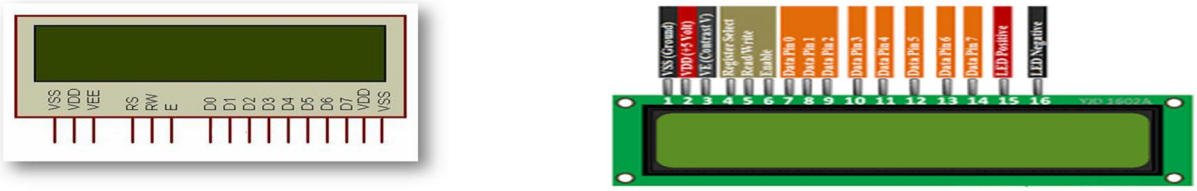


Fig 3.4: Liquid crystal display

3) *Ultrasonic Sensor:* Ultrasonic detection is most commonly used in industrial applications to detect hidden tracks, discontinuities in metals, composites, plastics, ceramics, and for water level detection. For this purpose the laws of physics which are indicating the propagation of sound waves through solid materials have been used since ultrasonic sensors using sound instead of light for detection.

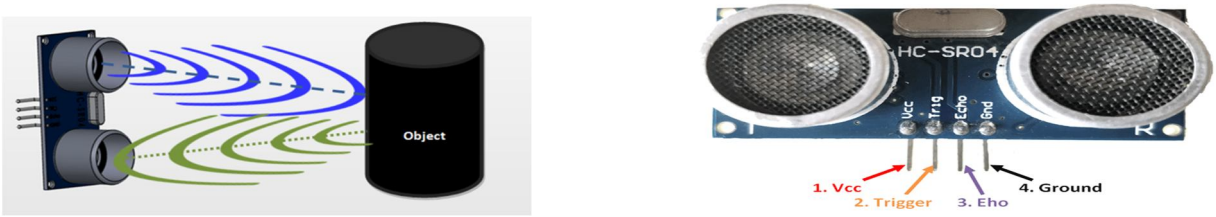


Fig 3.5: Ultrasonic sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves.
An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity

Table 3.1: Pin description of Ultrasonic sensor

PIN NUMBER	PIN NAME	DESCRIPTION
1	Vcc	The Vcc pin powers the sensor, typically with +5V
2	Trigger	Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4	Ground	This pin is connected to the Ground of the system.

4) HC-SR04 Sensor Features

Operating voltage: +5V.
Theoretical Measuring Distance: 2cm to 450cm
Practical Measuring Distance: 2cm to 80cm.
Accuracy: 3mm.
Measuring angle covered: <15°.
Operating Current: <15Ma.
Operating Frequency: 40Hz.

5) Servo Motors: A Servo Motor is a small device that has an output shaft. This shaft can be positioned to specific angular positions by sending the servo a coded signal.

Table 3.2: Pin description of Servo motor

Wire Number	Wire Colour	Description
1	Brown	Ground wire connected to the ground of the system
2	Red	Powers the motor typically +5v is used
3	Orange	PWM signal is given in through this wire to drive the motor

As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft. If the coded signal changes, the angular position of the shaft changes. In practice, servos are used in radio-controlled airplanes to position control surfaces like the elevators and rudders. They are also used in radio-controlled cars, puppets, and of course, robots.

Fig 3.6: Servo motor

6) DC Motor: A DC motor is an electric motor that runs on direct current power. In any electric motor, operation is dependent upon simple electromagnetism. A current carrying conductor generates a magnetic field, when this is then placed in an external magnetic field, it will encounter a force proportional to the current in the conductor and to the strength of the external magnetic field. It is a device which converts electrical energy to mechanical energy. It works on the fact that a current carrying conductor placed in a magnetic field experiences a force which causes it to rotate with respect to its original position.

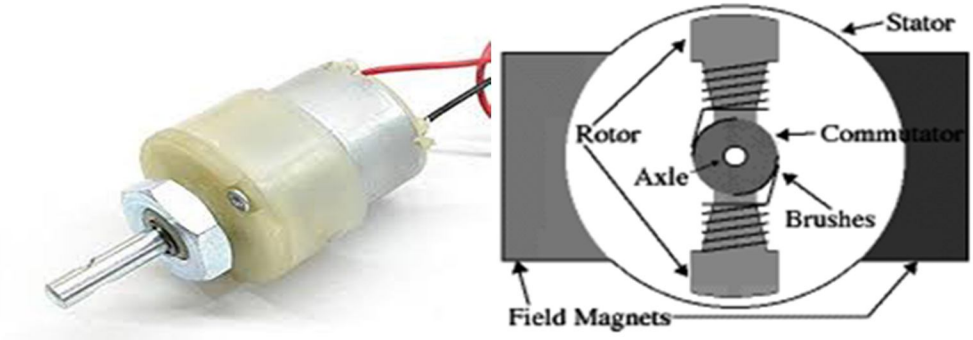


Fig 3.7: DC Motor

7) *Motor Driver:* The L293D is a popular 16-Pin Motor Driver IC. As the name suggests it is mainly used to drive motors. A single L293D IC is capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently. It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.

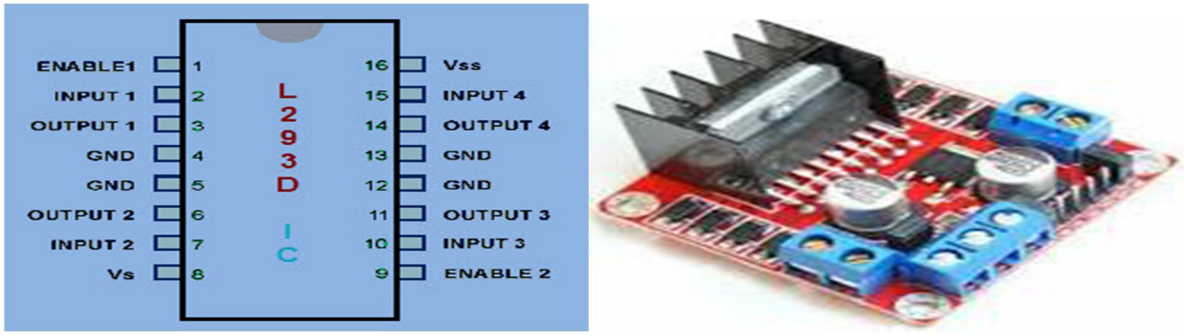


Fig 3.8: Motor Driver

8) *Laser Gun:* A laser is a device that emits light through a process of optical amplification based on the stimulated emission of photons. Laser light is notable for its high degree of spatial and temporal coherence. The term laser originated as an acronym for light amplification by stimulated emission of radiation.

Fig 3.9: Laser Gun

9) *ZIGBEE:* ZigBee is used to transfer the data from the control unit to the rover unit and vice-versa. It uses mesh topology which allows Zig-Bee devices to automatically connect with and transmit data through one another without the need of central gateway like a router. It has low power consumption and low data rate. Hence it is easy and efficient to send the instructions like turn on the device and to rotate them.

Fig 3.10: Zigbee

10) *Transmitter*

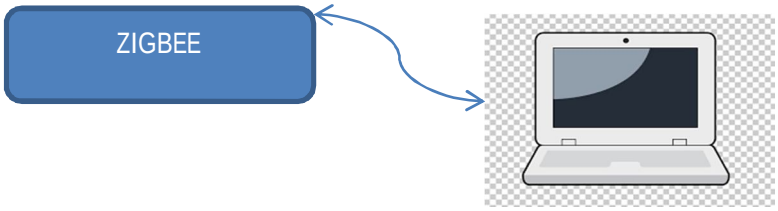


Fig 3.11: Block diagram of transmitter

The transmitter section consists of zigbee module connected with PC.The command to control the robot is given by the user .The command is then transmitted from the transmitter to the receiver with the help of zigbee.Through the command the robots can move in all directions. The laser and gun can also be controlled.

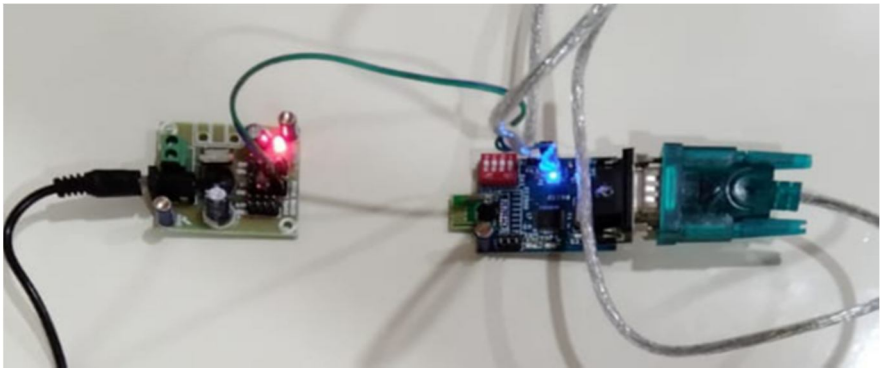
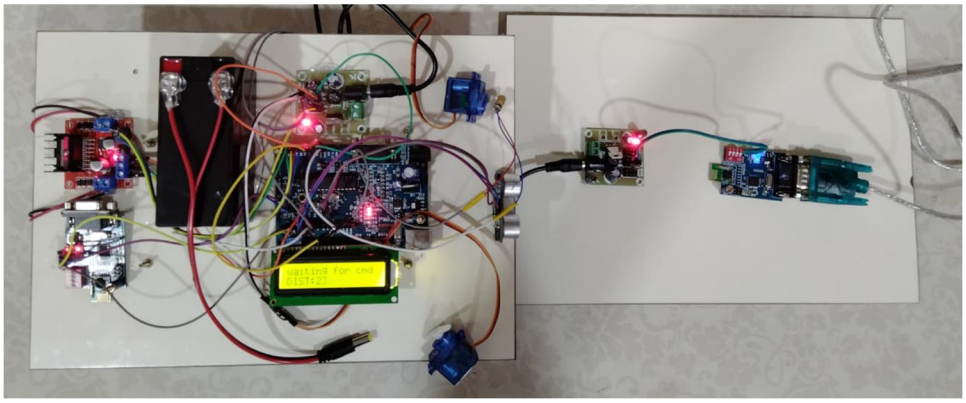


Fig 3.12: Practical implementation of transmitter

IV. RESULT

The proposed system overcomes the human intervention in dangerous areas. In the existing system, the surveillance has to be done by the soldier themselves. The laser gun is used to point at the enemy and the gun can be used to attack the enemy. Zigbee helps to communicate between the transmitter and receiver, controlled by PC. Mobile phone attached to the system can help in live streaming of video.



A. Arduino Software (IDE)

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

This System is programmed using Embedded C.

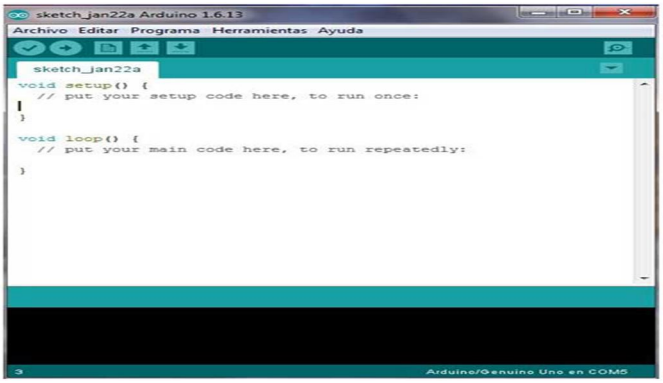


Fig 4.2: Arduino software (IDE)

V. CONCLUSION

This system is portable and can be used anywhere in the war field and it also overcomes the limitations of the existing system. This robot can sense the area and intimate in case of any intrusion. The firing mechanism is controlled based upon the command given. This system provides security, reducing the risk of soldiers' lives.

This system gives us a idea about the war field and the enemies in the area. It can also be used in areas where human intrusion is difficult and dangerous. Installing such robots in secure and forest areas can help increase security.This system gives us an idea about the forest cover and the vegetation.

VI. FUTURE SCOPE

The proposed system can be improvised by using LoRA which can transmit over long distances.More number of sensors could be used to increase security.A single robot can cover only a small area, by using a number of robots we can increase more security.

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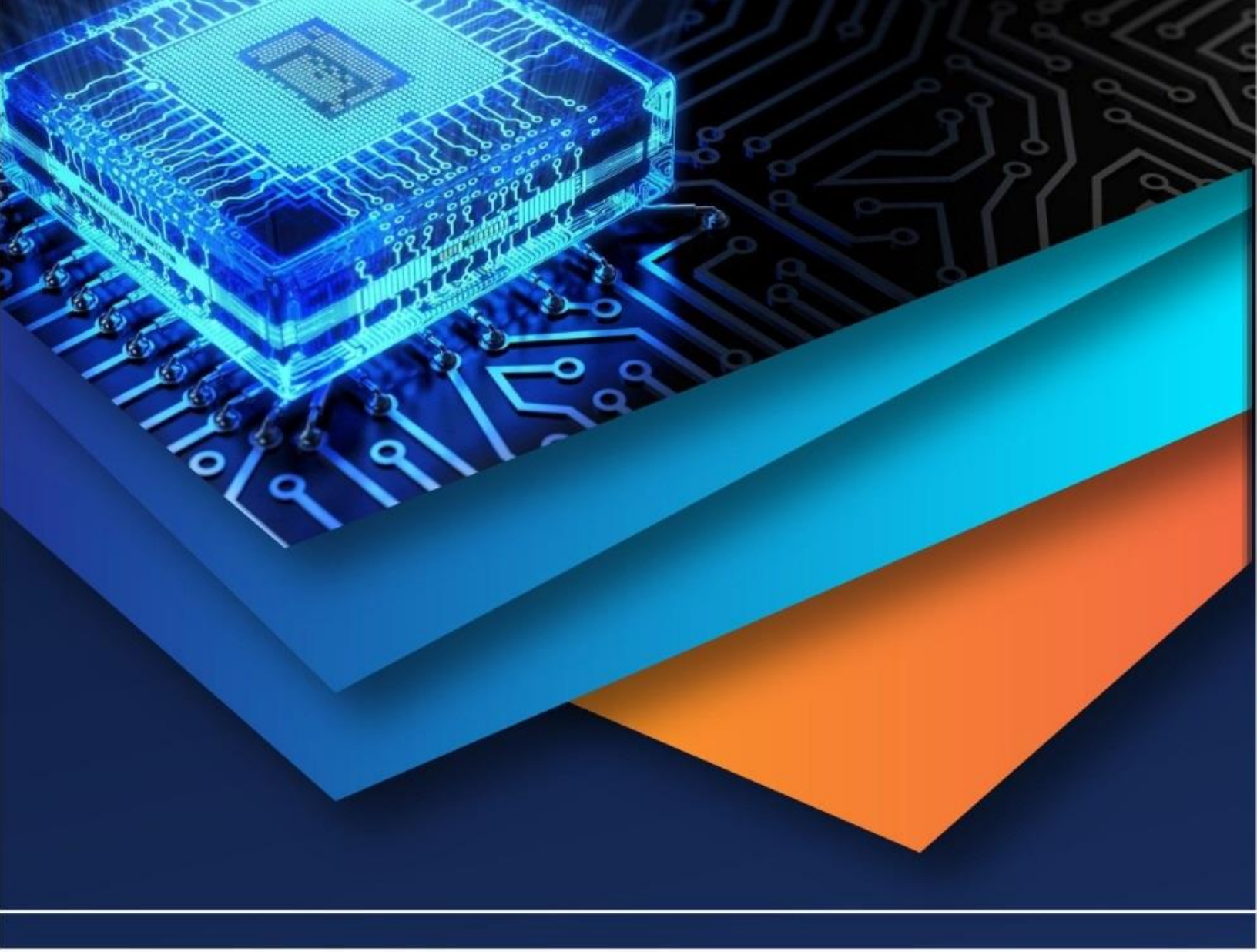

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