Advances in Consumer Research
https://acr-journal.com/
Volume-2 | Issue-6 | Dec: 2025
Original Researcher Article

Advanced Autonomous Surveillance Robot for Tactical Operations.

Mr.G.Mohanavel[1],P.Bhavadharani[2],N.Gowthami[3],N.Ilakkiya[4], Abupakkar Sithick A[5], Abishek S[6]
[1]Assistant Professor, Electronics and Communication Engineering College, VSB Engineering College, Karur, Tamilnadu.
[23456]Students, Electronics and Communication Engineering College, VSB Engineering College, Karur, Tamilnadu.

ABSTRACT
The military surveillance robot project aimsto develop an advanced robot that can enhance the safety and effectiveness of military operations. Equipped with state-of-the- art sensors, cameras, and artificial intelligence algorithms, this robot is designed to gather real-time intelligence and provide surveillance in difficult and hazardous environments. The robot can operate autonomously or be remotely controlled by military personnel, and it is capable of navigating through complex terrains, detecting potential threats, and transmitting data to command centers. The robot's versatile capabilities and adaptability make it a valuable asset for military operations, including reconnaissance, target tracking, and perimeter security. Overall, the military surveillance robot project represents a significant advancement in military technology and has the potential to revolutionize the way military personnel operate in the field, increasing safety and efficiency while minimizing risk to human life...
Keywords: Agriculture, Mobile Application, Direct Market Access, Farmers, Digital Marketplace.
.

1. INTRODUCTION:

The military surveillance robot project is an ambitious and cutting-edge effort to develop an advanced robot that can assist in military operations. The project aims to address the limitations and challenges faced by military personnel in difficult and hazardous environments by providing a reliable, versatile, and efficient surveillance solution. With advancements in artificial intelligence, robotics, and sensing technologies, the military surveillance robot project seeks to create a robot that can operate autonomously or be remotely controlled to gather real-time intelligence, provide surveillance, and aid in reconnaissance, target tracking, and perimeter security.

Literature Survey

[1] N.A. Somani and Y. Patel, “ZigBee: A low power wireless technology for industrial applications”, International Journal of Control Theory and Computer Modelling (IJCTCM), Vol. 2 ,No. 3,pp. 27-33, May 2012.The paper "ZigBee: A low power wireless technology for industrial applications" discusses the ZigBee technology and its applications in the industrial sector. ZigBee is a wireless communicationprotocolbasedontheIEEE802.15.4standard, which is specifically designed for low-power and low-data-rate applications.[2] J. Khurshid and H. Bing-rong, “Military Robots-A Glimpse from Today and Tomorrow”, International Conference on control, automation, robotics and vision, pp.771-777, December 2004. The paper "Military Robots - A Glimpse from Today and Tomorrow" presents an overview of military robots and their potential uses in the present and future.

The authors discuss various types of military robots, such as unmanned aerial vehicles(UAVs),unmanned ground vehicles (UGVs), and unmanned underwater vehicles (UUVs).The paper describes the current uses of military robots, such as reconnaissance, surveillance, and target acquisition, and also discusses potential future uses, including logistics, medical evacuation, and combat operations.[3] S.S. Kim, S. Kim, H. Kang and M. Oh, “A Remote Operating System of an Unmanned Military Robot for Indoor Test Environment”, September 1999. The paper "A Remote Operating System of an Unmanned Military Robot for Indoor Test Environment" presents a system for remotely operating an unmanned military robot in an indoor test environment.

2. OBJECTIVES

The military surveillance robot project has several key objectives that aim to address the limitations and challenges faced by military personnel in hazardous environments. These objectives are focused on developing an innovative, versatile, and efficient surveillance solution that can enhance the safety and effectiveness of military operations. The following are the main objectives of the military surveillance robot project:

1. Develop a versatile and adaptable robot

The military surveillance robot should be capable of operating in a wide range of environments, including challenging terrains and hazardous areas. The robot must have versatile and adaptable features that can be modified to suit different applications and environments.

2. Enhance situational awareness

The military surveillance robot should be equipped with sensors and cameras that can provide real-time intelligence and surveillance data to military personnel. This data can be used to enhance situational awareness and help military personnel make informed decisions.

3. Improve reconnaissance capabilities

The military surveillance robot should be able to navigate through complex terrains, detect potential threats, and gather data to aid in reconnaissance efforts. This capability will enhance the efficiency and effectiveness of military operations. 4. Increase safety and efficiency

The military surveillance robot should be able to operate autonomously or be remotely controlled by military personnel to minimize the risk to human life. The robot's versatile capabilities will increase the efficiency of military operations, enabling military personnel to achieve their objectives safely and quickly.

5. Incorporate the latest technology

The military surveillance robot project should incorporate the latest advancements in artificial intelligence, robotics, and

sensing technologies to create an innovative and efficient surveillance solution.

The military surveillance robot project's objectives aim to provide military personnel with a reliable, versatile, and efficient surveillance solution that can enhance the safety and effectiveness of military operations. By achieving these objectives, the military surveillance robot project can contribute significantly to the advancement of military technology and help military personnel carry out their operations more effectively and efficiently.

HARDWAREIMPLEMENTATION

The hardware implementation for the military surveillance robot project is a critical aspect of the project's success. The robot's hardware should be designed to withstand harsh environments and provide reliable performance in challenging conditions. The following are the primary hardware components required for the military surveillance robot project:

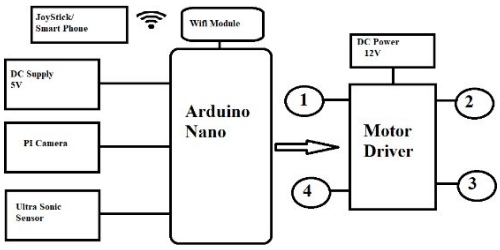


Figure1:Block Diagram of Intelligent Combat Robot

Chassis - The chassis of the robot should be sturdy and robust to withstand impact and rough terrain. It should also be lightweight to enable the robot to move swiftly and quickly. Sensors - The robot should be equipped with sensors that can detect and navigate through complex terrains, avoid obstacles, and detect potential threats. These sensors may include LiDAR, sonar, and infrared sensors. Cameras - The robot should have cameras that can provide high-quality visual data in challenging environments. These cameras should be able to capture images and videos in real-time and transmit the data to military personnel. Communication modules - The robot should be equipped with communication modules that can transmit data and receive instructions from military personnel. These modules may include Wi-Fi, Bluetooth, or satellite communication. Power source - The robot should have a reliable power source that can provide sufficient power to the robot's hardware components. This power source may include batteries or a hybrid power system that combines batteries and solar panels.

Transmitting Unit

The transmitting unit is a critical component of the military surveillance robot project, as it enables the robot to communicate with military personnel in real-time. The transmitting unit should be designed to be reliable and secure, enabling the transmission of high-quality dat aand instructions. The unit may include Wi-Fi, Bluetooth, or satellite communication, depending on the environment and the range required. The transmitting unit should also be easy to use and operate, allowing military personnel to control the robot and receive real-time data from the robot's sensors and cameras. Overall, the transmitting unit plays a critical role in the success of the military surveillance robot project by enabling efficient communication between the robot and military personnel.

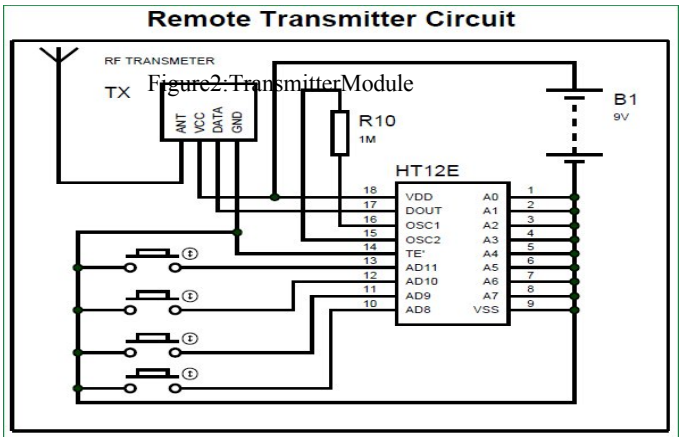


Figure2:TransmitterModule

Figure2:Transmitter Module

The receiving unit is an essential component of the military surveillance robot project that allows military personnel to receive real-time data and instructions from the robot. The receiving unit should be designed to be reliable and secure, enabling the reception of high-quality data and instructions from the robot's transmitting unit. The unit should be able to display real-time data from the robot's sensors and cameras in a user- friendly format, enabling military personnel to make informed decisions quickly. The receiving unit may include a laptop, tablet, or other display device, depending on the application and the mobility required. Overall, the receiving unit is critical to the success of the military surveillance robot project, enabling military personnel to control and monitor the robot efficiently.

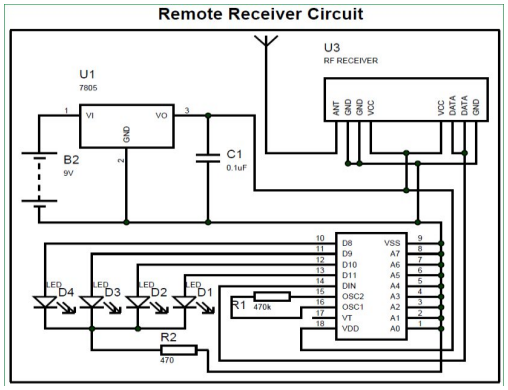


Figure3: Receiver Module

COMPONENTS OR SUBSYSTEMS DESCRIPTION

Micro controller circuit(AT89S52)

The microcontroller circuit for the military surveillance robot project is a critical component that controls the robot's various hardware components, including motors, sensors, and communication modules. The circuit uses an AT89S52 microcontroller, which is a popular microcontroller chip that provides high-speed performance and a range of features suitable for robotics applications.

The AT89S52 microcontroller circuit includes various components, including crystal oscillator, reset circuit, power supply, and input/output (I/O) pins. The crystal oscillator provides accurate timing for the microcontroller, while there set circuit ensures that the microcontroller starts correctly. The power supply circuit provides a stable voltage to the microcontroller and other hardware components.

The AT89S52microcontroller has a range of I/O pins that can be used to interface with various hardware components, including sensors, motors, and communication modules. The microcontroller's programming can be done using a range of software tools, including C, C++, and Assembly. Overall, the microcontroller circuit using the AT89S52 microcontroller plays a critical role in the military surveillance robot project, enabling efficient control and communication between the robot's various hardware components. The circuit's reliability and performance are essential to the success of the project, ensuring that the robot can operate effectively in challenging environments.

Power supply circuit

The power supply unit is a critical component of the military surveillance robot project, as it provides the necessary power to operate the robot's various hardware components. The power supply unit should be designed to be reliable and efficient, providing a stable voltage to the robot's microcontroller, motors, sensors, and communication modules. The power supply unit can use various sources of power, including batteries, solar panels, or mains electricity, depending on the application and mobility requirements. The unit may include voltage regulators, filters, and protection circuits to ensure stable and clean power supply. The power supply unit's capacity should be carefully calculated to ensure that it can provide sufficient power to the robot's various components for an extended period without the need for frequent recharging or replacement. Overall, the power supply unit plays a critical role in the success of the military surveillance robot project, enabling the robot to operate effectively in challenging environments for extended periods.

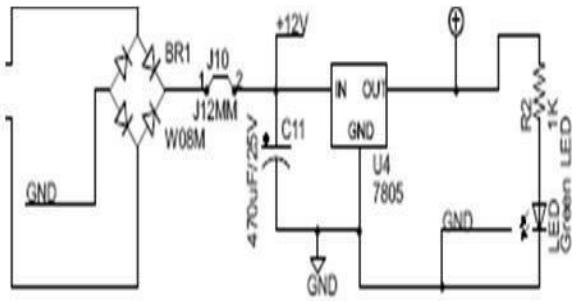


Figure 4:Power Supply Module

Decoder HT-12D

The HT-12D decoder is an essential component of the military surveillance robot project, as it enables wireless communication between the robot and the receiving unit. The decoder receives a signal transmitted by the robot's encoder and decodes it into a binary data stream that can be interpreted by the microcontroller. The HT-12D decoder includes various components, including a resonator, filter, amplifier, and comparator. The resonator provides accurate timing for the decoder, while the filter removes noise from the signal. The amplifier and comparator amplify and compare the signal, respectively, to generate a binary data stream. The HT-12D decoder has a range of pins that can be used to interface with the robot's transmitting unit and the microcontroller. The decoder's performance is affected by various factors, including the signal's frequency, amplitude, and modulation scheme. The HT-12D decoder is easy to use and integrate with various microcontrollers and wireless communication modules. It can be used in various applications, including remote control, security systems, and automation. Overall, the HT-12Ddecoder plays a critical role in the success of the military surveillance robot project, enabling efficient wireless communication between the robot and the receiving unit.

The VT legal so goes high to indicate a valid transmission. The 212series of decoders are able of decrypting information's that correspond of N bits of address and12_N bits of data. Of this series, the HT 12 Disarranged to give 8 address bits and 4 data bits, and HT12 F is used to crack 12 bits of address information.

EncoderHT-12E

The HT-12E encoder is an important component of the military surveillance robot project that allows for wireless communication between the robot and the receiving unit. The encoder generates a signal that can be transmitted wirelessly to the receiving unit, which can then decode it into a binary data stream. The HT-12E encoder includes

various components, including an oscillator, encoder, and output pins. The oscillator provides accurate timing for the encoder, while the encoder converts the data from the microcontroller in to a signal that can be transmitted wirelessly. The output pins can be used to interface with the microcontroller and the transmitting unit. Overall, the HT-12 E encoder plays a crucial role in the success of the military surveillance robot project, enabling efficient wireless communication between the robot and the receiving unit. The capability to elect a TE detector on the HT12E(8) further enhances the operation in flexibility of the 212 series of encoders.

DC Motors

A DC motor is a common choice for a military surveillance robot project due to its reliable and efficient performance. DC motors provide precise control over motor speed and direction, making them ideal for a range of robotic applications. Additionally, they are rugged and durable, able to withstand harsh operating environments and conditions. DC motors can be powered using a variety of sources, including batteries and generators, making them versatile and adaptable to various power sources. Overall, a DC motor is a reliable and efficient choice for a military surveillance robot project, providing the necessary performance and durability for the task at hand.

MotorDriverL293D

The L293D motor driver is a popular choice for military surveillance robot projects due to its ability to control multiple DC motors with high precision and reliability. The L293D is a dual H-bridge driver, meaning it can control two DC motors independently in terms of speed and directi on. It is also capable of handling motor currents up to 600mA and has built-in flyback diodes for protection against voltage spikes. The L293D is a versatile motor driver that can be powered using a wide range of voltage inputs, making it well-suited for use with a variety of power sources commonly used in military applications. Its compact size and low power consumption also make it an ideal choice for mobile and battery-powered applications. In a military surveillance robot project, the L293D can be used to control the movement of the robot's wheels or tracks, allowing it to navigate various terrains and obstacles. It can also be used to control other components of the robot, such as cameras and sensors, to enable effective surveillance and data gathering. Overall, the L293D motor driver is a reliable and versatile choice for military surveillance robot projects, providing the necessary precision and control over motor performance required for such applications. The behaviour of motor for various input is shown in Table 1. TABLE 1. BEHAVIOR OF MOTORS

Operation	A	B
Stop	Low	Low
Clockwise	Low	High
Anti Clockwise	High	Low
Stop	High	High

Transmitter for Laser Gun

The transmitter is constituted by AT90S2323 microcontroller and TLP434 RF transmitter module at 418 MHz. Transmitter is designed for further battery frugality and safe transmission of the data. Block diagram for the transmitter of laser gun is as shown in the Figure 5.

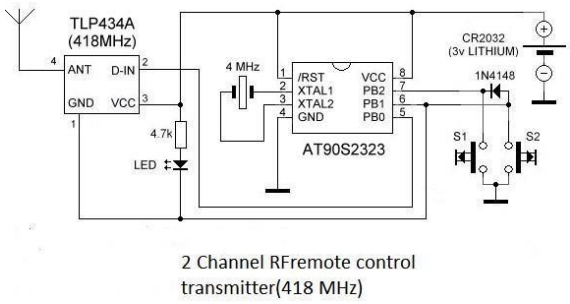


Figure 5:Block Diagram of Transmitter Laser Gun

Then TLP 434 A is an Ultra-small transmitter of range 418MHz with ASK modulation scheme with operating voltage range from 2- 12 dc voltage. This IC is generally chained with the encoder IC for illustration HT12- E. This transmitter is connected to the AT90S232310MHz with 2k flash microcontroller. This constitutes a transmitter section of laser gun.

Receiver for Laser Gun

The receiver constituted with the aid of using RF receiver module RLP434A at 418MHz, the microcontroller AT90S2313 [10] and the 2 relays which could take care of any electric (or electronic) tool up to ten Amps (the contacts of my relays are 10 Amp at 250Volts). The RLP 434 A is an RF receiver module with receipt frequency at 418MHz with ASK modulation. There are 2 outputs from this module, the digital, with tiers from 0v to VCC (five volts in our case) and the analog output. Analog output isn't used. The transmitter sends four bytes with 2400bps four instances and the receiver RLP- 434A collects them and movements them to AT90S2313 to RxDpin, PD0. Block diagram for receiver of the laser gun is depicted in Figure 6.

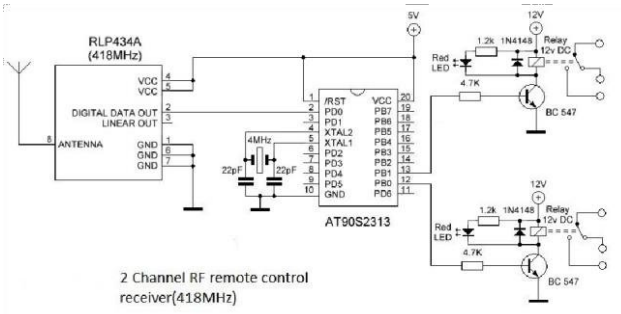


Figure 6: Block Diagram of Receiver Laser Gun

The RL 434 A is a grounded SAW (face a ural surge) receiver that is compatible with 418 MHz of frequency and has a working range of 3.3 to 6 dc voltage. It also uses ASK modulation. We also have an 8-bit microcontroller

AT90S2313with2kflashmemoryandan11legDIPasaTx. These elements will combine to form the ray gun receiver.

RF Communication

Radio frequency (RF) is the rate of oscillation that describes the frequency of radio waves and the alternating currents that convey radio communications. Its range is around 3 kHz to 300 GHz. RF often refers to electrical oscillations rather than mechanical ones. The foundation of radio technology is the ability of an RF current to emit energy as electromagnetic waves (radio waves) from a conductor into space.

JMKAV Receiver with Wireless Camera

It is being utilized here for demonstration purposes and is a little wireless monitoring video camera and wireless receiver combination for home and small business surveillance. Install the wireless camera in the space that needs monitoring, place the wireless receiver in the next space (upto15metresaway), connect it to a TV or DVR, and observe what's happening or record it for security records.

Here, we're installing a wireless camera inside the fighting robot. Depiction of AV Receiver wireless camera is as shown in Figure 7

TV Capture card

A TV capture card is a part of a computer that enables the computer to receive television signals. It is a specific type of TV tuner. Most TV tuners may also be used as video capture cards, which enables them to record TV shows into a hard drive. Digital TV tuner card is as shown in the Figure 8

Figure7: AV Receiver and Wireless Camera

Figure8: ATI digital TV capture card

The card has demodulation and interface circuitry in addition to a tuner and an analog-to-digital converter.

Remote Controller Decoder SC2272-T4Its characteristics include

Operating voltage:DC4–6V and it may be utilized

for wireless remote-control receivers.

Upto6data pins

Toggle control mode

Upto12tri-statecodeaddress pins. A TV capture card, also known as a video capture card or a TV tuner card, is a computer hardware device that allows users to capture or record video signals from a TV source or other video sources, such as a video camera, DVD player, or VHS player, and then display or save the captured video on their computer. TV capture cards typically connect to a computer through a PCI or USB interface and come with software that enables the user to tune into TV channels and record video content. Some TV capture cards also come with built-in hardware compression, which allows users to capture and compress video in real-time, reducing the amount of disk space required to store the video. TV capture cards can be used for a variety of applications, such as recording TV shows, capturing video from a video camera, creating home movies, and even streaming video content over the internet. They can also be used for video conferencing, video surveillance, and other applications that require video input. There are different types of TV capture cards ,including analog and digital capture cards.

Every level of software developer, from the expert Applications engineer to the student learning about embedded software development, is supported by Keil development tools for the Microcontroller Architecture. All 89S52 variants are supported by the industry-recognized Keil C Compilers, Macro Assemblers, Debuggers, Real-time Kernels, Single-board Computers, and Emulators. The complicated issues that embedded software developers face are addressed by the Keil Development Tools.

The code from the computer is dumped to the microcontroller via flash magic. A robust, feature-rich Windows tool called Flash Magic is free and makes it simple to programme Philips FLASH Microcontrollers. Use the Flash Magic platform to create original apps for Philips Microcontrollers! Use it to produce an internal production line programming tool or custom end-user firmware programming apps

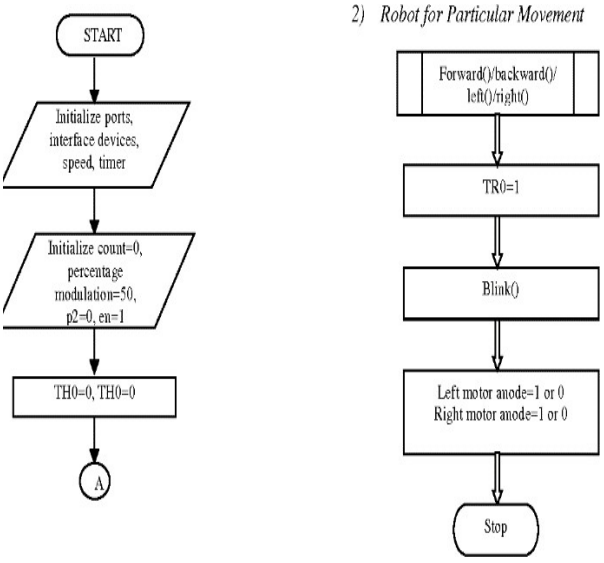
THEIMPLEMENTATIONOFSOFTWARE

We use two software packages to implement the programme. The Keil Vision 3.0 is the first, while the Flash magic simulator is the second. The 89S52 device's on-chip peripherals (I2C, CAN, UART, SPI, interrupts, I/O Ports, A/D Converter, D/A Converter, and PWM Modules) are precisely simulated by the Keil Vision Debugger.

Simulating device setup scan a id with understanding and save time on setup issues. Before the target hardware is

ready, we may create and test apps using simulation. The microcontroller will be used to store the system programme, which was created in embedded C [11] using the KEIL IDE software.

OnWindows95/98/NT4/2000,theFlashMemoryIn-System Programmer is a programme that may be used. Using a serial RS232 interface, it enables in-circuit programming of FLASH storage. The Intel HEX format file produced by compiler Keil is accepted by computer side software named Flash Magic and transmitted to the target microcontroller. It recognizes the serial port-connected hardware



Delay Flowchart

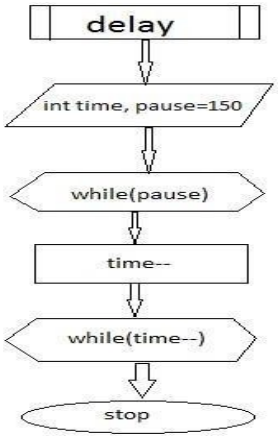


Figure 11: Flow chart for Delay

RESULTSANDDISCUSSION

Remote controls are intended to control the laser gun and the robot's direction. Robot continues to move in both manual and self-modes. In them annual mode, it is put under the user's control. In self-mode, the robot begins to move across the surface and responds as necessary to the situation. We have placed infrared sensors (left sensor and right sensor) in the module's front section in order to identify impediments. If the left sensor is detected when the robot is travelling on the surface, the robot briefly resumes its position before going right. In the event that the right sensor is found, the robot returns and goes left. The front view and top view of designed combat robots are shown in the figures 12 &13

Figure 12: Front view of designed combat robot

Figure 13: Top view of designed combat robot

Military surveillance robot projects have a wide range of applications. It is shown in the figure 14.

Figure 14:Top view of combat robot

APPLICATIONS

Reconnaissance

Military surveillance robots can be used for reconnaissance missions, where they can gather intelligence on enemy positions, movements, and activities.

Border patrol:

These robots can be used to patrol borders and monitor for illegal activity such as smuggling and trafficking.

Explosive ordnance disposal (EOD):

These robots can be equipped with tools to safely and remotely remove and dispose of explosives.

Search and rescue:

Military surveillance robots can be used in search and rescue missions to locate and assist individuals in difficult to reach locations, such as in natural disasters or military conflicts.

Surveillance:

These robots can be used for surveillance purposes, such as monitoring sensitive areas or events. Mine detection:

Military surveillance robots can be used to detect and safely remove landmines, reducing the risk of injury or death to personnel.

Combat support:

These robots can be used to support military operations by providing additional firepower or logistics support

3. CONCLUSION

As we all know, India is tired of recent large-scale terrorist assaults and bombings at opulent resorts. In order to prevent such catastrophes, TECHNOLOGICAL power must surpass HUMAN power. Time and human life are priceless.

It is up to us to take the effort to create a suitable robot model that satisfies military requirements. So ,i t is necessary to keep top-notch military technology in line with combatant demands in order to prevent terror attacks, to guarantee greater security at the border, and in densely populated regions. Every country requires a defense system of its own to maintain its integrity and security. These robots' building will promote the country's reputation and popularity internationally.

In conclusion, military surveillance robot projects play an important role in enhancing situational awareness and providing critical support to military personnel in a variety of applications. These robots offer a range of capabilities, including reconnaissance, border patrol, explosive ordnance disposal, search and rescue, surveillance, mine detection, and combat support. DC motors and motor drivers such as the L293D are essential components of military surveillance robots, providing precise control over motor performance and enabling the robot to navigate challenging terrain and obstacles. These robots are also typically equipped with a range of sensors, cameras, and other equipment to gather and transmit data to military personnel, enhancing their ability to make informed decisions in complex and dynamic environments. Overall, military surveillance robot projects continue to evolve and improve, incorporating new technologies and capabilities to enhance their performance and effectiveness

REFERENCES

1. N.A.Somaniand Y.Patel, “ZigBee:A low power wireless technology for industrial applications”, International Journal of Control Theory and Computer Modelling (IJCTCM), Vol.2 ,No. 3,pp. 27-33, May 2012.
2. J.Khurshid and H.Bing-rong,“Military Robots-A Glimpse from Today and Tomorrow”, International Conference on control ,automation, robotics and vision, pp.771-777, December 2004.
3. S.S. Kim, S. Kim, H. Kang and M. Oh, “A Remote Operating System of an Unmanned Military Robot for Indoor Test Environment”, September 1999.
4. C.R. Weisbin, “Miniature Robots for Space and Military Missions”, IEEE Robotics and Automation Magazine, Issue3, pp.9-18,September 1999.
5. H. Schempfa, E. Mutschle, B. Chemela, S.Nayar, C.Piepgrasa, W.Crowleya and SBoehmkea, “Evolutionof Urban Robotic System Developments”, International conference on advanced Mechatronics, pp.689-694, September 1999.