Journal of Current Research in Engineering and Science
Bi-Annual Online Journal (ISSN: 2581 - 611X)

Volume7-Issue2, January 2024
Paper: 22

IoT Based Multifunctional Robot for War Assistance

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Abstract**:** *This review paper offers a comprehensive examination of the development, capabilities, and applications of multipurpose robots in modern warfare. As warfare evolves in complexity, so does the need for advanced technological interventions. Multipurpose robots, armed with diverse functionalities, have emerged as a potential game- changer, assisting soldiers in tasks ranging from reconnaissance, demining, and logistics support, to direct combat engagements. We delve into the historical progression of robotic aid in warfare, highlighting key innovations and turning points. Our analysis underscores the multifaceted benefits of these robots, including increased operational efficiency, reduced human casualties, and enhanced strategic capabilities. However, ethical concerns surrounding autonomy in decision-making and the potential for collateral damage are also discussed. We conclude with insights into the future trajectory of war robots, emphasizing research areas that promise further advancements and integration into military strategy.*

1. INTRODUCTION:

In the evolving landscape of modern warfare, technological advancements play a pivotal role in determining strategic advantages. Among these advancements, the development and deployment of multipurpose robots have garnered significant attention. These robots, designed to assist in a myriad of combat and non-combat roles, offer the dual benefits of enhancing operational capabilities while reducing risks to human personnel. From reconnaissance missions in hostile territories to bomb disposal, and from logistical support to active combat roles, these robots represent the confluence of artificial intelligence, advanced mechanics, and military strategy. This review delves into the various applications of multipurpose robots in war assistance, the challenges they face, and the prospects they offer for reshaping the future of warfare.

2.LITERATURE SURVEY:

2.1IOT Based Multifunctional Robot for War Assistance:

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Paper: 22

The system IOT proposed here is integrated with multiple functions such as wireless camera which can identify unknown persons. Additionally, it has sensors, gripper and a weapon. Thus, the proposed system, fire alert systems (for instance, smoke detectors and heat sensors), frequently fall short in giving timely fire alerts, especially in intricate scenarios or open-air Multifunctional defense Robot using wireless network GSM through we can update the data to web page server. This robot is designed to protect individuals and the nation. Robots carry out risky jobs, ensuring soldier safety integrated systems in defense robots with features such as video screens, sensors, laser guns, metal detectors, and cameras. Robots have specialized shapes based on their specific roles. New system uses a wireless camera to detect intruders**.** Dependency on technology might reduce human roles and skills in defense. Malfunctions or cyber-attacks could compromise robot efficiency or turn them against friendly forces. Over- reliance on robots might lead to fewer trained soldiers for back up in the event of system failures.

2.2Seeking at Home Long Term Autonomy of Assistive Mobile Robots through TheIntegration with an Iot-Based Monitoring System.

The innovative Internet of Things based robot is a combination of intelligent devices and robotic systems. This system emphasizes a clear assisted care for end users and it is specially made for older persons. This system offers several functions that work cooperatively with SAR and IOT systems. This design, with the user at its core, allows the robot to access a broader range of data from various smart objects and sensors. Additionally, the robot's social interaction with humans enhances data collection from IoT devices in smart homes. All interactions are managed by a cloud-based virtual agent called the Virtual Caregiver. The system seems to rely on users during technical failures. This could be problematic if users are unavailable or unable to assist. Relying on a cloud-based system might raise concerns about latency, bandwidth, and potential downtime. This is an intelligent machine which perform tasks and operate independently without the control of humans.

2.3 Smart Fire-Warning Materials and Sensors: Design Principle, Performances, And Applications

This article delves deeply into the domain of passive flame-resistant substances, conventional fire detection mechanisms, and the forefront of intelligent fire alert materials and devices, coupled with the flammability aspects of burnable substances. We systematically explore the conceptual architecture, creation, analytical methods, and manufacturing approaches of these intelligent alert materials. These dynamic fire safety measures initiate or emit a distinct signal, amplifying the likelihood of curtailing or dousing a blaze before substantial damage occurs. When it comes to real-world application, both active and passive fire defense methods serve vital, yet distinct roles. Conventional fire counteraction tools, defense operations vulnerable to cyber-attacks or technical malfunctions. Manual control from distant settings. Their tardy response to combustion patterns results in postponed alarms. Depending on manual surveillance for potential fire hazards is inconsistent and often

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Paper: 22

inefficient, possibly leading to protracted reactions and major fire events.

2.4 Wireless motion controlled dual six axis robotic arms with rover

This system is specifically made to operate in remote conditions to carry out difficult works independently. This performs tasks with a motion caption controller. The model consists of two receiving and two transmitting units. One of the transmitting units is a controller, which can control the robotic arms with rover by hand gestures. The first transmitting unit is the joystick which is used to control the 6-DOF dual robotic arms with rover by using hand motions. Human-like Precision: The technology is designed to handle tasks that require intricate, human-like precision. Intuitive Control: The motion capture joystick offers a natural way to control the robotic arms, eliminating the need for specialized training. Efficiency: With dual robotic arms mimicking human hands, tasks can be completed more quickly and efficiently. Reliability of Communication Channels: Any delay or interruption in the wireless communication can lead to mistakes, especially during critical operation.

2.5 IoTbased Multifunctional Robot for War Assistance

Defense organizations increasingly utilize robots equipped with integrated systems such as video screens, sensors, and weaponry to undertake tasks too risky for soldiers. These defense robots vary in design based on their function and can detect intruders using wireless cameras. The newly proposed system integrates multi- functional defense robots with a GSM wireless network, allowing data updates to web page servers. As combat dynamics shift globally, defense robot automation emerges as the latest evolutionary phase in military operations. These robots can be manually controlled from distant control rooms using non-commercial WIFI standards, ensuring secure communication. The Multifunction Robot system, built on the Raspberry Pi platform and paired with GPRS for data storage, offers an affordable and efficient solution for military applications, with its camera providing real-time data for analysis. Defense robot scan undertake tasks that are too risky for soldiers, enhancing safety. The proposed system's integration with a GSM wireless network allows real-time data updates, ensuring timely information dissemination. The use of non-commercial WIFI standards provides secure communication, safeguarding sensitive military information. Dependence on technology might make its next move, ensuring safe navigation. Provides an affordable solution to automated safety and remote vehicle access. Uses intuitive controls through an Android app, making it user friendly. The SONAR- based obstacle detection enhances the robot's navigational safety. Dependency on Bluetooth might locations could lead to delays or misjudgments in high-pressure situations. Over-reliance on robots might diminish the need for human skills and intuition in defense scenarios.

2.6 MultifunctionRobotforMilitaryApplication

The multifunction robot, designed for military applications, can operate autonomously or be manually controlled using the internet. It is equipped with sensors to detect humans, metals, harmful gases, and fire, particularly in high-risk areas such as war fields. Robotics, initially used in advanced manufacturing, has expanded its reach to entertainment, military, and surveillance

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due to technological advancements. The primary purpose of this project is to design a wireless, multifunctional defense robot, controllable via computer using an RF module. This robot, an electro-mechanical device, is critical in various applications like automation in hospitals, factories, defense, entertainment, space exploration, and other dangerous missions. Its ability to detect potential threats and relay them through an LCD display, along with alert alarms, holds promise for the future, aiming to safeguard soldiers and military equipment. The robot can operate both autonomously and manually, offering flexibility in various situations. Ulti-sensory capabilities allow the robot to detect a wide range of threats, enhancing safety. Its diverse applications, from military to automation, highlight its versatility and adaptability. Relying solely on robots may lead to overconfidence and underestimation of human intuition and judgment. Technical glitches or malfunctions can jeopardize missions or lead to false alarms. A dependency on the internet or RF modules for communication might introduce vulnerabilities or points of failure.

2.7 Multi Featured Robot Car with Arduino

This project aims to provide employs a Bluetooth Control Theory, where distinct buttons on the app send specific character commands to automated safety and remote access in vehicles using an affordable alternative, without needing significant modifications or added weight. The core of the project is a robot designed to resemble a standard RC car, distinguished by its control through an Android app. The robot controls its movements. Additionally, the robot utilizes the SONAR principle, with an HC SR04 sensor, to detect obstacles. This sensor measures distances by emitting ultrasonic waves and calculating the time they take to return after reflecting off an object. If an obstacle is detected within30 cm, the robot analyzes the distances on both sides and decides might be dangerous delays. Plus, people are right to be worried about their private photos, messages, or information being at risk if it's sent to big cloud computers, as hackers might steal them. Another thing is that while many devices are smart, they might not have enough power or storage space to handle all these advanced tasks. This is especially true for smaller gadgets. So, while the blend of AI with our daily devices limits the operational range and reliability. Limited to moderate rpm motors without an external speed control might constrain versatility. Reliance on the HC SR04 sensor means the robot's performance might vary based on acoustic conditions

2.8 Hydro gel Based-Electro chemical Gas Sensor for Explosive Material Detection

In Thailand, terrorists predominantly employ trinitrotoluene (TNT) in explosive devices, a substance challenging to detect due to its low vapor pressure. This study introduces an innovative TNT detection method utilizing polyacrylamide gel as an electrochemical gas sensor. By leveraging cyclic voltammetry signals, it was discerned that the time- derivative calculation of the signal, rather than the signal itself, uniquely identifies different chemicals, potentially revolutionizing the field of explosive detection. This novel method offers the advantage of distinct chemical differentiation, possibly bridging the gap between traditional detection methods like chromatography, mass spectrometry, and newer techniques. However, its reliance on polyacrylamide gel—a non-specific gas absorbent material—may pose selectivity challenges without additional modifications. While the approach is groundbreaking, there's an inherent

need for further experimentation and validation, suggesting preliminary rather than definitive results. Additionally, understanding the broader applicability of this technique in real-world scenarios is essential for its adaptation in security and surveillance systems.

2.9 Pervasive AI for IoT Applications: A Survey on Resource-Efficient Distributed Artificial Intelligence

Artificial Intelligence, or AI, which is a fancy term for machines that can think and learn, is now working with everyday devices like phones, watches, and home appliances. This partnership has led to some fantastic benefits. Think of smart homes where lights adjust themselves or fridges that tell you when you're out of milk. Also, there are cars in development that can driven their own! A major advantage of this is that these devices can quickly process information without always needing to connect to big computers located far away. This means faster decisions and potentially more privacy, as less of our personal data needs to travel across the internet. However, just like everything, there are some issues. Some gadgets, especially those requiring quick decisions like self- driving cars, need super-fast responses. If they rely on distant computers, there is indeed a step into the future, there are still hurdles we need to overcome.

2.10 Multipurpose Robot

The abstract of this paper highlights Arduino as an open- source platform known for its user-friendly hardware and software, capable of interpreting various inputs such as light, touch, or messages and translating them into corresponding outputs like activating motors, LEDs, or online communication. This versatility makes Arduino ideal for educational purposes, particularly in robotics, where the integration of IoT technologies is transforming traditional learning methods. The project discussed proposes a versatile Robotic vehicle equipped with sensors for obstacle detection, line tracking, and human identification, all controlled by an Arduino-based IoT system. Each device's functionality is seamlessly integrated into the IoT framework, allowing remote control via GSM technology and data transmission to authorized users' websites. The introduction delves into Arduino's significance in democratizing electronics education, citing its simplicity and adaptability for both beginners and advanced users across various platforms. The Arduino Robot, comprising two interconnected platforms housing microcontrollers, sensors, and actuators, exemplifies the platform's accessibility and versatility. Additionally, the document emphasizes Arduino's role in revolutionizing electronics education, making it more accessible and engaging for students and educators alike, regardless of prior technical expertise

2.11 Multi-functionalityrobotnavigationwith improved performances

The abstract underscores the significance of developing a robot to mitigate risks associated with landmines, particularly in hazardous environments such as mining zones. The proposed robot is

designed to enhance safety by detecting landmines accurately, with the added capability of remote control via Bluetooth and Wi-Fi technologies from mobile devices or computers. Its multifunctional features enable precise navigation, obstacle avoidance, and light tracking, making it suitable for military surveillance applications. The project aims to leverage Arduino, DC motors, and other components to construct a robot capable of autonomously navigating terrain while avoiding obstacles and detecting metal, thus identifying potential landmines. The introductionprovides context on the evolution of robotics, emphasizing their increasing importance across various sectors, including military and industrial applications. It discusses the development process of the obstacle- avoidance and light-tracking robot, highlighting the integration of sensors such as ultrasonic and LDR modules controlled by an Arduino Uno R3 microcontroller. The article concludes with a discussion on the potential applications and functionalities of the robot, emphasizing its compact, autonomous, and fully functional design suitable for hazardous environments. Key components such as the Arduino Uno R3, battery, motors, chassis, sensors, and motor driver are detailed, underscoring the robot's versatility and potential impact in mitigating risks in challenging conditions.

2.12 SolarPoweredWirelessMultifunctionalRobot

The paper introduces a novel robotic system designed for espionage and surveillance purposes in remote and border areas. This multifunctional robot operates autonomously and can also be controlled manually through a dedicated webpage interface utilizing HTTP protocol. Equipped with various sensors, including those for detecting humans, metals, harmful gases, and fires, the robot offers enhanced surveillance capabilities. To overcome limitations of existing systems, the project integrates a RaspberryPi3 embedded board programmed with Python, allowing for remote monitoring and control via IoT. Additionally, the system utilizes renewable energy sources by incorporating a solar panel for sustained operation. Navigation is facilitated by ultrasonic sensors, while live streaming capabilities enable real- time assessment of surroundings. Overall, the project aims to address challenges in border surveillance with an innovative, sustainable, and versatile robotic solution.

3. DISCUSSION:

The advent and integration of multipurpose robots in warfare signify a paradigm shift in military strategies and combat dynamics. As gleaned from the diverse literature surveyed, robots have found applications ranging from active defense mechanisms to assistive care, and even fire-warning systems. Their benefits, including human safety enhancement, real-time data dissemination, and operational efficiency, are substantial. The innovations, such as the integration of IoT with robotics, showcase a promising trajectory where the confluence of advanced mechanics, AI, and military strategy are heading. However, while the technological advancements are commendable, it's imperative to address the challenges and vulnerabilities these systems present. Over-reliance on these robots, potential cyber-attacks, communication interruptions, and technical malfunctions stand as significant barriers to full-scale adoption. There’s also an ethical dimension to consider, especially when the autonomy of decision- making in warfare scenarios becomes predominantly robotic. Will warfare lose the human touch and judgment? Or will robots merely serve as tools?

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Volume7-Issue2, January 2024
Paper: 22

4. CONCLUSION:

In the modern era of warfare, multipurpose robots have indeed emerged as crucial game-changers. Their versatility, ranging from active combat roles to assistive functions, underscores their importance in shaping the future of military operations. However, as with all technological advancements, they come with their set of challenges that need to be addressed judiciously. The future of warfare will inevitably witness an increased presenceoftheseroboticaids,but their integration should be balanced with ethical considerations and a continual assessment of the human role in strategic decision- making. Research should not only focus on further advancements but also on ensuring the safe and responsible deployment of these tools on the battlefield.

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Volume7-Issue2, January 2024
Paper: 22

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