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INTELLIGENT COMBAT ROBOT (NOVA)

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ABSTRACT

The need for surveillance in a society escalates with an increase in population. As more people reside in a specified area, monitoring their activity gets tougher, which gives a rise in security concerns. Not only in societies, the need for surveillance, monitoring and detection has been a prime requirement in the defense sector. This research aims in developing a surveillance and detection robot which would be capable of various applications like monitoring environment at greater distances, detecting obstacles and objects, detecting mines in the ground and achieving autonomy in traversal. All these features combined in one package will serve as a complete solution to this problem. This robot can be used for surveillance, sending live feed to a local ground station in the city. Moreover, this robot can be used in hostile situations with the armed forces. The bot can be sent to survey a particular area and provide necessary data back to the soldiers to determine safety in proceeding further. Components ranging from cameras, motors, microcontrollers, sensors, communication modules are present in the system. The robot is an integration of various subsystems working together to provide an optimum solution for surveillance and detection.

Keywords: Surveillance, Microcontroller, Integration.

I. INTRODUCTION

The objective of this study is to develop a combat robot that can operate in intense combat situations, with the aim of minimizing human casualties. The robot is designed to be voice controlled, hand gesture controlled, and IOT- based, allowing it to be operated remotely using a mobile device or laptop. It has a range of functions including scouting, search and rescue, supply delivery, and firing. The robot is equipped with a wireless camera for remote monitoring of the enemy, and it is armed with firearms that can be controlled by the operator. Additionally, the robot can be armed and disarmed remotely, and it is capable of moving swiftly in challenging terrains. It can be used to supply soldiers with necessary equipment and communicate with them in the battlefield. The robot is powered by solar energy through solar panels and a rechargeable DC power supply battery. It utilizes an HD Wi-Fi camera IC with a built-in Wi-Fi module for operation. The combat robot is intended for use in war fields to reduce casualties and handle situations where there is a shortage of manpower.

II. METHODOLOGY

The experimentation and working methodology in the development of intelligent combat robots typically involves a systematic approach that encompasses several key stages. Here's a generalized outline of the methodology:

1. **Problem Identification**: The process begins with clearly defining the problem statement and identifying the specific challenges and objectives in developing intelligent combat robots. This includes understanding the operational requirements, mission scenarios, and constraints imposed by the battlefield environment.
2. **Research and Requirements Analysis**: Researchers conduct literature reviews and analyze existing technologies and methodologies relevant to the problem domain. They also gather requirements from stakeholders, including military personnel, to ensure that the developed systems meet operational needs effectively.

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3. **Design and Conceptualization**: Based on the identified requirements and research findings, researchers develop conceptual designs for intelligent combat robots. This involves defining the architecture, subsystems, and components of the robotic system, as well as specifying the integration of sensors, actuators, and computational resources.
4. **Prototyping and Implementation**: Prototyping involves building physical or virtual prototypes of the intelligent combat robots to validate design concepts and demonstrate feasibility. Researchers implement algorithms, develop software frameworks, and integrate hardware components to create functional prototypes for testing and evaluation.
5. **Sensor Integration and Perception**: Researchers focus on integrating sensors and developing perception algorithms to enable the robot to sense and understand its environment. This involves calibrating sensors, processing sensor data, and implementing algorithms for tasks such as object detection, localization, mapping, and obstacle avoidance.
6. **Autonomy and Decision-Making**: Autonomous capabilities are developed to enable the robot to make decisions and execute tasks independently. Researchers design algorithms for navigation, path planning, task allocation, and tactical decision-making, taking into account factors such as mission objectives, environmental conditions, and constraints.
7. **Testing and Evaluation**: The developed intelligent combat robots undergo rigorous testing and evaluation in controlled laboratory environments as well as in simulated and real-world scenarios. Testing involves assessing performance, reliability, robustness, and safety aspects of the robots under various conditions and stressors.
8. **Iterative Development and Optimization**: Based on feedback from testing and evaluation, researchers iterate on the design, refine algorithms, and optimize system performance. This iterative process may involve multiple cycles of prototyping, testing, and refinement to address identified issues and improves overall capabilities.
9. **Validation and Verification**: Once the intelligent combat robots reach a satisfactory level of performance and maturity, they undergo validation and verification to ensure that they meet the specified requirements and standards. This involves comprehensive testing, documentation, and certification procedures to validate the system's effectiveness and safety.
10. **Deployment and Operationalization**: Finally, successful intelligent combat robots are deployed for operational use in military missions. Continuous monitoring, maintenance, and updates are performed to ensure ongoing performance, adaptability, and relevance to evolving operational needs.

Throughout the experimentation and working methodology, collaboration between researchers, engineers, military personnel, and other stakeholders is essential to ensure that the developed intelligent combat robots meet the requirements and effectively address the challenges of modern warfare. Additionally, adherence to ethical and legal principles is paramount to ensure responsible development and deployment of these advanced technologies.

III. MODELING AND ANALYSIS

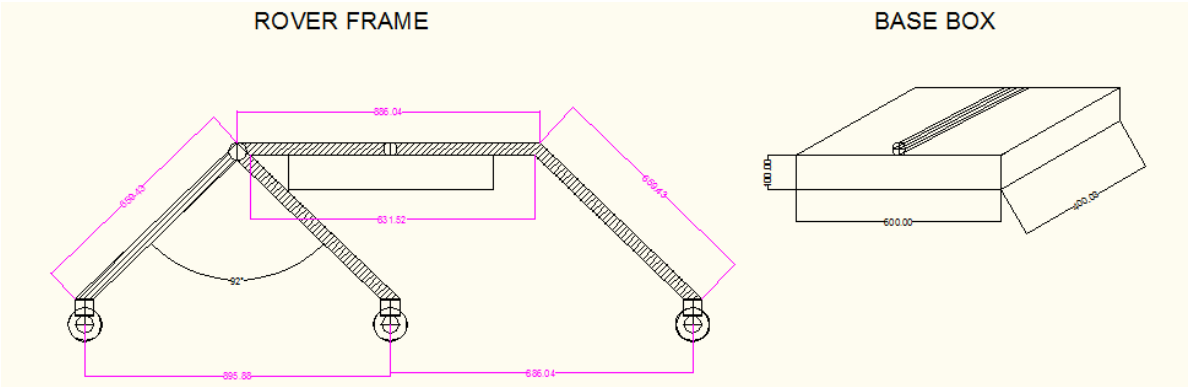

Figure 1: Body (CAD Model)

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Figure 2: Metal Body

IV. RESULTS AND DISCUSSION

The results and related to intelligent combat robots are likely to cover various aspects of their performance, capabilities, and implications. The discussions related to intelligent combat robots would be multifaceted, reflecting the complex interplay of technological, ethical, operational, and strategic factors involved in their development and deployment. These discussions are often informed by empirical data from field tests, simulations, and experiments, as well as theoretical frameworks from fields such as robotics, artificial intelligence, and military studies.

Figure 3:

V. CONCLUSION

The scrutiny of military surveillance robots, equipped with metal detectors, ultrasonic sensors, cameras, and laser sensors, reveals a comprehensive approach to navigation and threat detection. The amalgamation of sensors enhances adaptability and real-time responses. Challenges, including sensor integration complexities and power consumption, persist, suggesting the necessity for future research in innovative sensor technologies. This analysis underscores the potential for continuous progress in the realm of autonomous military robotics.

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