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IOT Based Delivery Robot

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ABSTRACT: The Semi-Automatic Delivery Robot is created to improve the efficiency of transporting materials in difficult and isolated areas, such as military logistics, Hospitals, schools, collage and supply operations. The Robot is Powred by a NodeMCU controller and integrated with the Blynk IoT cloud platform. Its mainly known for feature is an ESP32 Cam for live video streaming. The robot is furnished/deckout with a secure storage cabinet that can only be accessed using a PIN-operated keypad, for the the safety purpose to deliver the material.

This system, which is operated manually, is built for dependability and ease of use, without the inclusion of AI or autonomous features. The main goal is to offer an affordable, secure, and user-friendly solution for transporting/deliver the materials in dangerous or difficult-to-access locations like military camps. The robot showcases the potential of IoT-based systems to enhance logistics in specialized environments.

1.INTRODUCTION

In weapon industries and sectors like defense industrial based, efficient and secure transportation of materials is a critical need, particularly in remote or hazardous environments. Conventional manual handling methods often expose personnel to risks, while fully autonomous systems can be unaffordable and less adaptable to changing conditions.

The robot bridges this gap by combining the reliability of operator-controlled systems with the benefits of IoT-enabled technologies.

2.WORKING OF GESTURES

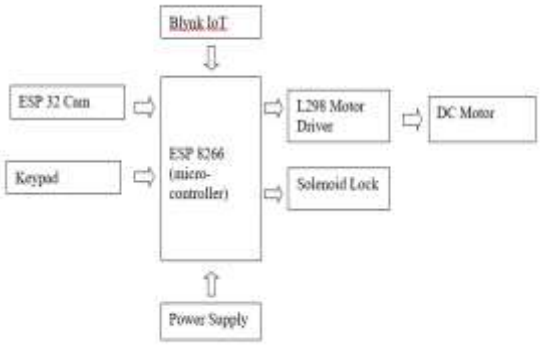
In an IoT-based delivery robot, gesture control will works by with the help of

sensors like cameras or depth sensors to detect hand movements, which are then translated into commands that control the robot's actions, like directing it to stop, go forward, turn, or wait, essentially allowing users to interact with the robot automatically through simple hand gestures without needing a physical controller; this data is typically transmitted wirelessly via an IoT network to the robot for execution.

3.HARDWARE COMPONENTS

- NodeMCU: Handles robot movement and communicates with the Blynk IoT cloud for remote control.
- Camera: ESP32 Cam: Provides live video streaming for real-time monitoring and navigation.
- Communication: Wi-Fi-based connectivity for seamless operation via the Blynk-IoT platform.
- Control Interface: Mobile app (Blynk) for manual control of movement and operation.
- Motors: DC Motors: Operated via an L298 motor driver for forward, backward, and directional movement.
- Power Supply: Rechargeable battery powering NodeMCU, ESP32 Cam, and motors.
- Payload Capacity: Designed to carry lightweight to medium loads (customizable based on application).
- Navigation: Fully manual navigation guided by live video feed; no autonomous features included.
- Frame: Lightweight yet robust chassis suitable for diverse terrains.
- Operation Range: Limited to the Wi-Fi range for communication with the Blynk app.
- Dimensions: Compact design for easy mobility in restricted or remote areas (customizable).

4.BLOCK DIAGRAM



5.WORKING

Control via Blynk App: The operator uses the Blynk app on a smartphone or tablet to control the robot.The app sends movement commands (e.g., forward, backward, left, right, stop) to the NodeMCU, which controls the motors via an L298 motor driver.

Vedio Streaming: The ESP32 Cam captures the robot's surroundings and streams live video to the operator.This allows precise manual navigation, especially in challenging or remote areas where visibility is limited.

Power Supply and Initialization: The robot is powered by a rechargeable battery connected to the NodeMCU and ESP32 Cam modules.On powering up, the NodeMCU connects to the Blynk IoT cloud via Wi-Fi, and the ESP32 Cam initializes for live video streaming.

6.APPLICATIONS

Military Material Handling: Transporting supplies, ammunition, or other materials in remote or high-security military areas, reducing human risk and ensuring secure delivery.

Rural Healthcare Support: Delivering medical supplies to rural or underserved areas, ensuring quicker access to healthcare resources.

7.CONCLUSION

IoT-based delivery robots are transforming the logistics and supply chain industry by enhancing efficiency, reducing costs, and improving sustainability. ✓ While challenges such as regulatory approvals, infrastructure limitations, and security risks remain, continuous advancements in AI, IoT, and automation will drive widespread adoption. ✓ As businesses look for innovative and cost-effective solutions, IoT-based delivery robots present a scalable and future-ready approach to modernizing delivery systems.

8.REFERENCES

- **Books & Research Papers: "Robotics: Control, Sensing, Vision, and Intelligence" by K.S. Fu, R.C. Gonzalez, and C.S.G. Lee**
  This book provides foundational knowledge of robotics, control systems, and sensor integration, which would be useful for understanding the system architecture and operation of the robot**.**
- **"Mobile Robotics: A Practical Introduction" by Ulrich Nehmzow**. This text offers an overview of mobile robotics, including motion planning, control, and robot localization. Relevant for understanding the manual control of the robot.
- **"Design of Autonomous Systems" by Andreas Biedenkapp and Alexander L. Thomas** A guide that explains autonomous control and communication between robots, which could help in the integration of manual control via IoT platforms like Blynk.
- **Journals & Articles: IEEE Robotics and Automation Magazine**
  A journal that covers a variety of articles on robotics, including delivery robots, autonomous systems, and semi-automatic control. This could provide case studies and insights into similar applications.
- **"Design of Semi-Autonomous Delivery Robots: A Review" - Journal of Robotics and Automation**
  A research paper that reviews semi-autonomous delivery robots, including manual control, navigation, and communication systems. It would be helpful for comparative analysis.

- **"IoT-based Control Systems for Mobile Robots" - International Journal of Robotics and Automation**
  Discusses the integration of IoT (e.g., Blynk) for mobile robot control, providing valuable insights into using platforms like NodeMCU in robotics projects.
- **Rural Healthcare Support:**
  Delivering medical supplies to rural or underserved areas, ensuring quicker access to healthcare resources.