Autonomous Delivery Robot

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Abstract: *The Autonomous Delivery Robot is designed with ESP32 Camera module to ensure the complete robotic working of the system. This robot is runs on the 4-wheel drive system and can fly over there with the help of long-range remote controller. The system contains a carrier which carry the packages in it that it can be opened by the recipient only. A delivery robot can be used in different settings such as food, package, medical as well as in hospitality industries also.*

Keywords: Camera Module, 4-Wheel, Fly, Remote Controller, Delivery

I. INTRODUCTION

In the delivery system an Autonomous Delivery Robot is a robotic equipment that provides the delivery services. A control server monitors and control the robot remotely in its way to delivery of packages. It is electrically powered motorized vehicle which can deliver item or packages to customers without interaction or interference of a delivery person.

This system is basically divided into two sections, the first section is drive by road and another is fly in the air. As its size is comparatively very small so that it uses the pedestrian paths while reaching the destination. If heavy traffics occurs on the road, it can also fly to get the destination in time or as early as possible. It is included with load carrier to carry the material safely & securely in its paths. Operator has the total view since the system is equipped camera in it. The delivery robot system is used to deliver the packages in food delivery, hospitality, medical industries, etc.

II. LITERATURE REVIEW

Sr. No.	Author	Paper Title	Year	Finding
1	Mohit mehndiratta, Erkan Kayacan, Erdal Kayacan	Aerial package delivery robot	2018	Developed a simple learning strategy-based feedback linearization control algo for the trajectory tracking of a highly nonlinear system.
2	Elsevier B.V., Miguel Figliozzia, Dylan Jennings	Autonomous delivery robots and their potential impacts on urban freight energy consumption and emissions	2019-20	Autonomous Delivery Robots used conjunction with mothership van to transport them to service areas.
3	Kai Feng1, Weixing Li1, Shengyang Ge1 and Feng Pan	Packages delivery based on marker detection for UAVs	2020	This paper designs and implements a simple and efficient UAV system for packages delivery.
4	Dylan Jennings1 and Miguel Figliozzi	Study of Sidewalk Autonomous Delivery Robots and Their Potential Impacts on Freight Efficiency and Travel	2019	Sidewalk autonomous delivery robots (SADRs) used in conjunction with vans to transport them to service areas could be a viable alternative to standard delivery vehicles

5	Md. Abid Hasan Shanto, Raian Islam, Murad Mehrab Abrar	Autonomous Delivery Robot to Prevent the Spread of Coronavirus in Product Delivery System	2021	Developed an autonomous package delivery robot prototype which can deliver up to 1KG of packages or products to a certain GPS location safely in a password protect container without any human contact.
6	Dylan Jennings1 and Miguel Figliozzi	Study of Road Autonomous Delivery Robots and their Potential Effects on Freight Efficiency and Travel	2020	Research has shown that road automated delivery robots have the potential to reduce delivery costs in many scenarios

III. METHODOLOGY

Block diagram
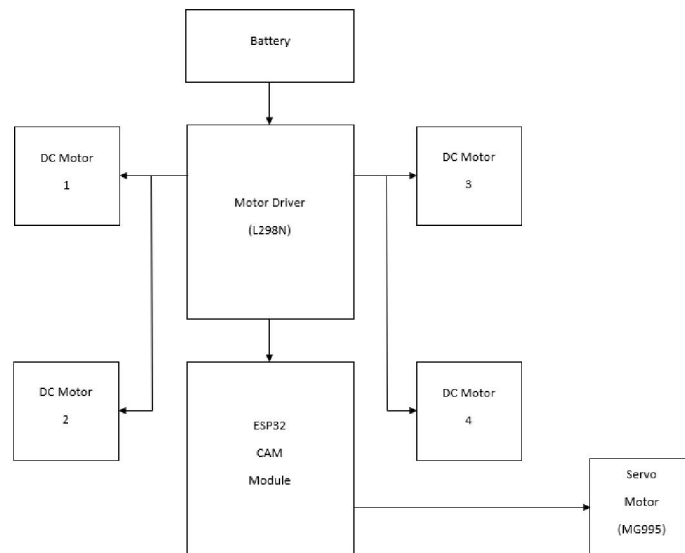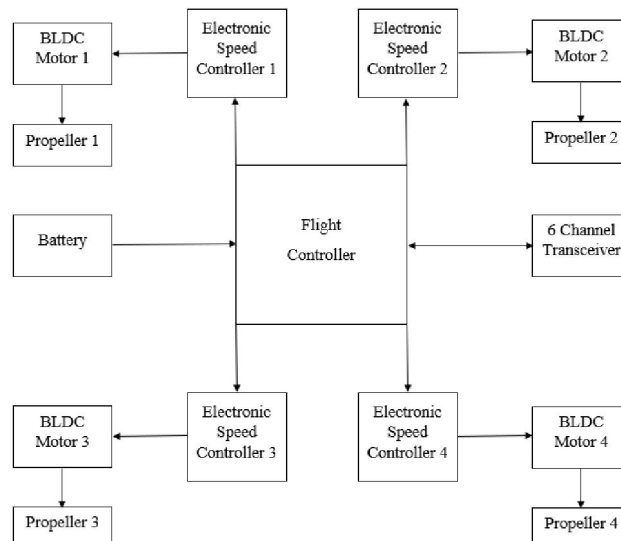

Figure 1. Delivery Robot Body block diagram

Figure 2. Drone Body block diagram

Algorithm

- Start
- Collect the delivery package for sender
- Heads towards the receiver's destination
- Monitor the way with the help of camera installed
- Reach the destination and indicate the receiver to receive the package
- Deliver the package and get back to original location
- End.

Flowchart
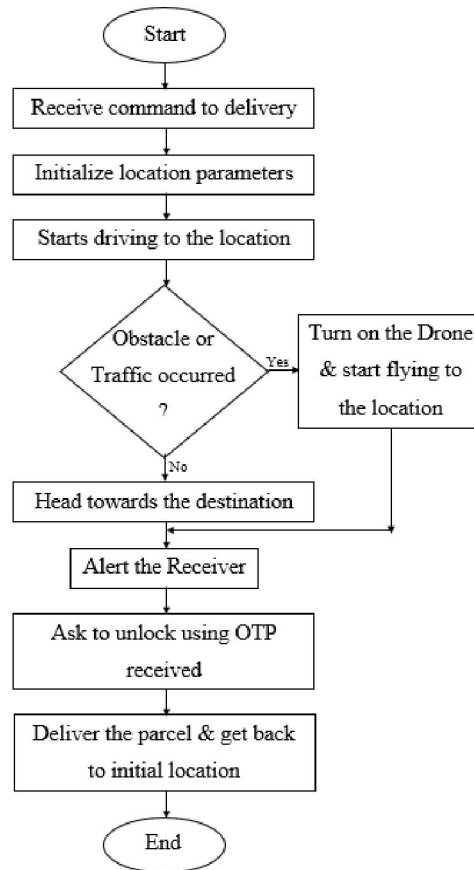
Hardware Details
Camera Module (ESP32)

The ESP32-CAM is a compact camera module designed for intelligent Internet of Things (IoT) applications, built around the ESP32 microcontroller. Equipped with an OV2640 camera and an onboard TF card slot, it can be used for a range of purposes, including uploading images for smart home devices, wireless monitoring, smart agriculture, QR code identification, and facial recognition. It is important to note that the module requires a 5V power source for programming, and a minimum input power of 5V 2A to ensure that water lines do not appear in the captured images.

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Motor Driver (L298N)

The L298N is an electronic component that can control high voltage and current. It is designed to work with things like motors, solenoids, and relays. It has two controls that can turn it on or off, even if there is no signal. It has a special feature that helps protect it from getting too hot. It can work with low voltage and high noise, and can handle up to 4 amps of electric current.

DC Motor (60rpm)

A DC motor is an electric motor that converts electrical energy into mechanical energy by utilizing the principle of Lorentz force. This principle states that a current-carrying object placed in a magnetic field experiences a force that is perpendicular to both the magnetic field and the direction of the current. DC motors consist of two main components: the stator and the rotor. The stator remains stationary, while the rotor rotates.

Servo Motor (MG995)

A servo motor is a type of motor that provides accurate control over angular or linear position, speed, and acceleration. It consists of a motor and a position sensor, which work together to provide precise positioning. To operate a servo motor, a specialized controller and a driver module designed specifically for use with servo motors are required. It's worth noting that servomotors are not a distinct category of motors, but rather a type of motor that provides superior control over position, speed, and acceleration.

BLDC Motor (1000kV)

The A2212 1000 KV BLDC Brushless DC Motor is a high-performance motor designed for quadcopters and multirotor. It has a 1000kV rating and is suitable for medium-sized quadcopters with 8–10-inch propellers. The motor features a steel design that can withstand competition conditions, a lightweight and compact size, and a smooth throttle response. It comes with an integrated prop adapter and aluminum mount, and can be used with the F450 quadcopter frame and 30A ESCs.

Electronic Speed Controller (30A)

The electronic speed controller (ESC) is a crucial component of an electric motive force system's hardware. It performs like the brain of the system by describing the motor and how fast it got placed on the data signals it accepts against the throttle controller. For compact applications such as drones and RC vehicles, this controller has the name "ESC," since for bigger producing applications it may be called an electronic control unit or inverter.

Flight Controller (KK2.1.5)

The flight controller is the brain of the drone, it commands the motors and ESCs in the drone. It is an electronics board on which sensors, processors, communication protocols, and carrier pins are assembled. Each & every component of the drone is composed of a flight controller. It drives the drone by varying the RPM of the motors.

Battery

Nine-volt batteries supply 9 volts. They come in different sizes and capacities. These batteries have a rectangular shape with snap connectors. These batteries are widely used. They power smoke detectors, clocks, and toys. It is important to use the correct battery for safety. The voltage supplied by a nine-volt battery is suitable for many household items. The batteries are easy to find and purchase. Always check which battery a device needs to avoid damage.

IV. RESULT & DISCUSSION

The application will be very economical with respect to environment in the sense that small cargo vehicles will reduce pollutions.

This application helps to increase the automation in the delivery industry such that it has a lot of future scope.

Delivery will be very safe and without involvement of any human being directly.

This application also consumes the less power supply then it also helps to energy conservation.

This various application increases surety and decrease the fraud levels.

V. CONCLUSION

We are developing an autonomous package delivery robot prototype which can deliver up to 1KG of packages or products to a certain GPS location safely in a password protected container without any human contact. The results show that our robot ensures the package protection and transportation, maintaining a 100% accurate password protected delivery

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