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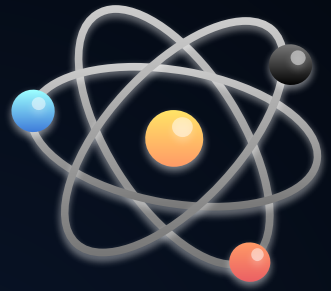
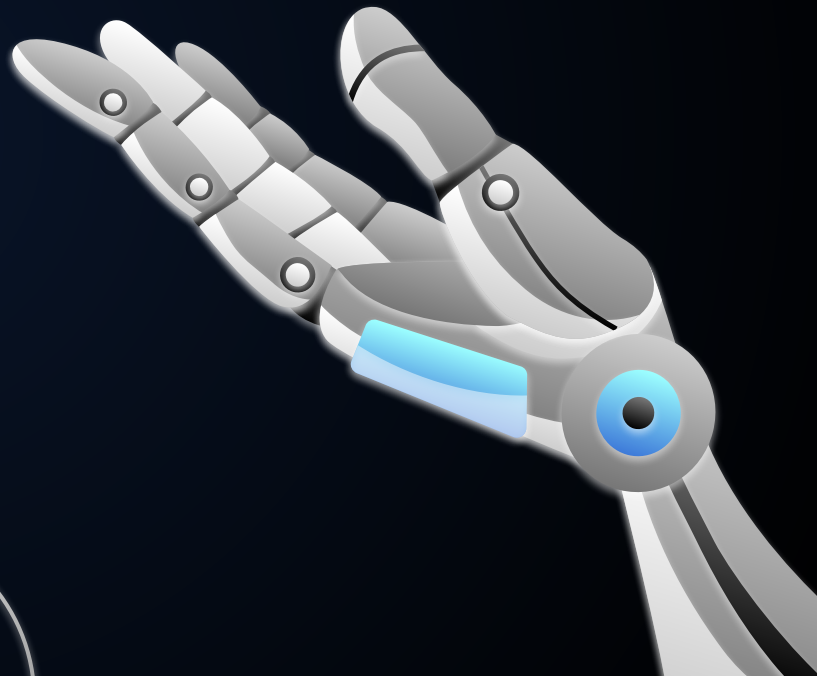
TEAM PUSHPAK

An innovative solution for automated delivery





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INTRODUCTION

Pushpak Rover is a semi-automated parcel delivery robot designed to enhance convenience and efficiency on campus. It autonomously transports parcels using sensors and a guided path, reducing human effort and improving delivery reliability.

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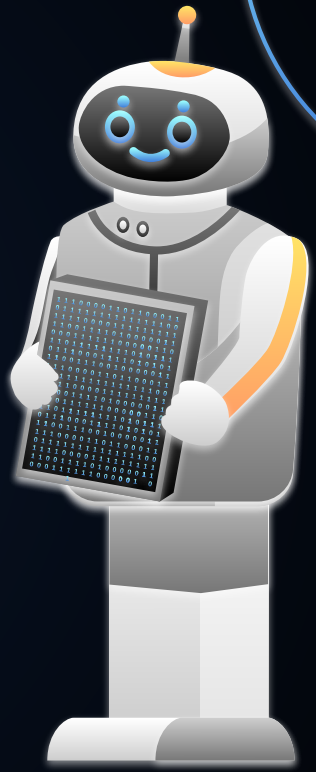
PROBLEM VS SOLUTION

PROBLEM

Currently, any kind of parcels ordered by students or faculty using the college address are delivered to the campus main gate. The parcels have to be collected in person by going to the main gate to collect their parcels from the delivery person.

This system has certain flaws:

- The recipient's physical effort is wasted in walking long distances (often from hostels to the main gate).
- Valuable time has been wasted on this task instead of spending it on something productive.



SOLUTION

AUTOMATED PARCEL DELIVERY

Pushpak Rover eliminates the need for recipients to walk long distances.

GPS TRACKING

Users can track the rover's live location for convenience

LINE FOLLOWING SYSTEM

The rover autonomously follows a white line along the road for accurate navigation.

TIME-SAVING & EFFORTLESS

Reduces physical effort and allows recipients to focus on other tasks.

3 COMPONENTS USED

MICRO-CONTROLLERS

- ESP8266 [For GPS control and data transfer.]
- Arduino MEGA [For motor drivers & sensor feedback]
- GPS Module NEO 6M
- Motor Driver L298 - 2 No.s [power control]

SENSORS

- IR Sensor - 2 No.s [white-line follower]
- Ultrasonic Sensor [Proximity Sensor]

BATTERIES

- Rechargeable Li-ion battery (3.7V) - 6 No.s [motor power]
- 9 V battery [for Arduino]

BASE

- DC Motors - 4 No.s [500 rpm]
- Wooden Plank [chassis]
- Wheels - 4 No.s

4

MILESTONES

MILESTONES

PHASE 1

PLANNING & DESIGN

Project requirements were defined, and the design was finalized.

PHASE 2

CHASSIS CONSTRUCTION

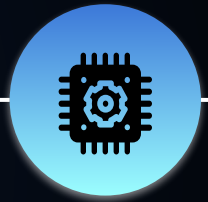
The rover's frame and parcel compartment were built.

PHASE 3

CIRCUIT CONNECTIONS

Sensors, motors, and other electronics were wired and integrated.

PHASE 4



MICROCONTROLLER CONFIGURATION

The microcontrollers were programmed for navigation and control.

MILESTONES

PHASE 5

SOFTWARE DEVELOPMENT

Navigation, GPS tracking, and automation were implemented.

PHASE 6

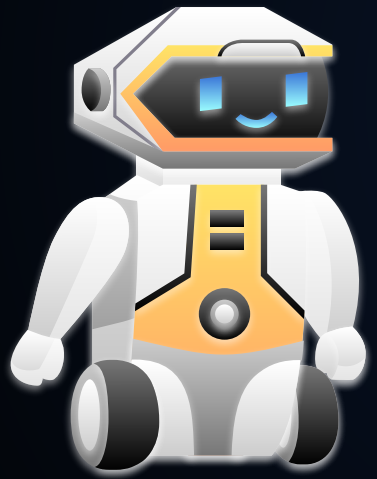
WEBSITE INTEGRATION

A web platform was linked for real-time tracking and booking the rover

PHASE 7

TESTING & OPTIMIZATION

The rover was tested, and improvements were made.



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SUB-SYSTEMS

SUB-SYSTEMS

C CONTROL SYSTEM

- **Microcontrollers (Arduino MEGA & ESP8266)** – The Arduino MEGA processes sensor feedback and controls motor power, while the ESP8266 manages GPS functionality and transmits data via Wi-Fi.
- **L298 Motor Drivers** – Controls the DC motors by adjusting the power supply for smooth and precise movement.
- **Control Logic** – The system processes sensor inputs to determine speed, direction, and obstacle avoidance strategies.
- **Power Management** – The Arduino MEGA manages the motor drivers to ensure efficient power distribution and prevent overload.

SUB-SYSTEMS

N NAVIGATION SYSTEM

- **Line-Following Mechanism** – Uses IR sensors to detect and follow the white road marking for path guidance.
- **Obstacle Detection** – Ultrasonic sensors identify obstacles and halt the rover to prevent collisions.
- **GPS Tracking** – Provides real-time location updates for users to monitor the rover's movement.
- **Path Correction** – Adjusts motor speeds to stay aligned with the path in case of minor deviations.
- **Autonomous Navigation** – The system processes sensor inputs to move towards the destination without manual intervention.

SUB-SYSTEMS

T

TRACTION SYSTEM

- **DC Motors (Geared)** – Provide controlled movement with sufficient torque for smooth operation.
- **L298 Motor Drivers** – Regulate power supply to the motors for precise speed and direction control.
- **Wheels & Grip** – Designed to ensure stability and traction on different surfaces.
- **Load Capacity** – Supports up to 2kg, balancing weight distribution for efficient movement.
- **Turning Mechanism** – Achieved by varying the speed of the wheels; one wheel slows down or stops while the other continues moving.
- **Power Efficiency** – Optimized motor performance to reduce battery consumption while maintaining stability.

SUB-SYSTEMS

P

POWER SYSTEM

- **Rechargeable Li-ion Batteries** – Serve as the primary power source for the rover.
- **Voltage & Configuration** – Each cell provides 3.7V, with a total system voltage of 12V for efficient operation.
- **Power Distribution** – The Arduino MEGA regulates power to motors, sensors, and other components.
- **Charging Mechanism** – Supports recharging for sustained usage and minimal downtime.
- **Energy Optimization** – Efficient power management ensures longer battery life and stable performance.

SUB-SYSTEMS

UI

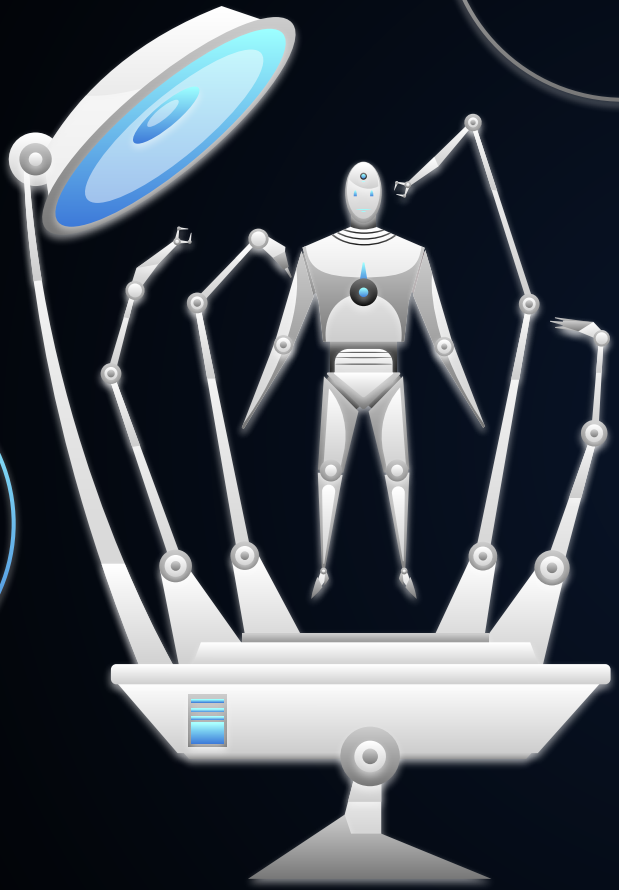
USER INTERFACE(DASHBOARD)

- **Web-Based Dashboard** – Displays real-time rover data in a user-friendly interface.
- **Live Tracking** – Shows the current location of the rover using GPS.
- **Occupancy Status** – Indicates whether the rover is occupied or unoccupied.
- **Queue System** – Allows users to schedule package deliveries efficiently.

6 FUTURE IMPROVEMENTS

The current Pushpak Rover model being a basic prototype due to budget and time constraints, has substantial scope for improvements in the future.

- **Hardware improvements:** The current processors and sensors have limited capabilities. LiDAR sensors and cameras may be used in conjunction with an AI model running on a Raspberry Pi 5 for advanced navigation and obstacle detection systems.
- **Electro-Mechanical improvements:** More powerful motors and batteries can be added for bigger load capacity and faster delivery.
- **Safety improvements:** The parcel compartment can include a lock which can be unlocked using a pin,sent to the user as an OTP.



THANKS!

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