Autonomous Vehicle and Robotic Assistant System

Project Topic:

Autonomous Vehicles and Robotics

Problem Statement

As cities grow more congested and transportation needs expand, there is increasing demand for efficient, safe, and intelligent mobility solutions. Traditional vehicles are heavily dependent on human control, prone to accidents, and can be inefficient in terms of fuel and traffic management. Meanwhile, various industries are seeking robotic systems to streamline logistics, improve delivery services, and enhance operational efficiency.

The challenge is how to integrate autonomous vehicles and robotics to create a safe, responsive, and intelligent transportation and assistance system that reduces human error, enhances mobility, and supports smart infrastructure.

Target Audience

- Urban commuters in need of safer, more efficient travel options
- Logistics companies aiming to automate last-mile delivery
- Smart city developers and planners
- Elderly or disabled individuals needing mobility assistance

Objectives

- To design an AI-based autonomous driving and robotic system capable of navigating environments safely
- To enhance delivery and transportation using robotic technologies
- To reduce traffic congestion and human errors in driving

- To create a user-friendly interface for managing and monitoring the system

Design Thinking Approach

Empathize:

Many individuals experience challenges with traffic, road safety, and mobility limitations. Logistics companies struggle with rising costs and workforce shortages. Understanding these pain points helps in developing a robotic system that is adaptable, reliable, and easy to use.

Key User Concerns:

- Trust in autonomous driving decisions
- Safety of robotic and vehicle interactions with humans
- Ease of control and monitoring
- Compatibility with urban infrastructure

Define

The system should autonomously navigate, detect obstacles, and interact with the environment using sensors and AI. It should assist with transport, delivery, or mobility tasks, adapting to dynamic conditions in real-time.

Key Features Required:

- Sensor fusion and real-time decision-making using AI
- Robust obstacle detection and collision avoidance
- GPS and mapping for accurate route planning
- Dashboard or app interface for users to monitor and interact with the vehicle/robot

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Ideate

Potential solutions may include:

- A self-driving delivery robot capable of urban navigation
- An AI-based car assistant for autonomous navigation and traffic adaptation
- A robotic wheelchair for elderly or disabled individuals, capable of mapping environments and avoiding obstacles

Brainstorming Results:

- A compact delivery robot for last-mile services
- A mobile assistant robot that guides people through buildings or cities
- An AI assistant in vehicles that can communicate with traffic lights or other vehicles for optimal routing

Prototype

Developing a robotic system with autonomous navigation for specific use cases (e.g., delivery or personal mobility):

Key Components of Prototype:

- LIDAR and camera-based vision systems
- AI module for environment interpretation and decision-making
- Electric motor system for movement
- User interface on mobile or web for control and feedback

Test

The prototype will be tested in a controlled environment with users from the target audience (e.g.,

commuters, logistics professionals). Feedback will help improve navigation, reliability, and user interaction.

Testing Goals:

- Measure trust in autonomous navigation
- Validate accuracy in object detection and response
- Assess usability of the user interface