**Project Overview**

The Autonomous Electric Delivery Vans (AEDV) System was developed for the System Analysis course under Dr. Larry Hughes at Dalhousie University. The project's primary objective was to create an advanced software solution to control AEDVs for optimized navigation and delivery within a dynamically changing city environment. This project aimed to demonstrate how autonomous technology can revolutionize urban logistics by enhancing efficiency, reducing ecological impact, and improving overall service reliability.

To achieve these objectives, the project incorporated stringent rules and clear expectations:

1. **Optimized Navigation**: The system was designed to handle real-time changes in the cityscape, such as accidents, construction, and other disruptions. Although dynamic routing was not fully completed, the foundation for managing these changes was established.
2. **Efficient Pickup and Delivery**: Emphasis was placed on supporting logistics operations while considering vehicle load capacities and energy efficiency. This ensures that the AEDVs can effectively manage deliveries, even under varying conditions.
3. **Comprehensive Charging Management**: The system included provisions for managing AEDV battery levels to prevent operational downtimes. While a complete solution for charging infrastructure was not fully implemented, the groundwork for this critical functionality was laid.
4. **Billing System**: The software aimed to utilize customer numbers for accurate transaction processing based on factors such as weight, route, and energy consumption. Although this feature was not developed within the project timeframe, it remains a key consideration for future development.
5. **Traffic and Accident Management**: The system was expected to enforce traffic rules prioritizing street over avenue traffic, managing intersections efficiently, and minimizing collision risks. Procedures for dispatching recovery vehicles and handling undelivered goods were outlined, though not fully developed, to ensure comprehensive accident management.

## **Assumptions & Constraints**

**Assumptions**

1. **Single Entry Point for Intruders**: For testing and design purposes, it is assumed that intruders will enter the vehicle through only one entry point at a time.
2. **Constant City Grid**: The city grid, including avenues, streets, and buildings, remains consistent in layout, with only temporary changes due to dynamic events such as construction or accidents.
3. **Battery Performance**: The 150-kWh battery will perform consistently under varying loads and conditions within the expected operational parameters.
4. **Standardized Customer Transactions**: Customer transactions will be processed uniformly, based on predefined criteria for weight, route, and energy consumption.
5. **Real-Time Data Availability**: The navigation system will have access to real-time data on cityscape changes to make routing decisions.

**Constraints**

1. **Time Limitations**: The project faced strict deadlines, resulting in incomplete features such as dynamic routing, comprehensive charging solutions, and a fully developed billing system.
2. **Resource Limitations**: Limited by the available technology and hardware, which affected the scope and implementation of some functionalities.
3. **Energy Management**: Full energy management strategies were not implemented, impacting the ability to maximize delivery range and minimize downtime.
4. **Accident Management Protocols**: Detailed protocols for accident management, including collision recovery and handling undelivered goods, remain incomplete.
5. **Dynamic Routing**: The dynamic routing feature, essential for real-time navigation adjustments, was not completed due to time constraints.
6. **Regulatory Compliance**: The system must comply with city traffic rules and regulations, which may change and impact AEDV operations.
7. **Battery Charging Infrastructure**: The existing infrastructure for charging stations is limited and may require expansion based on operational feedback.
8. **Billing System**: A comprehensive billing system for transaction processing based on weight, route, and energy consumption was not developed, affecting customer interaction and transaction accuracy.

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### Rules

Functionalities and Implementation

Navigation

Real-Time Adjustments: The navigation system is designed to handle real-time changes in the cityscape, such as accidents or construction.

Note: Dynamic routing remains incomplete.

Pickup and Delivery

Logistics Support: The system supports logistics operations with considerations for weight and energy efficiency.

Charging Stations

Battery Management: Intended to manage AEDV battery levels to prevent depletion.

Note: Comprehensive charging solutions were not fully implemented.

Billing System

Transaction Processing: Utilizes customer numbers for billing based on weight, route, and energy consumption.

Note: The billing system was not developed.

Challenges and Solutions

Energy Management

Efficiency Strategies: Implemented strategies to maximize delivery range and minimize downtime.

Note: Full energy management strategies were not completed.

Accident Avoidance

Collision Minimization: Designed systems to reduce collisions and manage recovery operations post-accident.

Note: Accident management protocols remain incomplete.  
  
  
  
  
  
  


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