SHRI G. S. INSTITUTE OF TECHNOLOGY & SCIENCE,INDORE

DEPARTMENT OF COMPUTER ENGINEERING

SUBJECT - MAJOR PROJECT PLANNING

CODE - 34999

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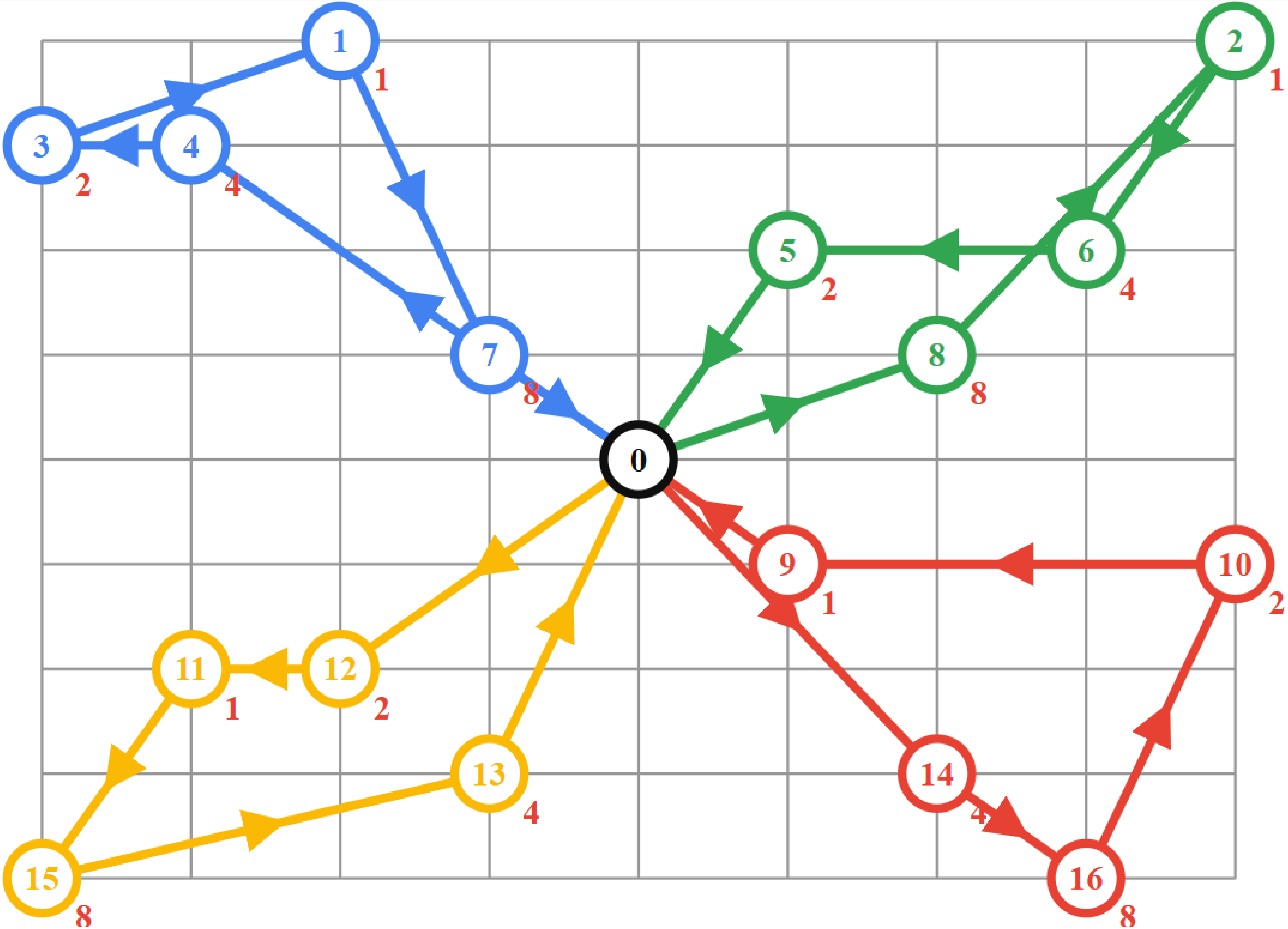
TITLE

ABSTRACT

Creating a real-time route optimization system for deliveries that updates routes dynamically based on traffic, weather, road closures, and vehicle capacity limits.

It directly applies to industries like e-commerce, food delivery, waste collection, courier services, etc.

Real-World Impact and incorporating real-world constraints: Optimizing delivery routes saves costs, reduces fuel consumption, and improves efficiency—critical for any logistics business.



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KEY OBJECTIVES

- **Route Optimization** : Optimize delivery routes considering vehicle capacity, traffic, and weather conditions.
- **Minimize**: Minimize travel time, fuel consumption, and costs.
- **Real Time Update** : Provide real-time dynamic re-routing based on updated conditions.

MAIN OUTCOMES

- Reduction in delivery time, fuel consumption, and operational costs.
- Scalable solution to handle multiple vehicles and large datasets.

CHALLENGES

The CVRP is computationally intensive, especially for larger datasets, as it is an NP-hard problem

ASSUMPTIONS

- Start with smaller datasets (e.g., 10–50 destinations and 2–5 vehicles)

INTRODUCTION

BACKGROUND AND CONTEXT

Existing delivery route systems fail to adapt to real-time conditions, leading to inefficiencies.

Vehicle capacity constraints are often neglected, resulting in overloading or underutilization of vehicles.

MOTIVATION

Logistics companies need efficient, real-time solutions that take into account capacity limitations, delivery deadlines, traffic, and weather to optimize routes.

OBJECTIVES AND SCOPE

- Incorporate real-time traffic, weather, and road closures.
- Ensure vehicle capacity constraints are respected in **route optimization**.
- Implement dynamic re-routing based on **real-time updates.**
- Application provide a user **friendly interface** for user .

LITERATURE REVIEW

RELATED WORK

Existing studies focus mostly on static route planning, with little attention to real-time adjustments that consider vehicle capacity and external factors. There is a need for systems that use real-time data to dynamically update routes.

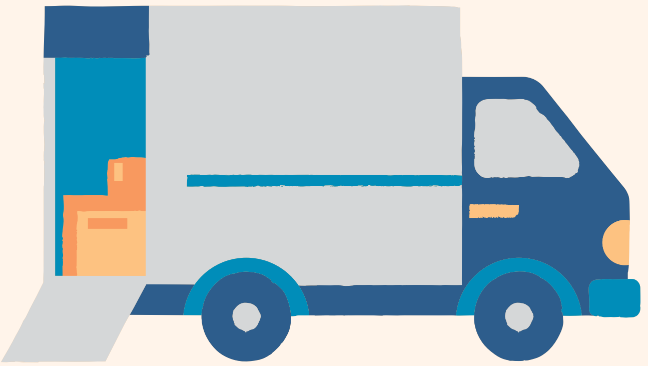
GAPS IN THE EXISTING KNOWLEDGE

Lack of systems that integrate real-time data and vehicle capacity constraints for dynamic route adjustments.

PREVIOUS RESEARCH AND PROJECTS

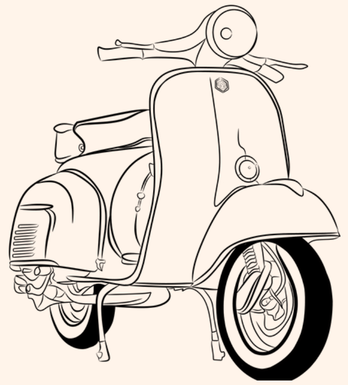
Google Maps:

Google Maps provides route planning with traffic updates but is designed for personal use. It does not consider vehicle capacity or logistics needs.



Fleet Management Systems:

These tools help businesses manage vehicles and routes but don't handle real-time changes or vehicle capacity.



Specialized Delivery Platforms

Designed for courier services, they optimize routes for deliveries but aren't flexible for other industries.

PREVIOUS RESEARCH AND PROJECTS

Delivery Circle

Loop

MULTIPLE PROPOSED APPROACHES

1. **Heuristic-Based Optimization**:

   Use algorithms like nearest neighbor or genetic algorithms for quick, approximate solutions.

2. **Real-Time Traffic Data Integration:**

   Adjust routes dynamically based on live traffic conditions.

3. **Machine Learning for Predictive Routing**: .

   Use historical data and AI to predict optimal routes over time

4. **Vehicle Capacity Considerations**: .

   Optimize routes based on vehicle load and capacity.

PROPOSED SOLUTION

Real-time Traffic Data

The solution incorporates real-time traffic data from various sources to adjust routes dynamically.

Personalized Route Preferences

Allow users to set personal preferences, such as scenic routes, avoiding highways, or prioritizing toll-free roads.

Route Optimization for Diverse Vehicle Types

Optimize routes based on vehicle type (e.g., electric vehicles, trucks, motorcycles) and their unique needs (charging stations, road restrictions).

Advanced Algorithms

The solution uses sophisticated algorithms to calculate the most efficient routes based on multiple factors.

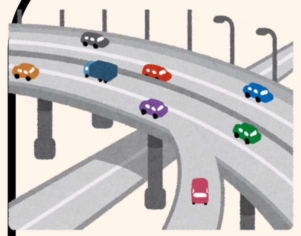
Improvement UI Interface

Make your UI responsive using CSS frameworks like Bootstrap or Tailwind CSS to ensure the app looks great on any device (desktop, tablet, mobile).

Multiple Language Support

Mention that the website detects the user's language preference based on their browser settings and automatically adjusts content accordingly.

KEY FEATURES OF THE PROPOSED SOLUTION



Dynamic Routing

Routes are adjusted in real-time based on traffic conditions, road closures, and other factors.

Multi-stop Optimization

The solution optimizes routes for multiple delivery points, ensuring efficient delivery sequences

Vehicle Capacity

The solution takes into account vehicle capacity and optimizes routes to avoid overloading

Delivery Time Windows

The solution considers time constraints and ensures deliveries within specified time windows

BENEFITS OF THE PROPOSED SOLUTION

Reduced Costs

Reduced fuel consumption, fewer delays, and optimized route planning lead to cost savings.

Enhanced Customer Satisfaction

Predictable delivery times, reliable service, and improved communication lead to higher customer satisfaction.

Sustainability

By optimizing routes and reducing fuel consumption, the solution minimizes carbon emissions, contributing to environmental preservation .

Improved Efficiency

Faster delivery times, improved vehicle utilization, and enhanced operational efficiency.

PROBLEM STATEMENT

How might we develop a delivery system that dynamically adjusts routes in real-time based on factors like traffic, weather,road conditions and live updates, while also accounting for vehicle capacity and delivery time windows?

METHODOLOGY

1

Requirements Gathering

Thorough analysis of user needs, identifying specific requirements

2

System Design

Developing a system architecture that includes a user interface, data storage, Algorithums.

3

Implementation

Coding and testing the application, ensuring its functionality, scalability, and reliability

4

Evaluation & Refinement

Conducting rigorous testing and evaluation to identify areas for improvement

SURVEY

SANCHI

MANGLIYA FACTORY

PLAN OF ACTION

- **Data Collection**: Integrate APIs for real-time data: Google Maps (traffic), OpenWeatherMap (weather), and HERE (road conditions).
- **Optimization**: Use a metaheuristic algorithm to minimize travel time, fuel costs, and ensure vehicle capacity constraints.
- **Dynamic Re-Routing**: Fetch new data periodically and adjust the routes based on real-time changes (e.g., traffic, road closures).

ALGORITHM DESIGN

Constraints:

- **Vehicle capacity** (ensure no vehicle is overloaded).
- **Delivery time windows** (deliveries need to meet specific time frames).
- **Traffic and weather delays** (consider real-time updates).

Objective:

Minimize travel time and fuel costs while respecting the delivery constraints.

TOOLS & TECHNOLOGY

- **Backend Development**: Python (Flask/Django)
- **Frontend Development**: React.js
- **Database** : MongoDB or Firebase for real-time updates
- **Algorithms**: Google OR-Tools, Algorithms like Genetic Algorithm or Simulated Annealing

PROJECT TIMELINE

- Weeks-2 : Data gathering and integration (APIs).
- Weeks-4: Algorithm development
- Weeks-5: Frontend and UI development
- Weeks-6: Testing, deployment, and performance evaluation.

EXPECTED OUTCOMES

- **Optimized Routes**: Real-time routes adjusted based on current traffic, weather, and vehicle capacity.
- **Reduced Costs**: Lower fuel consumption and fewer missed delivery windows.
- **Scalable Solution**: Able to handle large datasets and multiple vehicles.

IMPACT

The solution will simplify delivery operations, increase customer satisfaction by ensuring timely deliveries, and lower operational costs for logistics companies.

RESOURCES REQUIRED

Software : Google Maps API, OpenWeatherMap API, HERE API, Python (Flask/Django), React.js, MongoDB.

Hardware: Cloud hosting for scalability (AWS, Google Cloud).

Budget : API subscription costs, cloud service expenses.

REFERENCES

- Google OR-Tools, https://developers.google.com/optimization.
- D.E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, 1989.
- OpenWeatherMap API, https://openweathermap.org/api.
- HERE Routing API, https://developer.here.com.

THANK YOU