**City Navigation and Emergency Route Planning Tool**

**Group Project 2**

**Advanced Algorithm Section 4 Fall 2023**



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Table of Contents

Abstract ……………………………………………………………

Introduction ………………………………………………………..

Roles and Responsibilities …………………………………………

Methodology ……………………………………………………….

Implemented Algorithm …………………………………………..

GUI Design …………………………………………………………

Visualization ………………………………………………………..

Testing ………………………………………………………………

Challenges Faced ……………………………………………………

Conclusion …………………………………………………………..

References ……………………………………………………………

ABSTRACT

A team of eight professionals has joined forces to develop a city navigation tool with a specific focus. This tool harnesses the Floyd-Warshall algorithm to pre-calculate the shortest routes connecting essential landmarks or central hubs within a city. The primary aim of this project is to assist in emergency route planning, ensuring that emergency responders can swiftly identify and employ the most efficient paths, even when certain roads may be obstructed or inaccessible. The team is structured into five distinct roles, each with its own set of responsibilities.

The team followed a set of key rules to ensure the successful completion of the city navigation project:

1. The team successfully provided regular updates and maintained effective communication throughout the project to ensure alignment.
2. An interactive GUI has been developed to make the tool more user-friendly and visually more appealing and easy to understand.
3. The team used various tools like leaflet.js , React js , OpenStreetMap to integrate real-world data for developing the navigation tool .
4. The group has implemented various innovative features like custom place selection, multiple path options, accident / blockage reporting and support for use on mobile phones.
5. Thorough documentation has been completed, detailing the code, processes, individual roles, and outcomes, as well as a concise overview of the tool's features.

Through collaborative teamwork and a steadfast commitment to our goals, our "City Navigation Tool" has become a valuable resource for emergency responders, helping them plan efficient routes even when faced with roadblocks or inaccessible routes. With the project, emergency responders can now navigate environments more effectively and efficiently, enhancing their ability to respond to critical situations.

INTRODUCTION

The 'City Navigation Tool' project is an innovative initiative with a primary focus on navigation while fostering the scalability for further integration tools as part of effective navigation solutions. This project transcends the mere creation of a navigation tool; it aims to harness innovative solutions to elevate emergency route planning, teamwork, and our collective problem-solving abilities.

The project is driven by the mission to enhance response capabilities through efficient route planning and providing the best possible solution for navigation. By implementing the Floyd-Warshall algorithm to pre-calculate optimal routes between key landmarks or hubs, we provide users with a valuable tool that can transform critical situations.

The scope of this project extends well beyond the realm of navigation services. It offers a platform for hands-on learning and skill development. Our challenge lies in designing a user-friendly interface that accommodates various input scenarios, requiring us to bridge the gap between technical complexity and user simplicity. This intuitive interface sharpens our creative problem-solving skills and strengthens our ability to convey complex ideas effectively.

Furthermore, this project underscores the significance of data visualization and tool integration, a highly versatile skill with applications across diverse fields. Through various open-source tools, we were able to achieve an efficient routing tool with best user experience in mind.

Moreover, collaboration within our team is fundamental to achieving the project's success. It facilitates effective communication and enhances our teamwork skills, emphasizing the vital role of collective effort in attaining our objectives. The 'City Navigation Tool' project goes beyond navigation; it embodies innovation, learning, and the pursuit of excellence within a real-world context.

ROLES AND RESPONSIBILITIES

# GUI Developer

* Conceptualize and design the layout and visual elements of the tool.
* Develop an interactive interface that enables users to input data and choose sorting algorithms effortlessly.
* Ensure consistency in design elements and adhere to the project's overall aesthetic.

# Algorithm Specialists and Testing

* + Optimize algorithms to solve complex problems or perform specific tasks as required by the project.
  + Test and validate algorithms to ensure they produce accurate and reliable results and make necessary adjustments as needed.
  + Build CI/CD workflow that automates the process of building code changes, and testing them, enabling faster and more reliable software releases.

# Documentation and Presentation

* + - Project Documentation: Thoroughly document the project's codebase, including comments, explanations, and usage instructions.
    - Presentation Design: Design an engaging and informative presentation that effectively communicates the project's features, functionalities, and achievements.
    - Demonstration: Conduct a live demonstration during the presentation, highlighting how users can interact with the tool and interpret visualizations.
    - Conclusion: Summarize the project's objectives, achievements, and the skills acquired by the team.

# Data Visualization

* + - * Understand algorithm complexity.
      * Collect and prepare data.
      * Design effective Matplotlib visualizations.
      * Code and implement visualizations.
      * Customize visualizations for the tool's needs.
      * Integrate visualizations into the tool's interface.
      * Optimize performance for large datasets.
      * Document on how to interpret visualizations.
      * Test and validate visualizations.
      * Incorporate user feedback for improvements.

METHODOLOGY

Within the framework of our navigation project, named the "City Navigation Tool," we have diligently established a systematic and well-organized development approach. Each team member has been entrusted with specific roles and responsibilities. The following section outlines our methodology, the tools we have utilized, and the technologies incorporated throughout the project:

IMPLEMENTED ALGORITHM