MINOR-1 PROJECT

SYNOPSIS REPORT

For
Electric bus routing and fare optimization system

Submitted By

Name	SAP ID	Specialization
Aryan Mehta	500093629	CCVT
Dhruv Srivastava	500092009	DevOps
Nikhil Rawat	500092003	CCVT
Parth Rawat	500091983	CCVT

Department of Systemics

School Of Computer Science

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

DEHRADUN- 248007 Uttarakhand

Dr. Keshav Sinha
Project Guide

Dr. Hitesh Kumar Sharma
Cluster Head

School of Computer Science
University of Petroleum & Energy Studies, Dehradun

Synopsis Report

1. Project Title

Eco Trav: Electric bus routing and fare optimization system

2. Abstract

The "Eco Trav" project is a novel approach to electric bus routing and fare optimization to provide efficient and eco-friendly urban transportation solutions. The project focuses on utilizing fundamental data algorithms, specifically Dijkstra's algorithm and Ant Colony Optimization, to develop an intuitive and user-friendly system for commuters to navigate electric bus routes while minimizing travel time and cost. By combining graph theory and optimization techniques, the project aims to create a basic yet effective tool for urban commuters seeking the most optimal routes for their journeys.

The heart of the "Eco Trav" system lies in the utilization of Dijkstra's algorithm to calculate the shortest paths between source and destination nodes within an electric bus network graph. This algorithm, well-suited for finding the shortest path in a weighted graph, forms the backbone of the routing component of the system. Additionally, the project employs the Ant Colony Optimization algorithm to introduce a novel element of route optimization, simulating the foraging behavior of ants to find optimal routes that balance efficiency and exploration.

3. Introduction

In the rapidly evolving urban landscape, the need for sustainable and efficient transportation solutions has become more pressing than ever before. As cities grapple with increasing traffic congestion, environmental concerns, and the demand for eco-friendly commuting options, innovative approaches are required to address these challenges. The "Eco Trav" project represents a fundamental yet impactful step toward transforming urban transportation by harnessing the power of data algorithms to optimize electric bus routing and fare calculation.

The essence of the "Eco Trav" project lies in its commitment to simplicity and effectiveness. Rather than relying on complex technologies, the project embraces the principles of data algorithms, utilizing two distinct yet complementary algorithms - Dijkstra's algorithm and Ant Colony Optimization. These algorithms serve as the project's building blocks, paving the way for a refined system that guides commuters toward the shortest and most cost-effective electric bus routes.

Dijkstra's algorithm, a cornerstone of graph theory, is employed to find the optimal path between source and destination nodes in the electric bus network graph. By calculating the

shortest route Based on graph edge weights, the algorithm lays the foundation for efficient route recommendations. Alongside Dijkstra's algorithm, the project introduces a touch of innovation through Ant Colony Optimization. Inspired by the cooperative foraging behavior of ants, this algorithm fosters route optimization that strikes a balance between known efficiency and unexplored exploration.

While advanced technologies like cloud computing, AI, and databases are intentionally omitted from the project's scope, this decision accentuates the importance of core concepts. By focusing on data algorithms, the "Eco Trav" project underscores the significance of understanding the foundational principles that drive modern urban transportation systems.

The heart of the "Eco Trav" system lies in its potential to empower commuters with a streamlined interface that encourages eco-friendly choices. By offering commuters the shortest electric bus routes and corresponding fare estimates, the project supports the adoption of sustainable transportation practices. Through this commitment to basic data algorithms and optimization techniques, the "Eco Trav" project contributes to the ongoing discourse on sustainable urban mobility.

As the following sections elaborate on the design, methodology, and implementation of the project, it becomes evident that simplicity can maintain effectiveness. The "Eco Trav" project exemplifies the fusion of timeless algorithmic principles with contemporary transportation challenges, offering a glimpse into a future where sustainable urban commuting is guided by ingenuity, efficiency, and accessibility.

4. Literature Review

This project is about improving the route selection by the passengers, minimizing the cost factor, and determining the cost factor.
User satisfaction is a crucial indicator of public service quality, especially for those services considered basic necessities.
The time and cost-efficient features are to be implemented in order to get a good result.
Available Literature:
https://www.sciencedirect.com/science/article/abs/pii/030505487490046X

https://www.sciencedirect.com/science/article/abs/pii/S0967070X16304449

5. Problem Statement

Numerous issues, such as slowness, excessive expenses, and restricted accessibility, plague our city's current public transit system. We want to create a cutting-edge Economic Transport Bus System (ETBS) in order to address these problems and foster economic growth and sustainability.
We seek to address these issues by developing an Economic Transport Bus System that is affordable, effective, environmentally responsible, and open to all community members. This method would not only enhance the standard of living for our citizens but also help our city grow economically and sustainably.

6. Objectives

a) Cost Effective

b) Eco-Friendly

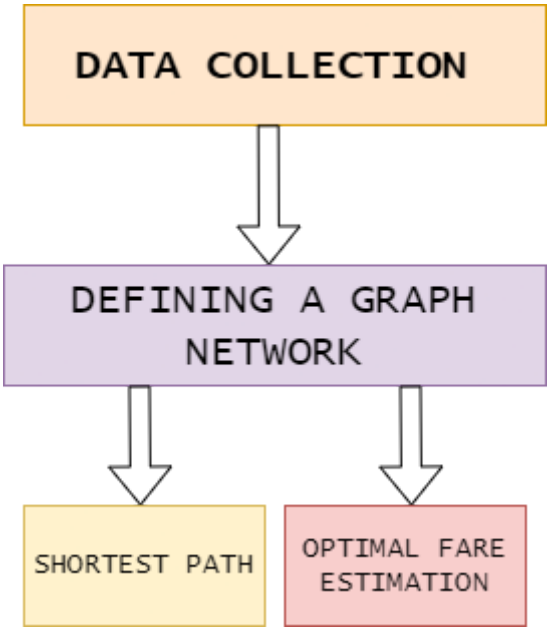
c) More use of public transport

d) Increase Accessibility

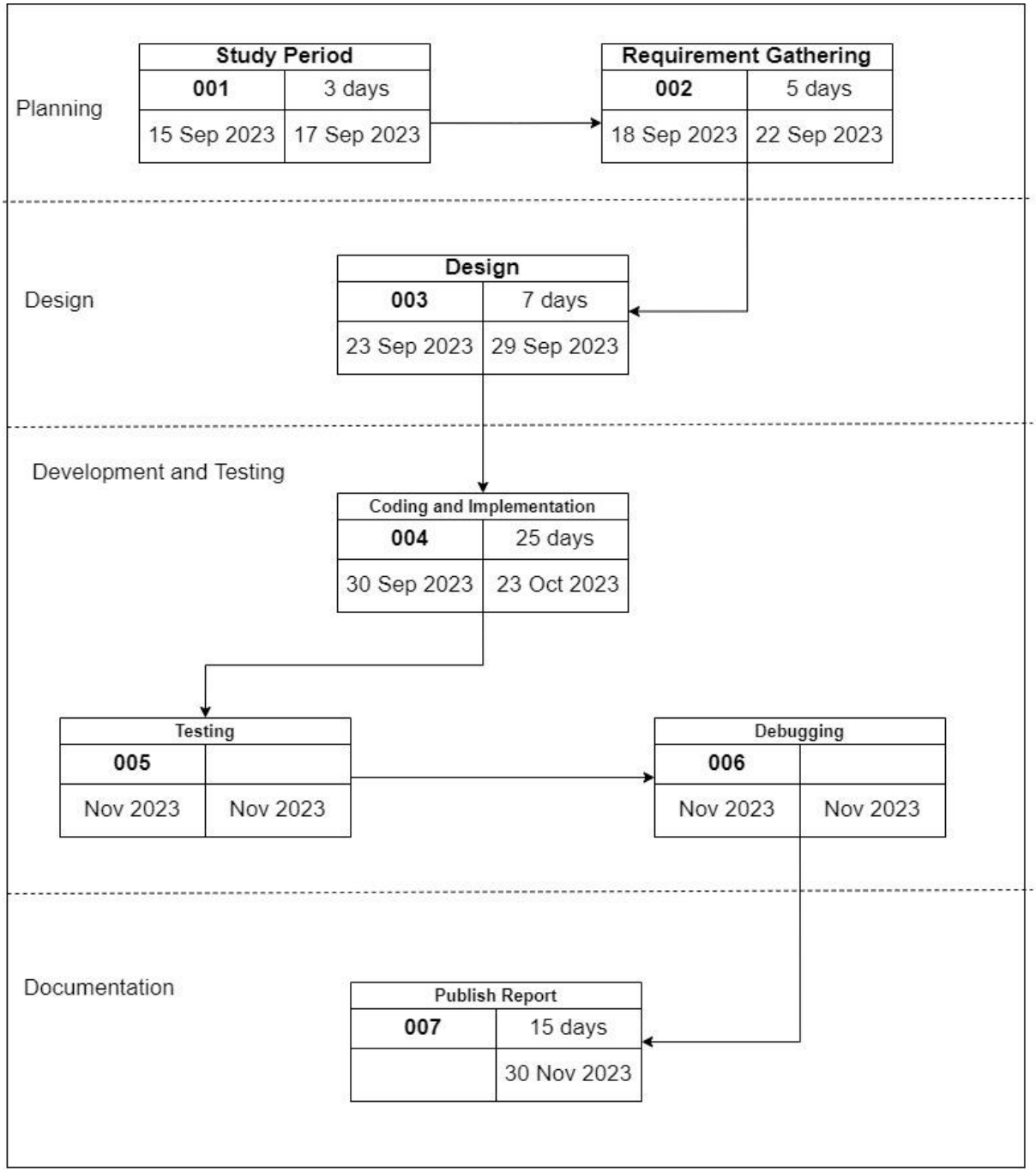
e) Traffic Congestion Mitigation

7. Methodology

- **Data Collection:** Gather data on the electric bus routes, stations, distance between stations, and fares from the relevant source.
- **Node and Edge Definition:** Create nodes to represent bus stations, including information about station names, fares, and connections.
- **Dijkstra's Algorithm:** Implementing Dijkstra's algorithm to calculate the shortest path between source and destination stations within the electric bus network graph. Consider factors such as edge weight(distance) for route determination.
- **Ant Colony Optimization (ACO):** Implement the ACO algorithm to introduce route optimization. Simulate ant behavior to explore alternative routes while balancing efficient route discovery.
- **Fare Estimation:** Develop a fare calculation. module that determines the total fare for the recommended route based on the fare structure associated with each station and the distance traveled.



8. PERT Chart



9. References

https://www.sciencedirect.com/science/article/abs/pii/030505487490046X

https://www.sciencedirect.com/science/article/abs/pii/S0967070X16304449

10. GitHub Link

https://github.com/Dhruv2063/EcoTrav.git