SRM Institute of Science and Technology
College of Engineering & Technology | School of Computing
Department of Computing Technologies

18CSC305J Artificial Intelligence – Mini Project

OPTIMAL PATH

Team Members

1. **RA21110030010175 A Mohammad Fazil**
2. **RA21110030010186 Sai Vardhan Reddy**
3. **RA21110030010190 Jaini Eswar**

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Societal benefit :

- Improving the efficiency of navigation systems can result in shorter trip times, lower fuel consumption, less traffic, and better transportation systems as a whole. Both financial savings and environmental sustainability are aided by this.

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Abstract

- The "Optimal Path Finder" project aims to revolutionize navigation efficiency through the application of artificial intelligence (AI) technologies. In today's dynamic world, efficient navigation is crucial for minimizing travel time, reducing fuel consumption, alleviating traffic congestion, and enhancing overall transportation systems' performance.

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Abstract

- To address these challenges, our project proposes the development of an AI-driven optimal path finder system. Leveraging cutting-edge machine learning algorithms, data analytics techniques, and optimization methods, the system will analyze vast amounts of data in real-time to identify the most efficient routes for navigation.

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Introduction

- Imagine you're planning a trip to a new city or trying to navigate through your own city during rush hour. You want to reach your destination as quickly as possible, while avoiding traffic jams and road closures. That's where the "Optimal Path Finder" comes in.

- The "Optimal Path Finder" is like having a personal navigation assistant powered by artificial intelligence (AI). Its main goal is to help you find the best route from point A to point B, taking into account various factors like traffic conditions, road closures, and even your own preferences.

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Introduction

- Think of it as your own smart GPS system that not only tells you where to go but also considers real-time data to suggest the fastest and most efficient route possible.
- Ultimately, optimal path finding plays a crucial role in optimizing resource utilization, enhancing efficiency, and enabling intelligent decision-making in a wide range of practical scenarios. As technology continues to advance, the development and refinement of optimal path finder algorithms will remain a focal point in numerous fields, driving innovation and shaping the future of navigation and spatial planning.

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Problem Statement

Statement : Software Tool to find optimal path.

Description: Developing an AI-based system to find the most efficient and optimal path for navigation, considering factors like distance , cost(fuel) ,closures, real-time data.

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Objective :

- To design and implement an AI-driven optimal path finder that considers real-time data, user preferences, and various constraints to provide the most efficient route for navigation.
- Provide users with the fastest, the most efficient routes from origin to destination.
- Promotes sustainability by optimizing routes to minimize fuel consumption.
- Deliver accurate route recommendations considering factors like traffic conditions.

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Technical depth :

- Discussing the utilization of advanced AI techniques such as machine learning algorithms (e.g., reinforcement learning, neural networks), data analytics, and optimization algorithms (e.g., A* algorithm, Dijkstra's algorithm) to analyze vast amounts of data and generate the optimal path in real-time.

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Technical depth :

- Represent the road network as a graph, where nodes represent intersections or waypoints, and edges represent road segments connecting them. Each edge has a weight representing the cost or distance between adjacent nodes.Define Heuristic Function: A key component of the A* algorithm is the heuristic function, which estimates the cost of reaching the goal from a given node. In the context of route planning, the heuristic function can be based on factors such as straight-line distance, travel time, or historical traffic patterns.

Example Implementation of algorithm :

- Using the A* algorithm for the "Optimal Path Finder" project can be highly effective for finding the most efficient routes from one location to another. Here's how you can incorporate the A* algorithm into the project : Understand the A Algorithm*: The A* algorithm is a popular pathfinding algorithm that efficiently searches for the shortest path between two points in a graph or network. It combines elements of both Dijkstra's algorithm and heuristic search to find a balance between efficiency and accuracy.

Example Implementation of algorithm :

- **Implement A Algorithm*:** Write code to implement the A* algorithm for searching the road network graph. The algorithm maintains a list of open nodes to explore, along with their tentative costs from the start node and estimated costs to the goal. It iteratively selects the node with the lowest total cost and expands its neighbors until the goal is reached.Consider Real-Time Data: Incorporate real-time data such as traffic conditions, road closures, and user preferences into the A* algorithm. Adjust the edge weights or heuristic function dynamically based on current conditions to generate more accurate route recommendations.

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