

Optimal Path

Project Report

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Introduction

In today's globalized world, one of the challenging tasks of AI is to find the optimal path from one place to the destination place.

The project idea is to find the optimal path for a vehicle to travel so that cost and time can be minimized. This is a business problem that needs solutions.

As the name of implemented system suggests, the vision was to develop a virtual assistant for people who are new to the organization or in the new city or place to solve path based queries and provide path from the source to destination within the area. Virtual system may be considered as a system that is not physically available but can be used as a virtual assistant.



The system uses Artificial Intelligence in software to guide people. The implemented system can assist the user by solving user queries related to path within the campus.

Artificial intelligence is an intelligence demonstrated by the machines in contrast to the intelligence displayed by the humans. Using this technology the machines behaves as humans.

For example, the query answered by the machine looks as if the answer is coming from humans. There are various applications of AI that is in health care, automotive, military, audit, art, advertising, government, video games, finance and economics. Similar is the behavior of this system as it provides the path to the user between two locations in such a way that a human is answering to the user query related to path.

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To study an intelligent agents is a field of computer science. Any device that acts from its surroundings and perform actions accordingly can be considered as intelligent agents. Learning and problem solving is the basic approach of artificial intelligence.

The Problem

In the present world, if the vehicle has to move from one place to the destination, it couldn't find the real shortest path.

The path followed by the vehicle from the point to the destination not only consume much more time but also spend more cost inn reaching the destination.

It is a major growing problem in this modern world which not only waste time but also consume more fuel, battery usage of the vehicle etc.

Project Goal

The objective of this project is to find the shortest optimal path for the vehicle from the point to the destination point. This saves the time from reaching from point to the destination point.

This would be very helpful because they do not need to ask the path to anyone else. The path related information can be very helpful with respect to the people coming from different area.

Using the techniques of Artificial Intelligence, this will also enable solve another modern world problem.

System Implementation

It has been carried out in consideration that artificial intelligent system can be used with in the campus to find path between two ends. This is an assistant system that is capable of answering campus related queries of a new comer

The system is designed and implemented on Python platform. The initial step is to take an input from the user which contains the source and destination for which the user wants to know the path. This input is processed to convert it into a text form so that we get the source and destination.

Dijkstra's algorithm is used to find shortest path from defined source to all possible destinations in the graph. After fetching the shortest path, it is presented to the user. For any possible path from one place to another Dijkstra's algorithm is used.

Dijkstra works on positive weight values and gives the single source shortest path. Moving from vertex a to b there is some weight assigned to that edge. Dijkstra's algorithm can be used to calculate and find the shortest path from source vertex to every other vertex within the same connected graph data structure, provided that the vertices are reachable from the source node.

Complexity of the algorithm depends upon number of vertex available in the graph. The implementation of Dijkstra is depend upon min priority queue and Fibonacci heap. In Artificial intelligence, Dijkstra's procedure uses the concept of best first search.

Dijkstra's Algorithm

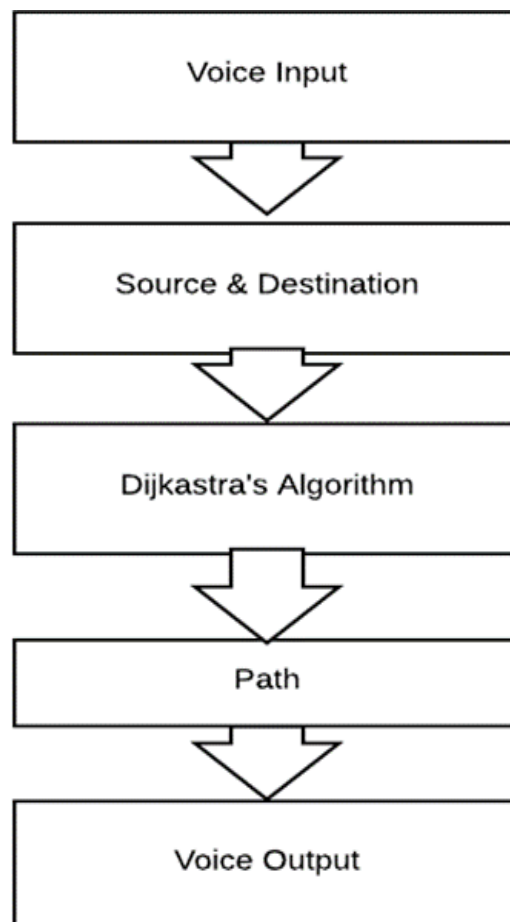
- Dijkstra(Graph, source):
- create vertex set Q
- for each vertex v in Graph:
- $\text{dist}[v] \leftarrow \infty$
- $\text{prev}[v] \leftarrow \text{UNDEFINED}$
- add v to Q
- $\text{dist}[\text{source}] \leftarrow 0$
- while Q is not empty
- $u \leftarrow \text{vertex in Q with min dist}[u]$
- remove u from Q
- for each neighbor v of u:
- $\text{alt} \leftarrow \text{dist}[u] + \text{length}(u, v)$ if $\text{alt} < \text{dist}[v]$:
- $\text{dist}[v] \leftarrow \text{alt}$
- $\text{prev}[v] \leftarrow u$
- return $\text{dist}[], \text{prev}[]$
- exit

This algorithm is used to find shortest path from given source vertex. If distance is not known at beginning, keep it as infinity (not defined).

For implementation, Queue data structure is used. Relax procedure is called to minimize the path distance from two identified nodes.

The reason behind choosing the Dijkstra algorithm over other algorithms is that Dijkstra's algorithm is asymptotically faster single-source shortest-path algorithm for any arbitrary directed graphs with non-negative weights.

When the user comes in front of the system, the system says How can I help you and provides various options like Path Finder to open path finder and other options to automate the system.



Then the user input by saying Path Finder. Then the system asks for the source where the user is present. So the user gives input source place. Then system asks for the destination and the user provides the destination.

Now the system processes this information by applying the Dijkstra's algorithm in it and the graph is present within it. Now after fetching the shortest path it uses the database to get the individual path between the nodes.

This information is provided to the user on the user interface so that everything is clear to the user.

The system will not only provide the single path but also gives the node to node path because the user is new to the place and the user will not be knowing how to go to the next place so to remove these type of ambiguities, node to node path is also provided in terms of voice form as well as displayed on the screen.

There are various possible paths from source to the destination but the system provides the shortest path between the two points using the Dijkstra's algorithm so that the user needs to move less and saves the time.

Shortest Path Identifier Algorithm

- The user enters the source and destination.
- The source and destination is stored in the variables as they need to be passed in the function.
- These source and destination are passed to the function where Dijkstra's algorithm is implemented.
- With the help of the nodes and the distances between them it forms the graph and in the parameter we have the source and destination so with the help of it, the algorithm returns the shortest between nodes.
- This returned information is processed so that it can be properly presented on the screen.

Conclusion:

In this paper we have presented the working of assistant system using artificial intelligence which is very useful to the people who are new to the area and do not know much about the locations. In this application Optimal Path, we have presented the functionality that are finding using Dijkstra's algorithm. So this system provides the shortest path within two locations in the area which is displayed on the screen too.

References:

<https://data-flair.training/blogs/artificial-intelligence-project-ideas/>