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 tin the new city or place to solve path based queries and provide path from the source to destination with in 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.

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.

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.

A* 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 A* algorithm is used.

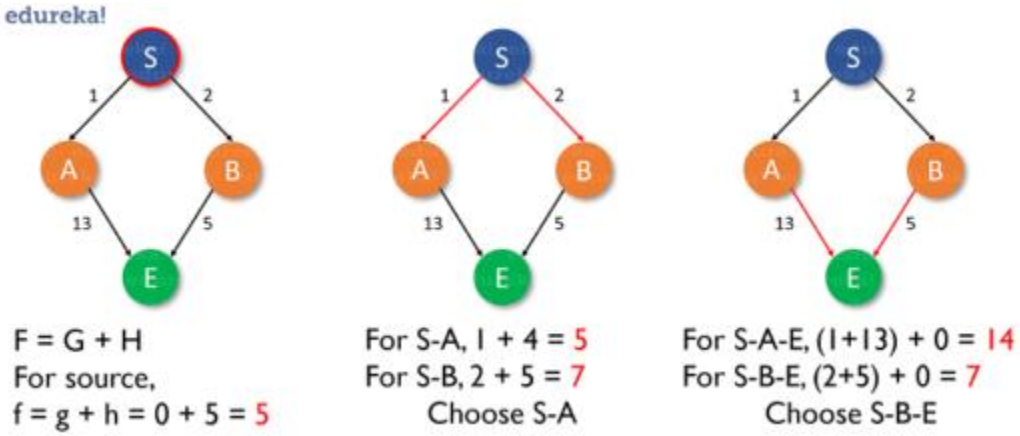
A*, as we all know by now, is used to find the most optimal path from a source to a destination. It optimizes the path by calculating the least distance from one node to the other.

There is one formula that all of you **need to remember** as it is the heart and soul of the algorithm.

F = G + H

So what are these 3 variables.

- F – **F is the** parameter of A* which is the sum of the other parameters G and H and is the **least cost from one node to the next node**. This parameter is responsible for helping us find the most optimal path from our source to destination.
- G – **G is the cost of moving from one node to the other node**. This parameter changes for every node as we move up to find the most optimal path.
- H – **H is the heuristic/estimated path between the current code to the destination node**. This cost is not actual but is, in reality, a guess cost that we use to find which could be the most optimal path between our source and destination.



f = g + h where g is cost to travel and h is the heuristic value.

To reach Source:

$$f(S) = 0 + 5 = 5$$

The paths from S to other vertices:

f(S-A) = 1 + 4 = 5

f(S-B) = 2 + 5 = 7

So, we firstly will choose the path of S -> A as it is the least.

The paths from A and B to the Destination:

f(S-A-E) = (1 + 13) + 0 = 14

f(S-B-E) = (2 + 5) + 0 = 7

After calculation, we have now found that B later has given us the least path. So, we change our least path to S-B-E and have reached our destination. That is how we use the formula to find out the most optimal path.

With having understood the usage of the formula, let's take a look at how the algorithm works:

Firstly create 2 lists which will help you understand the path, let's name them the **open** and **closed** list.

A* Algorithm():

- Add start node to list
- For all the neighbouring nodes, find the least cost F node
- Switch to the closed list
    - For 8 nodes adjacent to the current node
    - If the node is not reachable, ignore it. Else
        - If the node is not on the open list, move it to the open list and calculate f, g, h.
        - If the node is on the open list, check if the path it offers is less than the current path and change to it if it does so.
- Stop working when

- You find the destination
- You cannot find the destination going through all possible points

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 A* algorithm is implemented.
- With the help of the nodes 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 A* 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/