

SHORTEST PATH FINDING VISUALIZER

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I. ABSTRACT:

Visualization is an efficient way to learn concepts faster than traditional methods. Modern technology enables the creation of e-learning tools, which also greatly contribute to the improvement of computer science education. The goal of this project is to create the Pathfinding Visualizer, a web-based e-learning tool that can be used to visualize the Shortest Path algorithm. Conceptual applications of the project are illustrated through implementations of algorithms such as Dijkstra's and DFS. This project aims to perform all these tasks with some knowledge of HTML, CSS, JavaScript, and the React framework. Since the final product is a web application, users can easily see and learn how the algorithm works. The ease of use of the project provides users with simple operating instructions. First results using the application promise benefits of this here-learning tool for students with a good understanding of the shortest path algorithm.

II. INTRODUCTION

Currently, e-learning is being promoted very strongly among from different fields. Modern technologies enable the development of visualization tools for topics such as various graph theory algorithms and their descriptions. The implementation of such e-learning tools is one of the most important prerequisites for the successful use of any e-learning system. Learning by visualization has been shown to help improve learning ability. Gives more autonomy to an individual's learning

process. By providing a visual representation of what the destination node algorithms look like, applications aim to make them easier to understand. A good algorithm visualization tool will bring the algorithm to life by showing the traversal of nodes through the and animating transitions from one node to another. One of the broader applications of graph theory is the determination of shortest paths in many practical applications such as maps, road networks, and robot navigation. Dijkstra's algorithm is used to demonstrate how the tool works. This is because it also works for weighted graphs. So, it takes longer to run than BFS. This algorithm guarantees the shortest possible path. Moreover, using online learning methods instead of face-to-face lectures has the power to reinforce learning in terms of improving student performance, increasing student satisfaction, and increasing student learning flexibility.

III. ADVANTAGES

- Suitable for
- Scalable and consistent.
- More effective than traditional methods.
- Improves retention.
- Provide the latest content.

The e-learning tool described enables teachers, students, and other applicants to interact with the algorithm, actively work with it, and visualize the execution of the shortest-path algorithm.

IV. DIJKSTRA ALGORITHM

Dijkstra's algorithm is a single-source, shortest-path-first algorithm. It helps to find the shortest path to get from source to destination, like this: B. Between two points on a grid that can represent robot movement, road networks, maps, etc. He was developed in 1956 by Edger W. Dijkstra. There are many variations of the algorithm. In its early stages, the algorithm was designed to find the shortest path between a source node and a destination node, but current variants of the algorithm take a single node as the source and all other nodes as destinations and provide the shortest path. 4464 Creates a shortest path tree by constructing paths from ready sources to all destinations populated in the grid. I also favour cheaper methods.

Dijkstra's algorithm uses a data structure to store nodes sorted by distance from the source.

Mainly the lowest priority queue was used, but arrays can also be used.

Example: A person decides to travel from one place to another using the shortest route, and asks which roads are busy, which 4484 traffic is expected and is very difficult to use. Imagine a situation where you have information about for others like Dijkstra, this means that the edges of the graph are heavily weighted (algorithm tries to avoid heavily weighted roots). If you're using GPS to find her directions, you're very likely using Dijkstra's his algorithm or some other route-finding algorithm.

V. How Dijkstra's algorithm works:

The starting node is called the initial node, the algorithm assigns initial distance values to all other nodes, and the updates them incrementally.

- First, mark all nodes as unvisited and put them into the set. Assigns a tentative distance value of zero to the start node and all other to infinity. Set the current node to display as the first nodes.

- For the initial node, tentatively remove unvisited neighbouring nodes, compare the

newly found value with the value originally assigned to, and replace it with the smaller .

- If all unvisited nodes are considered current nodes, place the current node as a visited node on the grid and draw it from the set of unvisited nodes.

- If the destination node is found and marked as visited (while finding the route between the two given points), or the minimum tentative distance between the source and all destinations in the unvisited set is infinite (something such a situation occurs when there is no relationship between the source and target nodes in the unvisited set), then stop. Otherwise, choose the unvisited node with the smallest interim distance, consider this node the current node, and go to step 3. There is only one source and multiple destinations. Dijkstra's algorithm helps create the road network and reduces the cost of building roads.

- Applicable to network routing protocols. The shortest route will be opened first in the middle and middle system.

- Applicable to improving the movement of robot systems

VI. REFERENCE REVIEW:

eLearning is one of the crowning achievements of the Internet's transformation. This allows the user to fruitfully glean his education and knowledge from the variety of his resources available and use them effectively to learn and stay up to date quickly. became. Different problems require different solutions. Similarly, different types of e-learning include blended and informal learning, and network-based learning. Both asynchronous and synchronous e-learning methods are equally important. e-Learning is a modern solution for training and supporting your workforce to acquire the knowledge and skills they need to turn change into advantage and create more opportunities. As a result, many companies are using e-learning to keep their

employees up to date with new advancements, add new skills so they can deliver better solutions, and connect synchronous tools with asynchronous environments. I realized that I need to let Used to enable 24/7 learning models. In his current Covid-situation, eLearning is proving very effective. E-learning has enabled to deliver education anytime, anywhere. eLearning successfully replaces campus-based classrooms and helps improve student performance.

VII. Design and Architecture:

It turns out that there is a big gap between theory and practical understanding of algorithms. This is also true for the shortest path algorithm, especially the Dijkstra algorithm. The main purpose of the e-learning tool is to use it to learn the well-known graph algorithm. Starting with Dijkstra, other shortest-path algorithms have been gradually implemented. The main idea of this system is to provide an integrated educational environment to facilitate the learning process in an efficient way. The Pathfinding Visualizer tool has three steps.

1. Algorithm Selection
2. Node Placement
3. Visualization

USE CASE DIAGRAM

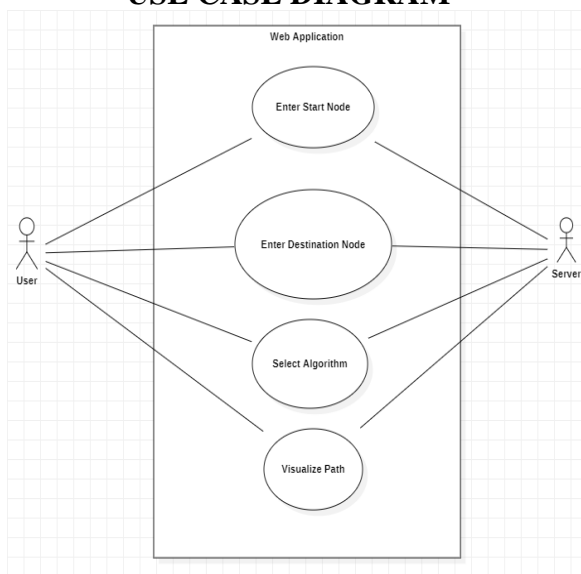


Figure 1 Use Case Diagram

ACTIVITY DIAGRAM

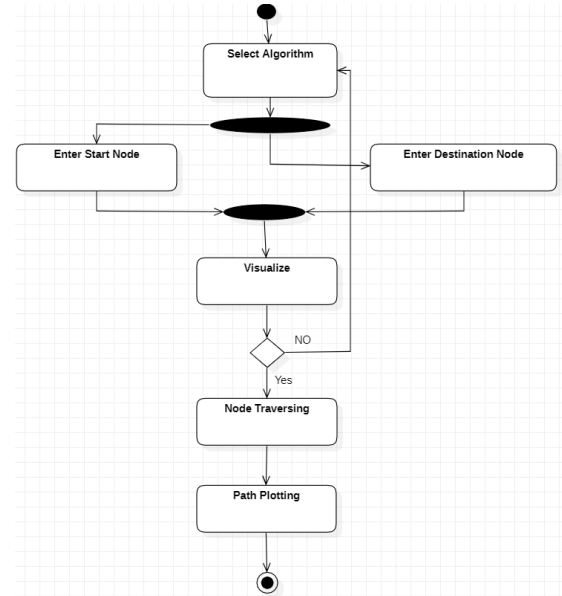


Figure 2 Activity Diagram

VIII. Problem Analysis:

Computer Science education has experienced tremendous growth in recent years. Computer science has many difficult subjects that are very complex to learn, especially algorithms such as the shortest path algorithm, which are often difficult and complex to understand. Modern technology proves that benefits the learning process. Visual aids were recognized as a means of enhancing a person's ability to learn. Visualizations make it surprisingly easy to understand the explanation of a particular topic. We are trying to build a e-learning tool for learning pathfinding algorithms by visualizing each step of the algorithm. Tool features:

Ease of use

Add animation for better visualization

Ability to insert obstacles in the path

VI. Benefits of the proposed work

Visual aids facilitate skill acquisition widely known as This tool simplifies the entire process of learning complex pathfinding algorithms and makes e-learning tools accessible.

● Various algorithmic visualizations can give

people more autonomy in the learning process, and help

find more applications in real life.

- Visualization helps build knowledge and organize information.
- Even a user without knowledge of the topic can learn from him watching
- It leads to better memory retention and promotes active learning.

IX. Merits OF THE PROPOSED WORK:

- Visual aids are widely recognized as facilitating skill acquisition. This tool simplifies the entire process of learning complex pathfinding algorithms and makes e-learning tools accessible.
- Various algorithmic visualizations can give people more autonomy in the learning process and help find more applications in real life.
- Visualization helps build knowledge and organize information.
- Users without knowledge of the topic can also learn by watching her.
- Leads to better retention and promotes active learning.

System Description:

The project consists of various modules that fulfil different tasks of the. These modules are the Algorithm module, the Node module, and the Path Visualizer module. These modules can also be implemented within a home network and over the Internet.

A. Algorithm Module: The Algorithm Module is the most important. It contains the functionality needed to traverse the nodes on the lattice and solve the graph shortest path problem. This module also contains the Dijkstra algorithm, A*, and the DFS algorithm. There are only 4 ways to move: up, down, right, and left. This means that all nodes are weighted equally.

B. Node Module: Once the algorithm starts searching for the target node and starts traversing according to the function, the node module covers creating an animation showing the direction of the traversal and the nodes traversed. It also handles the

animation of drawing paths between the source and destination nodes on the grid.

C. Path Visualizer Module: The Path Visualizer component handles mouse operations, implements algorithms from the Algorithms module on grids, and handles all operations performed on grids

X. Conclusion:

e-Learning is the latest solution for delivering education and knowledge. A variety of tools have been developed to implement this method of learning and to get people to recognize and accept its importance. Both synchronous and asynchronous learning methods are equally important. 's e-learning tools meet the needs of 's novices and experts alike, and its consistency also proves his 's effectiveness in traditional methods. The web application helped visualize how the pathfinding algorithm works and made it easy to understand. Further development of this tool may involve visualization of more complex algorithms and their implementation on real maps.

XI. ACKNOWLEDGEMENT:

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