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ALGORITHM VISUALIZER

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Abstract -Algorithm visualization plays a crucial role in computer science education and understanding complex algorithms. It is an interactive and intuitive platform for visualizing various algorithms and their execution processes. The Algorithm Visualizer serves as an invaluable educational tool, enabling students, educators, and enthusiasts to comprehend and analyses complex algorithms visually. By offering an interactive and intuitive learning experience, the visualizer enhances algorithmic understanding, promotes critical thinking, and contributes to the overall advancement of computer science education. Features: a) Sorting (Selection sort and Bubble sort) b) Searching (Linear Search and Binary Search). Languages: HTML, CSS, JAVA SCRIPT. Library: REACT JS.

Keywords: Sorting, Searching.

I.INTRODUCTION

The algorithm visualizer project is a tool designed to help users understand and visualize the workings of various algorithms in a visual and interactive manner. It allows users to input different algorithms and see how they perform step by step, helping to improve their understanding of complex algorithms and their efficiency. This project aims to make learning and teaching algorithms more engaging and accessible for users of all levels The visualizer enhances algorithmic understanding, promotes critical thinking, and contributes to the overall advancement of computer science education. The problem definition of an algorithm visualizer project involves clearly specifying the goals and objectives of the project, as well as identifying the challenges and requirements. Here's a detailed problem definition for an algorithm visualizer project. The problem

is to develop a web-based algorithm visualizer application that enables users to interactively understand, learn, and analyses various algorithms and data structures. The visualizer should provide a user-friendly interface for visualizing the step-by-step execution of algorithms and the changes they make to data structures, allowing users to gain a deeper understanding of algorithmic concepts. Visualization is proposed as one of the ways for supporting student learning. Me and my partner are visual learners, and we are keener to picking up concepts by seeing it get done, rather than reading about it. For example, when we were learning about sorting algorithms during the second semester Computer Science degree, we found it hard to grasp the working of a sorting algorithm just by seeing it explained on board or reading it as there is loads of recursion that takes place, we thought that maybe if these algorithms were taught visually and professors show how the data moves to its position, we would understand the concept better. For years, many educators have depended on lecturing, storytelling, and blackboard teaching to deliver information. Standardized exams, in written format, highlight verbal learning. But in a world entirely filled with laptops, smartphones, tablets, and VR machines it becomes predominant to dynamically teach students to read and produce visual texts and to espouse this instinct to risk falling behind. As such, many professors find themselves without the assets needed to give 21st century students the dexterity they'll need to succeed in a progressively visual world. The advantages, difficulties, and possibilities of integrating such visualization, on the other hand, need to be clarified. Teaching staff are becoming more interested in integrating visual representation into their methods to generate stimulating learning experiences for students in face-to-face, blended, and online contexts.

II.LITERATURE REVIEW

Every software engineer should have a good understanding of DSA to develop efficient software. Visualizers have a good history of providing effective understanding to the users. Many algorithm visualizers have been developed over the years. In 2008, paper "AlCoLab:

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Architecture of Algorithm Visualization System" concerns the style of script supported algorithm visualization systems for educational purposes, focusing on the support and the improvement that those systems provide in the process of teaching of a conceptual subject such as algorithms. In 2019, paper "Towards Developing an Effective Algorithm Visualization Tool for Online Learning" reports a work-in-progress research project at Athabasca University on developing an effective algorithm visualization tool for online learning. In 2019, paper "Open Interactive Algorithm Visualization " presents a work-in-progress project form developing an open interactive algorithm visualization website. In 2021, paper "AlgoAssist: Algorithm Visualizer and Coding Platform for Remote Classroom Learning" focuses on "algorithm visualization", which allows a better understanding of its flow and operation. It supports the combination of the lab into a single application dedicated to pre-assessment, algorithm explanation, visualization, coding, and post-assessment. In 2021, paper "Algorithm Visualizer " aims to simplify and deepen the understanding of algorithms operation. Within the paper we talk about the possibility of improving the standard methods of teaching algorithms, with the algorithm visualizations

III. METHODOLOGY

SYSTEM ARCHITECTURE:

The proposed system involves the simulation of the different type of algorithms codes. As you can see, there are no major components besides the three coding languages. Most websites have tools or scripts that require a server on the back-end , but it is not necessary in this case since React JS runs right in the user's browser. HTML5 and CSS are used for the interface. The HTML5 communicates with the React JS code and vice versa to launch the appropriate algorithms and update the interface accordingly, as seen with a single, bidirectional arrow. As the React JS was modified from a functional programming focus to a more object-oriented one, the parts of the HTML5 that did change were the function calls for each button. All of the back-end interaction is abstracted to the various buttons for selecting algorithms and running the animation.

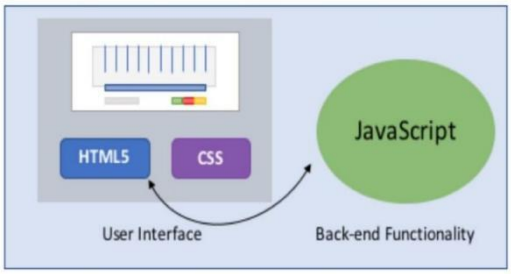

Fig :- 3.1 Architecture Diagram

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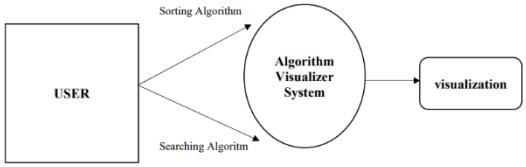
DATA FLOW DIAGRAM:

In Data Flow Diagram ,we Show the flow of data in our system, In DFD0 we show the base DFD in which rectangle present External entity (an outside system that sends or receives data)and circle show a Process(process that changes the data, producing an output).The arrows towards the process shows input while the arrows away from the process shows output



SELECTION SORT:

Selection sort is an in-place comparison sorting algorithm. It has an O(n^2) time complexity, which makes it unsuitable for an array size of large numbers, and in general executes worse than the similar insertion sort. Selection sort is well known for its simplicity and has performance advantages over more intricate algorithms in certain circumstances, particularly where additional memory is limited. The algorithm works by pushing the least element to the start of the array by swapping it with the first element of the

IV.IMPLEMENTATION

A Sorting Algorithms main purpose is to reposition a given array or list of elements in ascending or descending order. Now taking about the algorithms itself we are using 7 sorting algorithms in this visualizer namely Bubble Sort, Selection Sort. These algorithms are the commonly used algorithms for sorting.

array and the pointer pointing to the first element is moved to the next element and this process goes on till the last element of the array and eventually the array will be sorted.

BUBBLE SORT:

Bubble sort also known as sinking sort from time to time, is a simple sorting algorithm that repeatedly Pass through the list is repeated until the list is sorted. But the algorithm is not suitable for amounts of data as its average complexity is of O(n2), Where n is the number of elements

LINEAR SEARCH:

Every element is considered as a potential match for the key and checked for the

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same. If any element is found equal to the key, the search is successful and the index of that element is returned. If no element is found equal to the key, the search yields "No match found".

BINARY SEARCH.:

Compare the middle element of the search space with the key. If the key is found at middle element, the process is terminated. If the key is not found at middle element, choose which half will be used as the next search space. If the key is smaller than the middle element, then the left side is used for next search. If the key is larger than the middle element, then the right side is used for next search. This process is continued until the key is found or the total search space is exhausted.

V.RESULTS

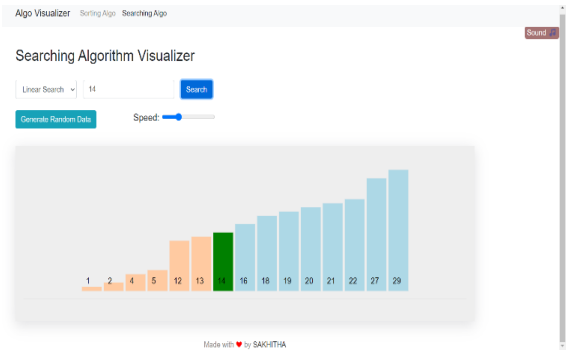

Fig:- 5.1 Linear Search

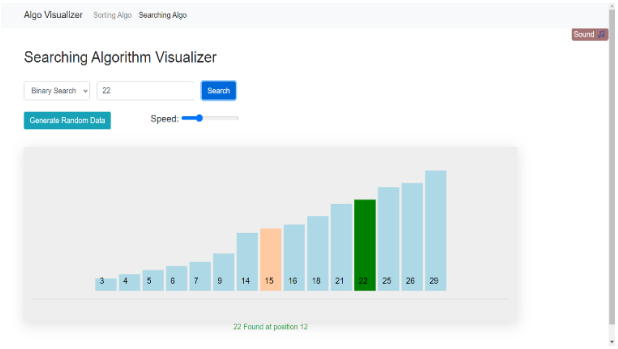

Fig :- 5.2 Binary Search

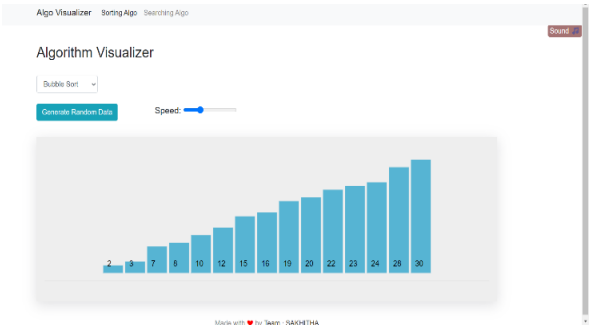

Fig: 5.3- Selection Sort

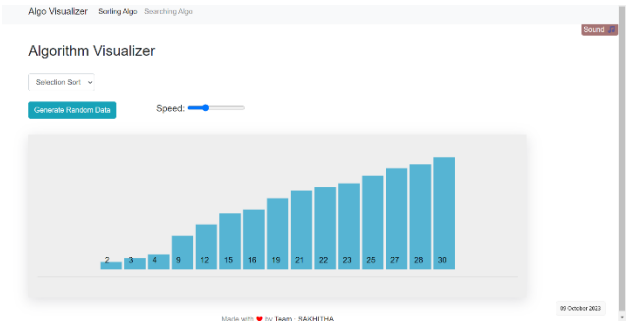

Fig 5.4:- Bubble Sort

VI. CONCLUSION

An algorithm visualizer is a software application or tool designed to help individuals understand and visualize how different algorithms work Real-time

Visualization: Users can see how the algorithm processes data and makes decisions step by step. Variety of Algorithms: Users can choose the algorithm they want to learn or analyse. Educational Tool: In educational settings, algorithm visualizers are valuable teaching aids. Visualization Speed Alteration & Generation of random data

VII . FUTURE ENHANCEMENTS

Algorithm Expansion: Add more algorithms to the visualizer. Include popular algorithms like merge sort, quicksort, insertion sort, and depth-first search.

Data Structure Visualization: Extend the visualizer to illustrate how different data structures work. **Performance Analysis**: Integrate performance analysis tools that measure and display the time and space complexity of algorithms

Machine Learning Algorithms: Incorporate visualizations for machine learning algorithms, such as neural networks, decision trees, and k-means clustering.

Feedback and Bug Reporting: Implement a system for users to provide feedback and report issues, ensuring continuous improvement**.**

Gamification: Turn the visualizer into a game where users solve algorithmic challenges with a time or resource constraint. This can make learning algorithms more engaging

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