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REVIEW PAPER ON ALGORITHM VISUALIZER

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ABSTRACT

"Algorithm Visualizer" is a online learning platform which can be used to learn algorithms like searching , Sorting and path-finding algorithm through visualization. Visualization gains more attention than theoretical study and it is easy way of learning process. It helps to understand fundamental concept of algorithms such as searching, sorting, path-finding method in simpler manner.

Keywords: Algorithm, Searching, Sorting, Path-Finding, Algovisualizer.

I. INTRODUCTION

The main objective of this platform is to help students to learn about algorithm through visualization as well as help teachers to teach with visualization. The first well-known visualization presented by Baecker, it was in video-tape format. It shows the animation of 9 different sorting algorithms. This video-tape allows students to watch the behavior of the algorithm instead of try to imagine its actions from a verbal explanation or from static images. Brown Algorithm Simulator and Animator (BALSA) is a algorithm visualization system developed at Brown University.

Algorithms and data structures are two essential courses for any computer science education. Both students and teachers face difficulties to learn and teach the concepts of algorithms and data structures. Students have difficulties to understand theoretical knowledge and core concepts of algorithms. Becker [1] states that it is often difficult to let students understand a working knowledge of the creation and operation of data structures by using traditional communication. When it comes to distance education, it is even more difficult, as the students and the teachers can have very minimum communication in this classroom setting. To address the above challenges, several Algorithm Visualizer tools have been created in the recent years, which intend to facilitate the understanding of algorithm and data structure concepts by means of animation and visualization.

In the recent years, algorithm visualization technologies undergone many changes from simple systems of visualization to sophisticated computer-based tutors that enables learners to interact with the platform. Although algorithm visualizer tools are improving day by day, they are still facing difficulties to get the full attention and engage students and achieve complete satisfaction of the online learners.

II. LITERATURE REVIEW

Over the recent years, several algorithm visualizer tools have been developed and it is still receiving increased interest from students and teachers. As browser is becoming the universal interface to a wide range of applications, web-based learning environments have a increasing impact on education and learning. Recent surveys on algorithm visualizer tools development can be found in [2] and [3].

Most algorithm visualization tools provided good results with their potentials in demonstrating the data structure and algorithms. Students need proper graphical representations which will give proper information about the execution of the particular algorithm [2]. In last few years many evaluations have been carried out on algorithm visualizer tools. In overall the results showed that simple visualization or passive algorithm visualization had minimal impact on learners due to low engagement from students[2]. Hundhausen[4] performed a systematic evaluation regarding the effectiveness of algorithm visualizer tools. Their meta-study on 24 published investigations on algorithm visualizer tools concluded that the way learners use visualizations is more important than the visualizations themselves and the algorithm visualizer tool's environments are effective only when the learners are actively engaged into the learning process.

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A number of pedagogical requirements are given in [5] including navigation of the animation forward and backward, hypertext-based descriptions of the execution of algorithm and data structure visualization, to learners and feedback to teachers. In [6], authors analyze the usability and educational characteristics of an algorithm visualizer tool and define four educational features — narrative and textual explanation of content; feedback to learners; extra time using the algorithm visualizer.

In [7] author proposed a method of finding runtime of each algorithm and aims to overcome the drawbacks of the existing systems. The proposed System[7] illustrates each and every step clearly using text and visualization. Comparisons of the time complexity have been carried out and results show that author's approach provides better perceptive of algorithms.

In[8], authors proposed 11 suggestions for a pedagogical success of an algorithm visualizer tools, such adapt to learners' knowledge level, performance and execution information, adding textual explanations of visualizations, and facilitating custom input datasets. They also suggest for careful consideration of the requirements to adapt in order to deliver effective algorithm visualizer tool suitable for all students and educators.

III. METHODOLOGY

In this project, we aim to develop an effective algorithm visualizer tool that can engage students to remain on platform and improve learning outcomes. To achieve this goal, we analyze the pedagogy, usability and accessibility goals of the online students and incorporate the features of the above goals to design effective user interactions and visualizations for an online algorithm visualizer tool. In this design process, we involve three basic activities:

- Establishing requirements
- Designing alternatives and prototyping
- Evaluation

In the establishing requirements activity, we conducted a comprehensive survey on the existing literature, which determines the goals and their relevant features. At the designing alternatives and prototyping activity, we designed the user interactions and the visualizations, where we followed the Schneiderman's eight golden rules of user interaction design [9]. In this work, we mainly highlighted the establishing requirements and designing alternatives and prototyping activities. The evaluation activity is currently in work-inprogress, and it will be done based on a set of Likert survey questionnaire.

IV. PROPOSED WORK

A. System Architecture:

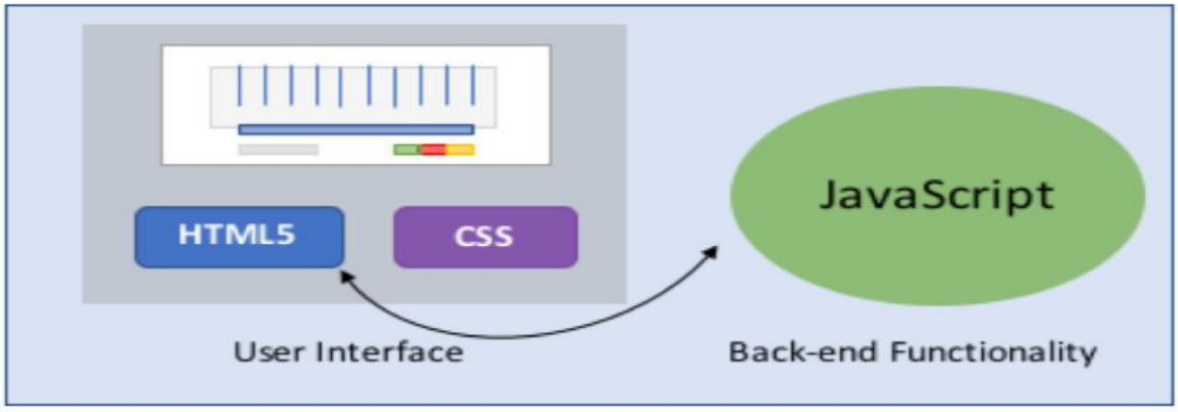

Fig 1: System architecture 1

The proposed system includes the visualization of algorithms such as sorting, Searching and path-finding algorithms. HTML5 and CSS are used for interface. HTML5 communicates with ReactJs code and vice versa to visualize the particular algorithm and update the interface accordingly as shown in Fig I with bidirectional arrow.

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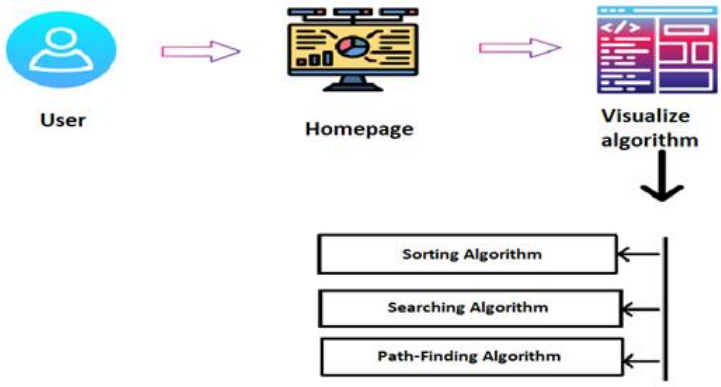

Fig 2: System architecture 2

B. Data Flow Diagram:

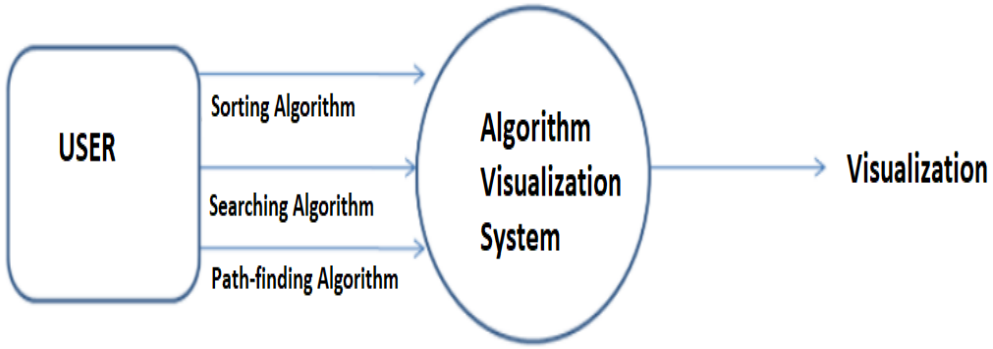

Fig 3: Data Flow Diagram

Data Flow Diagram 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.

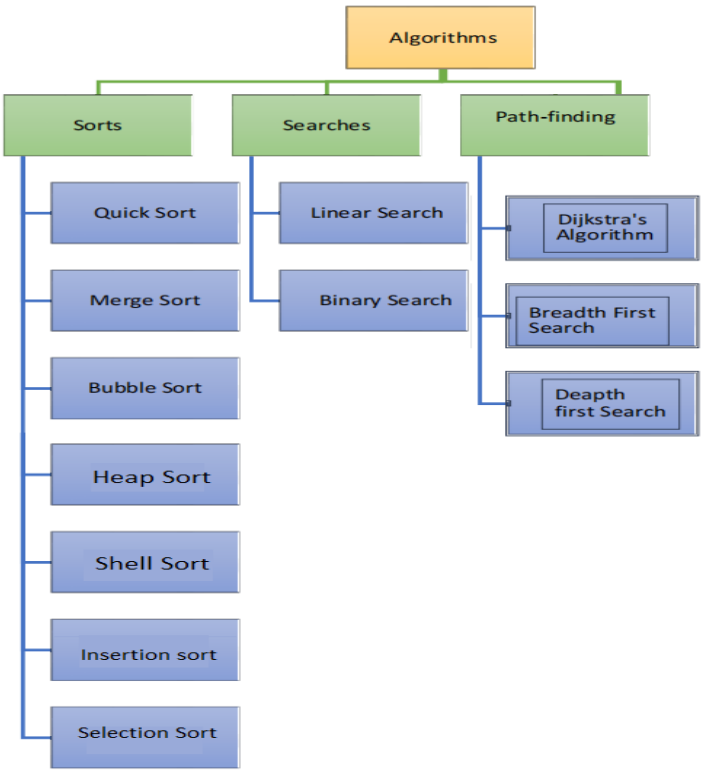

Fig 4: Algorithms in proposed system

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The proposed system contains 3 types of algorithms

1. Sorting Algorithm
2. Searching Algorithm
3. Path-finding algorithms

Sorting Algorithms:

A sorting algorithm is used to rearrange the array or list of numbers according to a comparison operator on the elements. List of elements can be arranged in ascending or descending order as per comparison operator.

Searching Algorithms:

Searching algorithms are developed to check or retrieve an element from a data structure where it is stored. These algorithms are classified in 2 main types based on the type of search operation

Linear search: In this algorithm the list of array is traversed sequentially and every element is checked.

Interval Search : This algorithm is specially developed to search in a sorted list of elements. It is more efficient since it does not check all the elements

Example: Binary search

Path-finding Algorithm :

There are many problems in computer science that needs user to find the shortest path between set points to solve such problems Path-finding Algorithms are developed.

V. CONCLUSION

This system is implemented for visualizing some of the sorting, searching, path-finding algorithms. This is a helpful tool for all kinds of students and tutors to easily understand the execution of algorithms. For future enhancement we can include more algorithms of sorting, searching and path-finding.

VI. REFERENCES

[1] K. Becker and M. Beacham, "A tool for teaching advanced data structures to computer science students: an overview of the BDP system," Journal of Computing Sciences, vol. 16, no. 2, pp. 65-71, 2001

[2] E. Vrachnos and A. Jimoyiannis, "Design and evaluation of a web-based dynamic algorithm visualization environment for novices," Procedia Computer Science, vol. 27, pp. 229-239, 2014.

[3] F. E, A. M and S. C, "The role of visualization in computer science education," Computers in the Schools, vol. 29, pp. 95-117, 2012.

[4] D. Hundhausen, S. Douglas and J. Stasko, "A metastudy of algorithm visualization effectiveness," Journal of Visual Languages and Computing, vol. 3, no. 3, pp. 259-290, 2002.

[5] G. Robling and T. L. Naps, "A testbed for pedagogical requirements in algorithm visualizations," in Conference on Innovation and Technology in Computer Science Education, New York, USA, 2002.

[6] J. Urquiza-Fuentes and J. A. Velazquez-Iturbide, "A survey of successful evaluations of program visualization and algorithm animation systems," ACM Transactions on Computing Education, vol. 9, no. 2, pp. 1-24, 2009.

[7] Bremananth R, Radhika V Thenmozhi S “Visualizing Sequence of Algorithms for Searching and Sorting” 2009 International Conference on Advances in Recent Technologies in Communication and Computing-2009

[8] T. L. Naps, G. Robling, V. Almstrum, W. Dann, R. Fleischer, C. Hundhausen, A. Korhonen, L. Malmi, M. McNally, S. Rodger and J. A. Velazquez-Iturbide, "Exploring the role of visualization and engagement in computer science education," in Proceedings of ITiCSE on Innovation and Technology in Computer Science Education, New York, USA, 2002.

[9] A. Dix, J. Finlay, G. D. Abowd and R. Beale, Human-Computer Interaction, 3. Edition, Ed., Harlow: Pearson Education, 2004.