REVIEW OF ALGORITHM VISUALIZATION METHODOLOGIES

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ABSTRACT

Software visualization provides methods to make algorithms and programs more understandable. Allowing a user to interact with dynamically changing graphical representations of algorithms or data structures can be helpful in teaching, research, or systems programming. For example, a sorting algorithm could be animated by a sequence of frames displaying a set of vertical lines of different heights, permuted in an order of increasing height. Such animations are useful for developing new programs, for debugging, and for explaining how programs work.

Keywords: Algorithm, Visualization, Animation, Data Structures, Software Visualization.

I.   INTRODUCTION

Data Structures and Algorithm is an important topic for the students who are pursuing Computer Science and Engineering or IT. There is a need of DSA no matter which programming language you learn. An application like this is to help students to understand Data Structures and Algorithms through animation and not just theory. As Data Structures and Algorithms is the building block of the software developing process, it is very important to learn them in easier and simple way for which we are using animations. Our aim is to create an appealing application for students and professors on both mobile and browser platform which will help in better understanding of working of simple data structures as well as complex algorithms. Also, to bring forth the beauty of the algorithms by animating them in a visually appealing manner. Algorithm animation can provide a visual representation of data structures and algorithm execution that can simplify algorithm learning and understanding. However, algorithm animation has not widely used in teaching data structures and algorithms [3].

II.   LITERATURE SURVEY

Sr. No.	Authors	Name of the paper	Description
1	Marc H. Brown, Robert Sedgewick	A System for Algorithm Animation	The paper outlines the conceptual framework developed for animating algorithms, describe the system implemented, and have given several examples drawn from the host of algorithms animated.
2	John T. Stasko	Tango: A Framework & System for Algorithm Animation	The paper introduces a framework and a system for algorithm animation which can easily convey the meaning, methodology and purpose of the program.
3	Bingyao Jin, Mingmei Jin, Xiaoqing Xue	Algorithm Animation and Its Applications in Instruction	The paper reviews the effect of algorithm animation on instruction of algorithms and data structures along with the brief history of algorithm animation systems.
4	Ville Karavirta, Clifford A. Shaffer	Creating Engaging Online Learning Material with the JSAV JavaScript Algorithm Visualization Library	The paper describes the JavaScript Algorithm Visualization Library developed which helps provide the functionality to simplify creation of AV's on various engagement levels including interactive exercise.
5	Marc H. Brown and Robert	Techniques for Algorithm	The paper summarises the BALSA integrated environment developed by Brown university which

	Sedgewick	Animation	allows users to interact with dynamically changing graphical representations of the programs and algorithms.
6	Slavomír Šimonák	Using algorithm visualizations in computer science Education	The paper introduces an algorithm visualization platform VizAlgo developed using Java which supports dynamic changes in the pseudo code along with visualization.
7	Clifford A. Shaffer, Matthew Cooper, Stephen H. Edwards	Algorithm Visualization: A Report on the State of the Field	The paper summarises the about the distribution of the learning content, creation of algorithm visualizations and the quality of the visualizations.
8	Euripides Vrachnos, Athanassios Jimoyiannis	Design and evaluation of a web-based dynamic algorithm visualization environment for novices	The paper presents a web based dynamic algorithm visualization environment named DAVE to teach simple algorithmic concepts to beginners.
9	Ahmad Affandi Supli, Norshuhada Shiratuddin, Syamsul Bahrin Zaibon	Critical Analysis on Algorithm Visualization Study	The paper introduces a novel approach to interactive algorithm visualization using hybrid mobile application to help student in IT to better grasp the concepts of DSA.
10	Jussi Nikander, Juha Helminen, Ari Korhonen	Algorithm Visualization System for Teaching Spatial Data Algorithms	The paper introduces a web based learning and visualization environment for DSA named TRAKLA2 which automatically assesses algorithm simulation exercises solved using GUI.
11	Jamil Abedalrahim Jamil Alsayaydeh, Maslan Zainon, A. Oliinyk, Azwan Aziz, A. I. A. Rahman, Zikri Abadi Baharudin	The Development of System for Algorithms Visualization using SimJava	The paper proposes a study for the design of the system for sorting algorithm visualization and implementation of the system named SimJava.
12	Ludek Kucera	Visualization of Abstract Algorithmic Ideas	The present paper identifies two key condition that an algorithm visualization must satisfy to be successful: general availability of used software, and visualization of why an algorithm solves the problem rather than what it is doing.
13	Gábor Törley	Algorithm Visualization in Teaching Practice	This paper presents the history of algorithm visualization, highlighting teaching-methodology aspects along with a combined, two-group pedagogical experiment which measured the efficiency and the impact on the abstract thinking of AV.
14	Christopher D. Hundhausen, Robert Patterson,	The Effects of Algorithm Visualizations with Storylines on Retention:	The paper publishes an experimental study on how visualizations based on storylines tend to increase audience interest and involvement but the study

	Jonathan Lee Brown, Sean Farley	An Experimental Study	didn't found any significant differences.

III. BASIC CONCEPTS

Algorithm

Algorithm is a set of well-defined process to solve a particular problem. It takes the set of input and produces the desired output.

1) Searching

Searching is an operation that helps finds the place of a given element or value in the list. If element is found it is said to be successful and the index is return of the found element.

2) Sorting

Sorting is an operation in which the elements are sorted in a numerical order. The order can be from lowest to highest or highest to lowest.

Data Structures

Data Structure is a storage that is used to store the data in an organized way. It is a way of representing the data so that it can be accessed and updated efficiently. There are two types of data structures viz. Linear and Non-Linear.

1) Linear Data Structure

When the elements are arranged in the sequential manner one after the other it is called as Linear Data Structure.

a) Array: It a collection of multiple items of similar data type in a contiguous memory location.

b) Stack: It follows a particular order in which the operations are performed. The order may be Last- In-First-Out (LIFO) or First-In-Last-Out (FILO).

c) Queue: It follows First-In-First-Out (FIFO) principle where the first element entered in queue will be removed first.

d) Linked List: In linked list the elements are linked using pointers rather than storing at contiguous memory location.

2) Non-Linear Data Structure

Unlike linear data structure, the elements in non-linear data structure are not stored in sequence. Instead, they are arranged in a hierarchical manner where one element will be connected to one or more elements.

a) Graphs: The graph consists of nodes and edges where each node is called vertex and each vertex is connected to other vertices through edges.

b) Trees: Similar to a graph, a tree is also a collection of vertices and edges. However, in tree data structure, there can only be one edge between two vertices.

IV. CONCLUSION

Due to the abstract nature of some algorithms understanding and remembering the intricate working of such algorithms becomes difficult for students. Hence using the developed app the learning of such algorithms becomes more conducive and it also satisfies the curiosity of the student who wishes to see the algorithm in action. This will further help the students in their studies as Data Structures and Algorithms are considered an inseparable part of CS education.

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