Project report

On

Sorting Algorithm Visualizer

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the dissertation entitled **"Sorting Algorithm Visualizer"** in partial fulfilment of the requirements for the award of the Degree of Bachelor of Technology in Computer Science and Engineering, submitted in the Department of Computer Science and Engineering of the Graphic Era Deemed to be University, Dehradun is an authentic record of my own work carried out during the period from **October 2021 to January 2022,** under the supervision of **Mr. Deepak Uniyal**, Assistant Professor, Department of Computer Science and Engineering of the Graphic Era Deemed to be University, Dehradun (Uttarakhand).

The matter presented in this dissertation has not been submitted by me for the award of any other degree of this or any other Institute/University.

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This is to certify that the above statement made by the candidate is correct to the best of our knowledge.

ACKNOWLEDGEMENT

I here by submit the project report on **"Sorting Algorithm Visualizer"**, as per the scheme of

Graphic Era University, Dehradun.

In this connection, we would like to express our deep sense of gratitude to our beloved institution Graphic Era University and also we like to express our sincere gratitude and indebtedness to **Dr. Kamal Ghansala,** Chairman, GEU, Dehradun

We would like to express our sincere gratitude to **Dr. Devesh Kumar,** Head of Dept. of Computer Science, for providing a congenial environment to work in and carry out our project.

We consider it our cardinal duty to express the deepest sense of gratitude to **Mr. Deepak Uniyal , Assistant Professor**, Department of Computer Science and Application for the invaluable guidance extended at every stage and in every possible way.

Finally we are very much thankful to all the faculty members of the Department of Computer Science and Application, friends and our parents for their constant encouragement, support and help throughout the period of project conduction.

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1 : ABSTRACT :

1.1 : About Project

I have created this project , Sorting algorithm visualizer, as a web app, using HTML(Hyper Text Markup Language), CSS(Cascading Style Sheets) and Javascript.
I created this app to visualize the sorting algorithms taught to me in the 2nd semester,
This project is implemented using a array of random numbers visualized as bars. The array is sorted in ascending order according to the algorithm selected.
The execution of the soring algorithm is represented by highlighting the bar in process with turqoise colour and bar which is in correct position by light green colour.

1.2 : Motivation

I decided to develop this project as I thought it would help students get a better understanding of the working of the sorting algorithms and also it will appeal to the general audience as it is an interactive project quite easy to understand.
Also through this project I too will understand the working of sorting algorithm in depth and a basic knowledge of web development which is very helpful in the course I am pursing.

2: Requirements of the project

2.1 : Hardware Requirements:

Any device capable of functioning a web browser and a code editor.

2.2 : Software Requirements:

Web browser (Chrome, Opera, Safari).
Code editor(Visual Studio Code)
HTML
CSS
Javascript

3: METHODOLOGY:

3.1 : Design

First, I chalked out the design of the webpage and decided the approach to the UI and theme to my project, I decided to make the project simple and basic as it was. my first project in the web development field.

3.2 : HTML(Hyper Text Markup Language

Using HTML, I first gave my webpage a skeleton, laid out the basic design and structure of the different buttons and areas, also the header and footer of the webpage.

I decided to keep this as simple and minimal as I could so that the rest of the project does not get very complex.

3.2.1 : Buttons:

Generate New Array: To generate a new array of random elements.

Sorting algorithm Selector: Drop Down menu implement using span class option to choose from different sorting algorithms.

Size Selector: To select the size of the random array generated.

Speed Selector: To choose and control the sorting and animation speed.

Sort Button: It acts as a calling button to execute the javascript and start sorting.

3.3 : CSS

I then stylized the contents of the webpage using CSS and gave my webpage a clean and light theme.

I also had to use CSS after I coded in the javascript, to convert the array into bar graph and to highlight the bar currently under process to make the execution of the sorting algorithm more understandable.

3.4 : JAVASCRIPT

3.4.1: Linking The Buttons:

I decided to first attach the different buttons created using HTML and linked them to appropriate function call, for this I created a javascript file with just function declarations so that the javascript file acted as template before I added the functionalities.

For the function calls a used await and functions are declared as async.

3.4.2: Generating A Random Array:

After that I decided to generate the array consisting of random numbers, For this I used a mathematical formula to generate the random elements w.r.t the upper and lower bound of the size of the array.

3.4.3: Sorting Algorithms

Once I generated the array, I created another javascript file to implement the sorting algorithms. I decided to first implement a single sorting algorithm and test it functioning completely, then to implement the rest of the sorting algorithms.

I used an online Javascript compiler to check if my sorting algorithm was functioning correctly.

3.4.4: Checking The Accuracy Of The Sorting Algorithm

To check if the sorting algorithm I wrote is working algorithm before visualizing it, I used an online Javascript compiler, then in a function I coded my sorting algorithm visualizer and in another function I copied a sorting algorithm from the internet and compared the two arrays to check if they match or not.

After this is, I used CSS to visualized the elements of the array generated as bars.

3.4.5: Visualizing The Sorting Algorithm

I created the javascript file *helper*,*js* in which I added the condtions to highlight the bar in a suitable colour according to the ongoing process on the bar while sorting to show the execution and process of the sorting algorithm.

I used turquoise colour to represent the bar currently under process, light green colour to represent the bar in the correct position, and purple colour to represent the key in the appropriate algorithm.

After that I tested the if the bubble sort algorithm is working correctly. Once the bubble sorting algorithm was working and functioning correctly.

I then coded in all the different sorting algorithm and tested their functioning in the online Javascript compiler as well.

After that I coded and linked the appropriate CSS animations to the different algorithms.

4.1 : Screen Shots And Adjustments

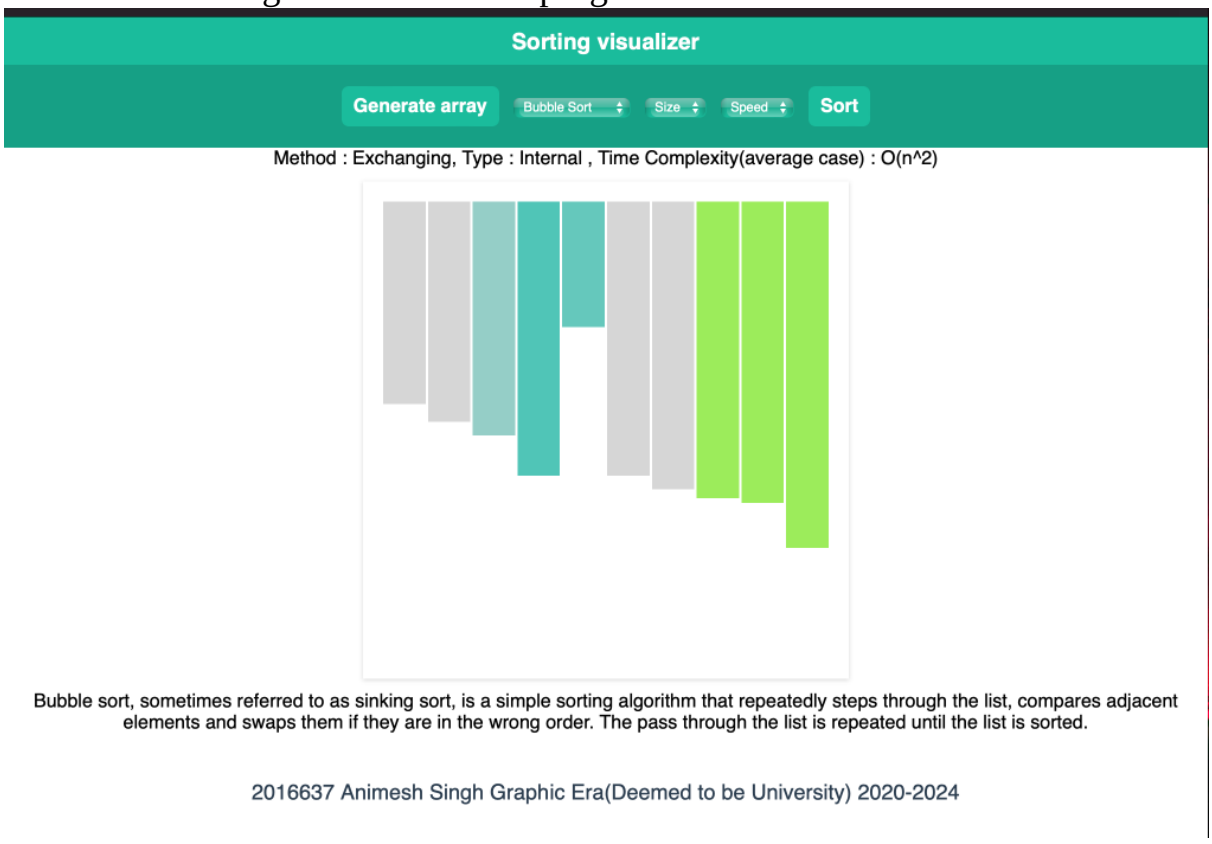
4.1: Screen Shot:

Attached below are the screen shot of the project first completed without any adjustments:

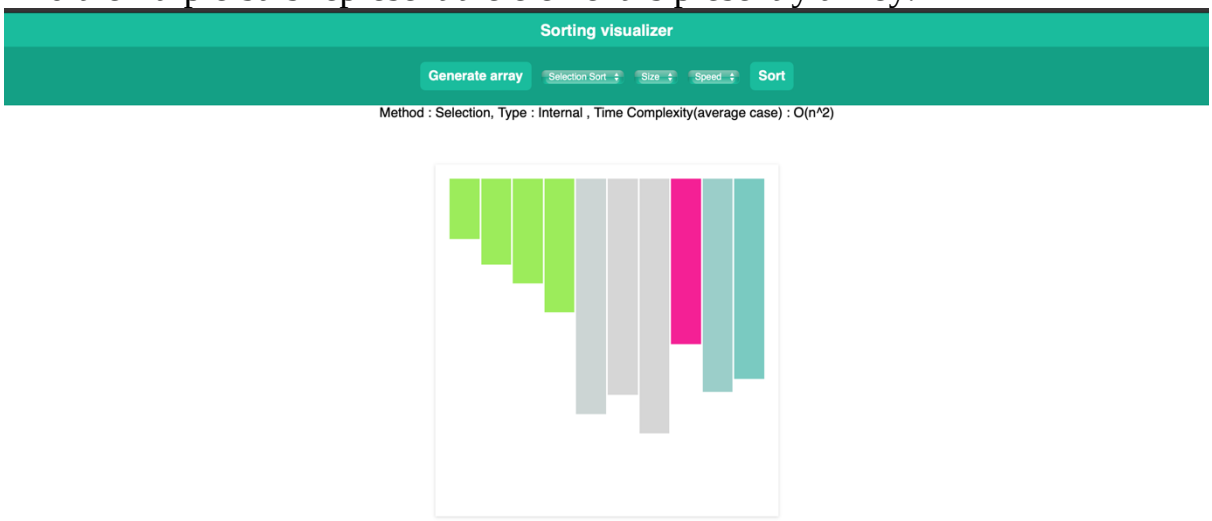
This is the first page that loads on to the screen.

4.2: Screenshot After Adjustments:

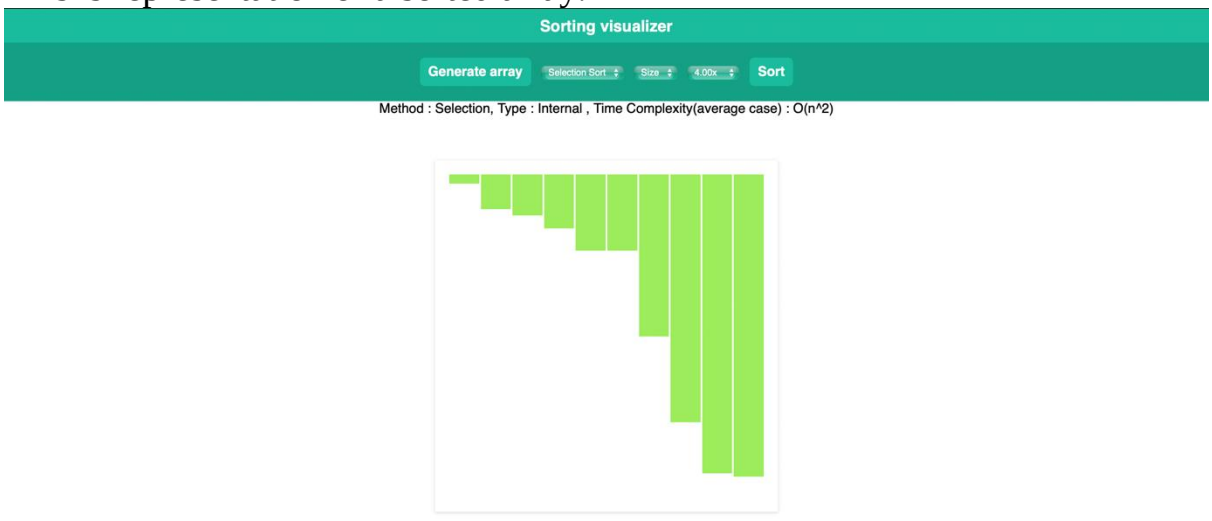
After completing the project I added in some additional information about the bars and the sorting algorithm chosen by the user.
ScreenShot during execution of the program.



Screenshot during execution of Selection Sort.
Here we can see that Light Green Bars represent the element which are sorted and in there correct position.
The dark Green bars represent the elements currently under process.
And the Purple bars represent the element is presently a Key.



This is representation of a sorted array.



5: SUMMARY:

Through this project I got an deeper understanding of the working of different sorting algorithm as I have to understand them completely in order to visualize their functioning. Also I got a good lesson of web development using HTML, CSS and javascript. I got to know about the different features and functioning of the language javascript.
I got a better understanding of interactive applications through this project and also the importance of a good User Interface.
I learnt different ways of applying CSS to our web page and make it look and feel better.

To summarize, developing and implementing this project, 'Sorting Algorithm Visualizer', I learnt about the execution and working of different algorithm as well as good basic understanding of web development.

6: REFERENCE:

- ww.stackoverflow.com
- The easy conecpts(youtube).
- Git Hub
- www.w3schools.com