NAAC B +

Yashoda Shikshan Prasarak Mandal's

YASHODA TECHNICAL CAMPUS, SATARA

Department of Computer Science
Engineering

**1. Title of Project:**    SORTING VISUALIZER USING JAVASCRIPT

**2. Name of college:**     Yashoda Technical Campus's College of
Engineering, Satara

**3. Name of Department:** Computer Science & Engineering

**4. Name of Students:**

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Muskan Hanif Shaikh

**5. Name of guide:**      Dr. S. V. Balshetwar

# 6. Relevance

**Tools and Technology used**

**HTML**

HTML stands for Hyper Text Markup Language

HTML is the standard markup language for creating Web pages

HTML describes the structure of a Web page

HTML consists of a series of elements

HTML elements tell the browser how to display the content

## CSS (Cascading Style Sheets)

CSS stands for Cascading Style Sheets

CSS describes how HTML elements are to be displayed on screen, paper, or in other media

CSS saves a lot of work. It can control the layout of multiple web pages all at once

External stylesheets are stored in CSS files

## JavaScript

JavaScript is the world's most popular programming language.

JavaScript is the programming language of the Web.

JavaScript is easy to learn.

This tutorial will teach you JavaScript from basic to advanced.

# 7. Literature Review

| Sr. No. | Paper | Year | Author | Review |
|---------|-------|------|--------|--------|
| 1. | A system for algorithms' animation | 1999 | D. Merlini, S. Petruzzi, R. Sprugnoli and M. C. Verri | Data structure related complicated concept student not easily understand. So, visualization technique helps teacher to teach them very easily sorting algorithm show user input data through animation. This tool show sorted data and unsorted data with different color. It helps student to understand, how data can be sorted dynamically. |
| 2. | DAVE: A Dynamic Algorithm Visualization Environment for Novice Learners | 2008 | E. Vrachnos and A. Jimoyiannis | sorting algorithm represent sorted array through animation. This tool shows sorted data and unsorted data with different color. It helps student to understand, how data can be sorted dynamically. It helps student to see how sorting function actually work to sort |

| | | | | data at backend |
|---|---|---|---|---|
| 3. | Sorting Algorithm visualizer | 2022 | Thakkar, Kavita, S. Dash and S. K. Joshi | It is E-learning platform which helps to improve theoretical concept regarding Data structure & algorithm. Data can be represented by Bar graph, and then sorting algorithm may be apply on that. In Sorting Visualizer, take input data from user and show that data as bar graph. Then choose animation tool shows, user input data as bar graph, after which sorting algorithm can be apply on that. |
| 4. | Algorithm Visualizer: Its features and working | 2021 | Goswami, A. Dhar, A. Gupta and A. Gupta | Design and Analysis of Algorithms is one of the most important subjects in the field of Computer Science. We have observed that it is one of those typical subjects, which when understood well can be very interesting, but for learners who are not able to understand the concepts clearly, it can become a burden. Through our work we intend to change the perception of this subject from complex and hard to grasp, to interesting and fun. Our work aims to engage the students by providing self-paced hands-on experience, fun filled games through mazes and patterns and interactive, perceivable visualizations for their better concept understanding of various algorithms. Our work presently focuses on path-finding, sorting and CPU scheduling algorithms as these are the most widely taught and used algorithms in the computer science domain. |
| 5. | Creating Engaging Online Learning Material with the JSAV JavaScript Algorithm Visualization Library | 2016 | V. Karavirta and C. A. Shaffer | In this paper, we present JSAV: the JavaScript AV development library. JSAV goes beyond traditional AV library support for displaying standard data structures components, to provide functionality to simplify creation of AVs on many engagement levels including interactive exercises. We describe the growing body of content created with JSAV and summarize our three years of experience and research results from using JSAV to build content that supports CS education. |

## 8.Problem Identification

Aim behind implementation of this project to make a clear understand ability of various algorithms of data structures. Using a web page this will simulates the Sorting algorithm of data structure such as sorting such as bubble sort, selection sort, radix sort. Thus our web page provides effective and efficient knowledge of data structures.
It is web based application for visualize different sorting algorithm with their functionality of speed control, Array size control. This also provide some theoretical knowledge regarding the data structure.

## 9. Block Diagram:
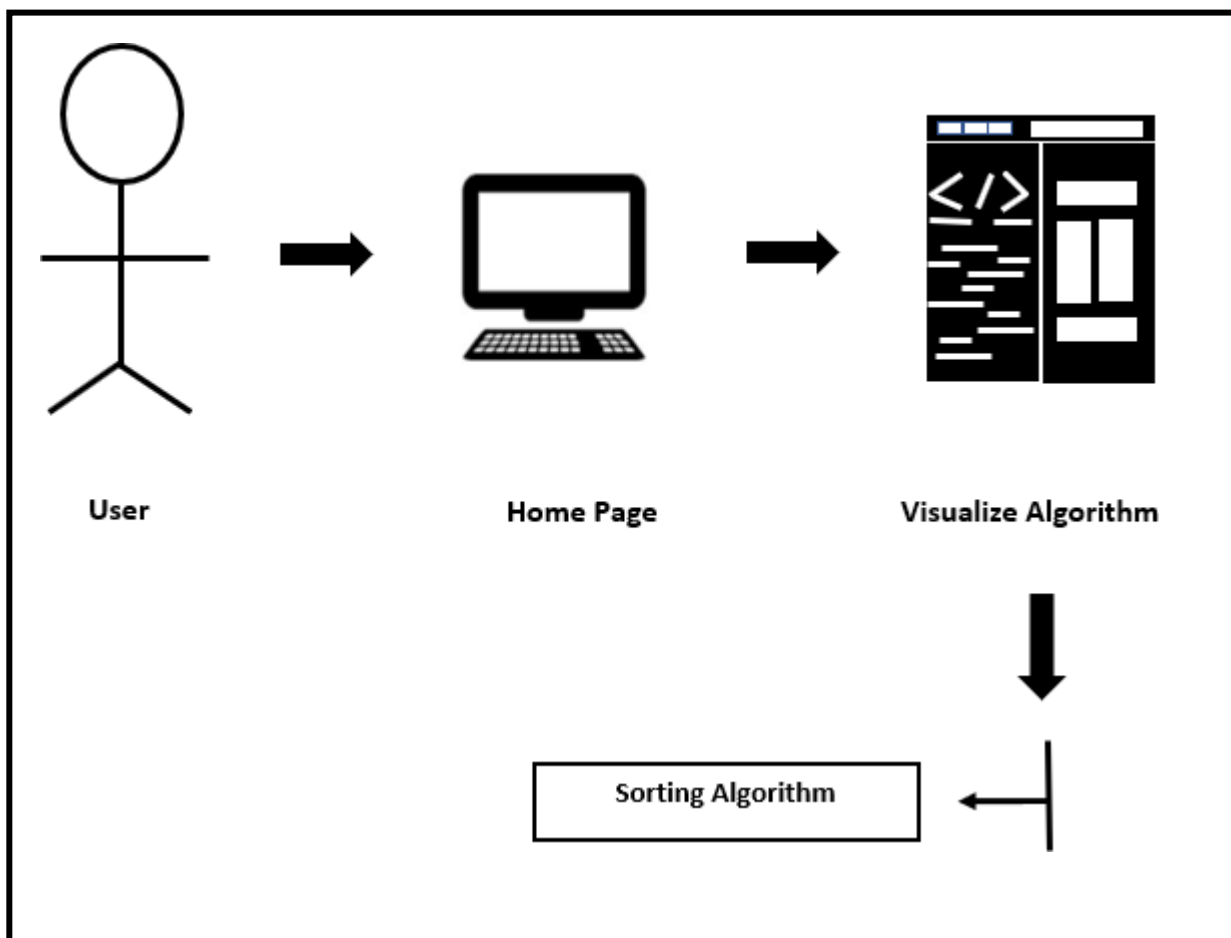


Figure 1: Block Diagram of Sorting Visualizer

## 10. Experimental Setup:

### Hardware and Software Requirements

- **Hardware Requirements**
  Processor: core i3
  Hard disk: 5 GB
  Memory: 1 GB RAM

- **Software Requirements**

  Browser: Chrome, Mozilla Firefox
  IDE: Visual Studio Code
  Frontend: HTML, CSS, JS

## 11. Scope of the project:

The main scope of this project was to create a teaching support software with visualization of the most known sorting algorithms and their variations. The application supports a graphic visualization of selected algorithms on randomly generated or manually created array, step-by-step execution possibility, pseudo code and current state of variables.

We have learnt sorting algorithms like bubble sort, selection sort, insertion sort, quick sort. But often we fail to understand the core idea of a particular algorithm maybe because we are unable to visualize how they work. So the most important thing to understand about these algorithms is visualization.

## 12. Objectives:

The main objective of this project is to help beginners to be able to visualize the basic algorithms and get a better understanding of the underlying operations.
- Creativity in making the visualizations even better and attractive.
- This project is for educational purpose.

## 13. Proposed Work:

### Sorting Algorithm
Modules and their functions: -

1

- ❖ **Home Page:**
  User can see various sorting algorithm and its abstract information.

- ❖ **Bubble Sort Page:**
  - Input array size – Here user can take input array
  - Stop Button - To Stop the bubble sort visualized algorithm
  - Resume - To Resume bubble sort visualized algorithm
  - Reset - To Reset bubble sort visualized algorithm
  - Clear - To Clear bubble sort visualized algorithm

- ❖ **Insertion Sort Page:**

- Input array size – Here user can take input array
- Stop Button - To Stop the insertion sort Visualized algorithm
- Resume - To Resume the insertion sort Visualized algorithm
- Reset - To Reset the insertion sort Visualized algorithm
- Clear - To Clear the insertion sort Visualized algorithm

❖ **Designing:**

For proper visualization we have used different colours to differentiate between the sorted bars and unsorted bars and even for bars which are currently in the process of comparison and sorting.
After sorting the colours of bars will change to same colour which will be different from initial colours of array and array elements will be arrange in ascending order.

## 14. Motivation For Work

The motivation behind this project is to study how the operations on data structure are performed. So that students can learn various algorithms through animation.
To get a clear knowledge about various data structures and their operations on it. It will makes data structures learning more interesting.
The main goal of this project is to implement a system for various sorting algorithm.
User run sorting algorithm by giving custom array. During the demonstration run, the application visualizes pseudocode and current information about some variables.

## 15. Expected Outcome:

❖ **Home Page:**



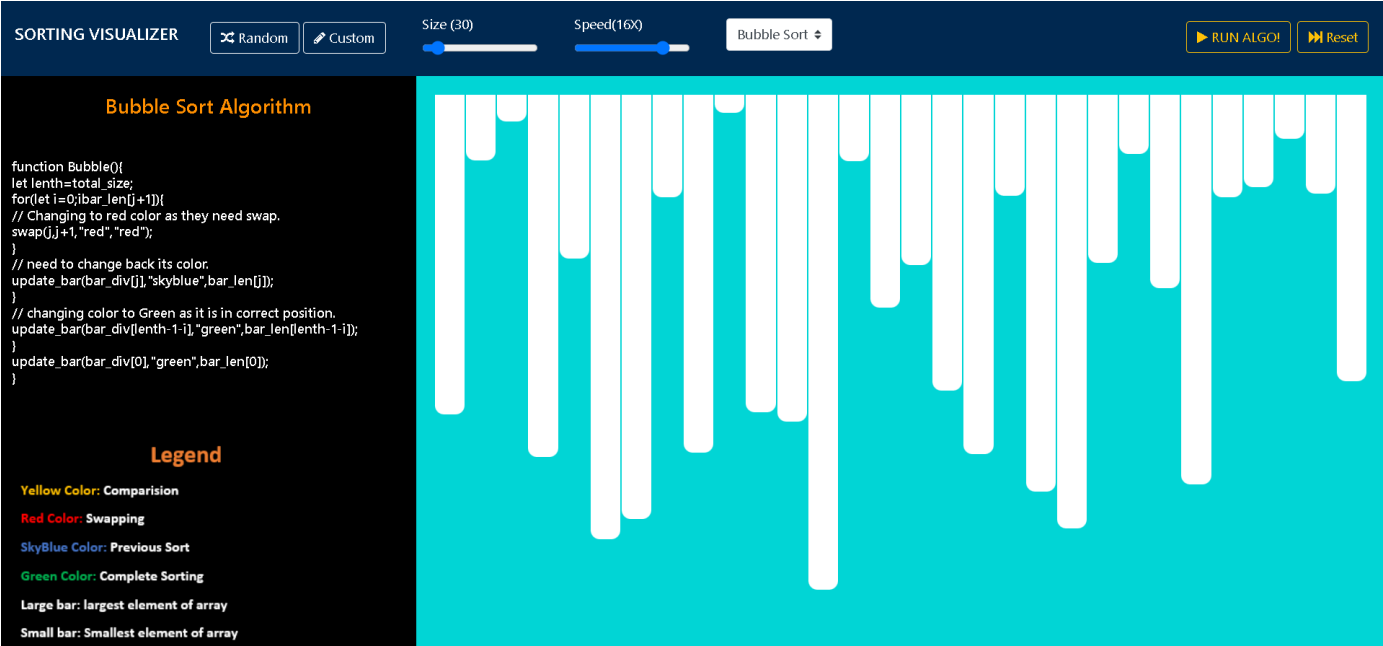**Fig :Home Page**

## ❖ Bubble Sort



**Fig: Bubble Sort**

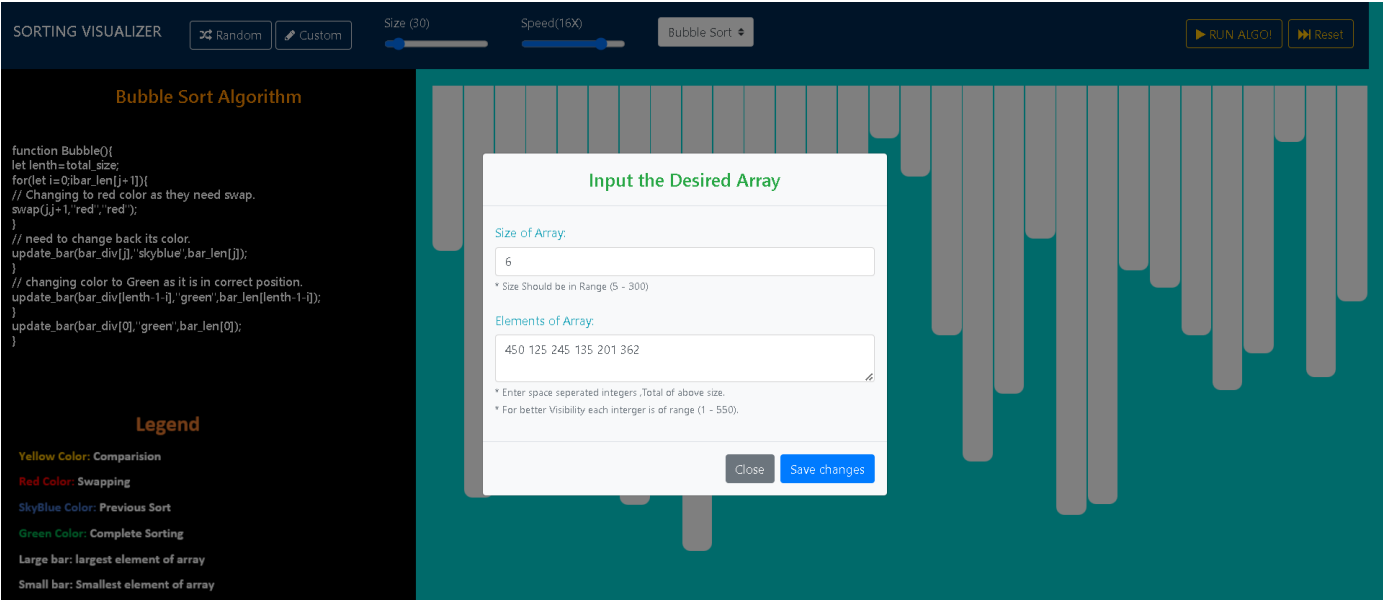- ### Enter Elements of Array:



**Fig : Enter Bubble Sort Elements**

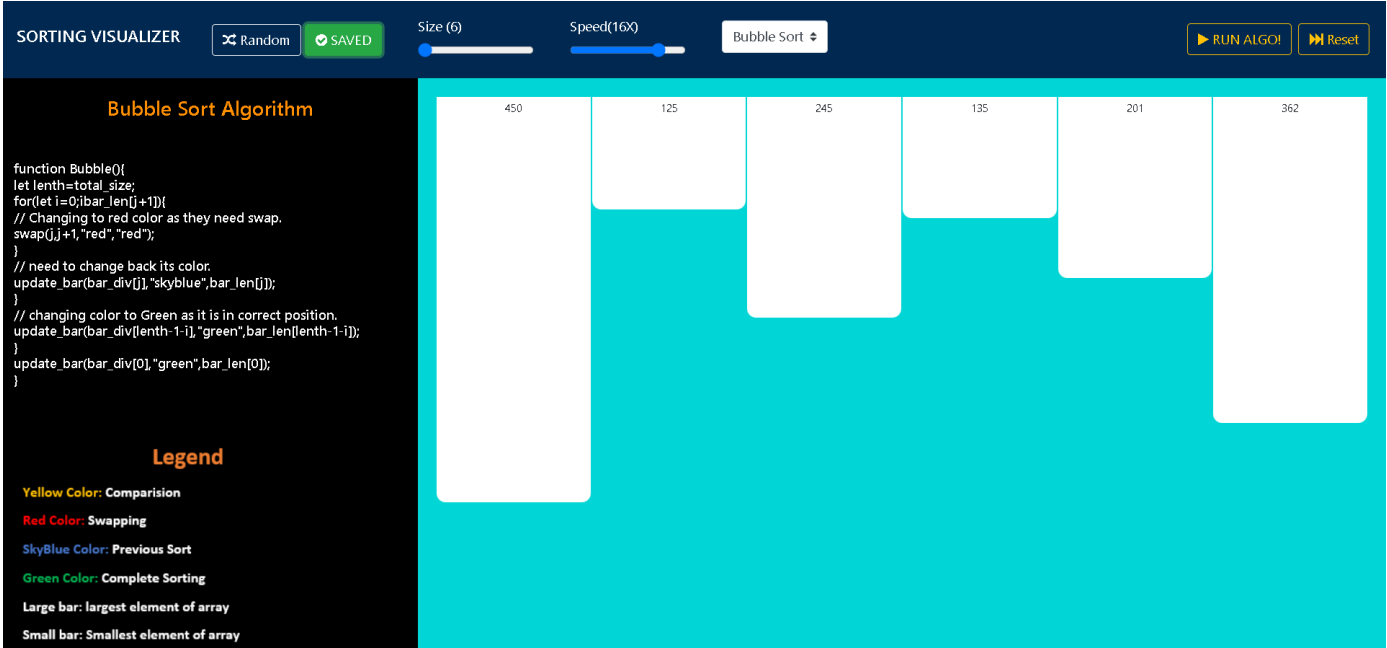## ❖ Generated Bars:



Fig :Generated Bars

# Output

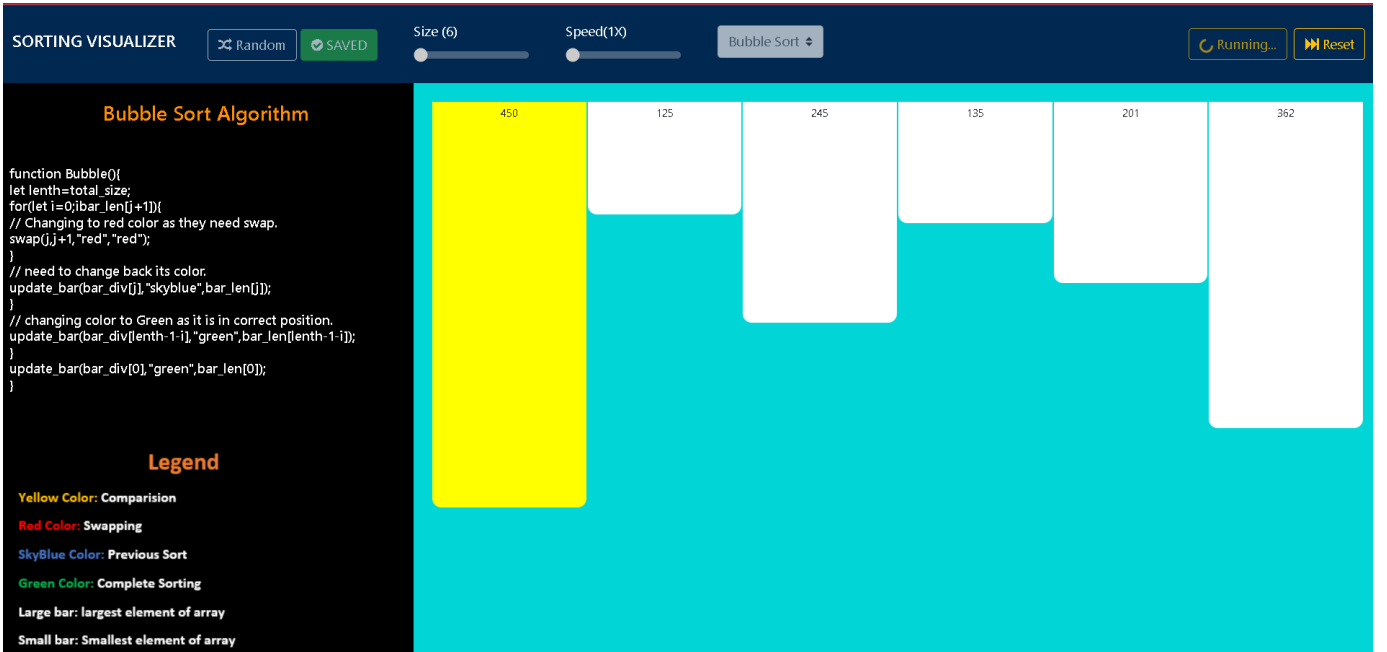## ❖ Comparison Between Elements:



Fig : Comparison Between Elements

## ❖ Swapping Between Elements:



Fig : Swapping Between Elements
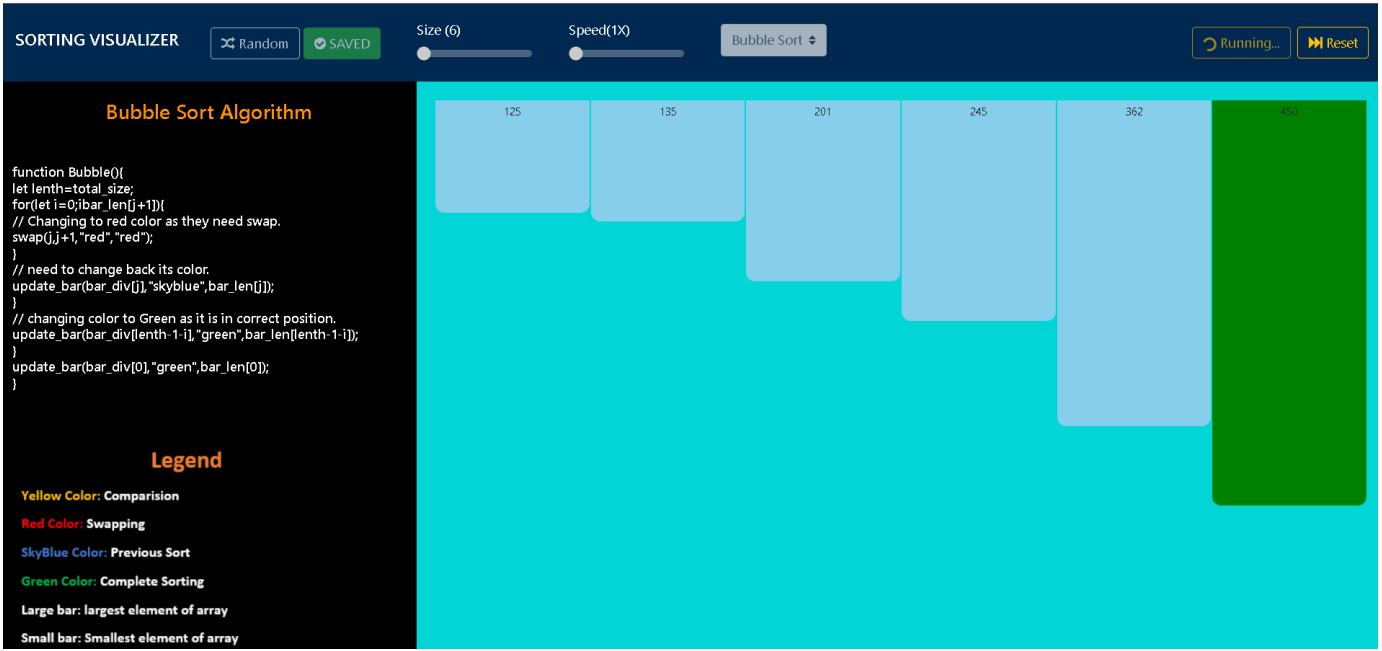
## • Previous Sort:
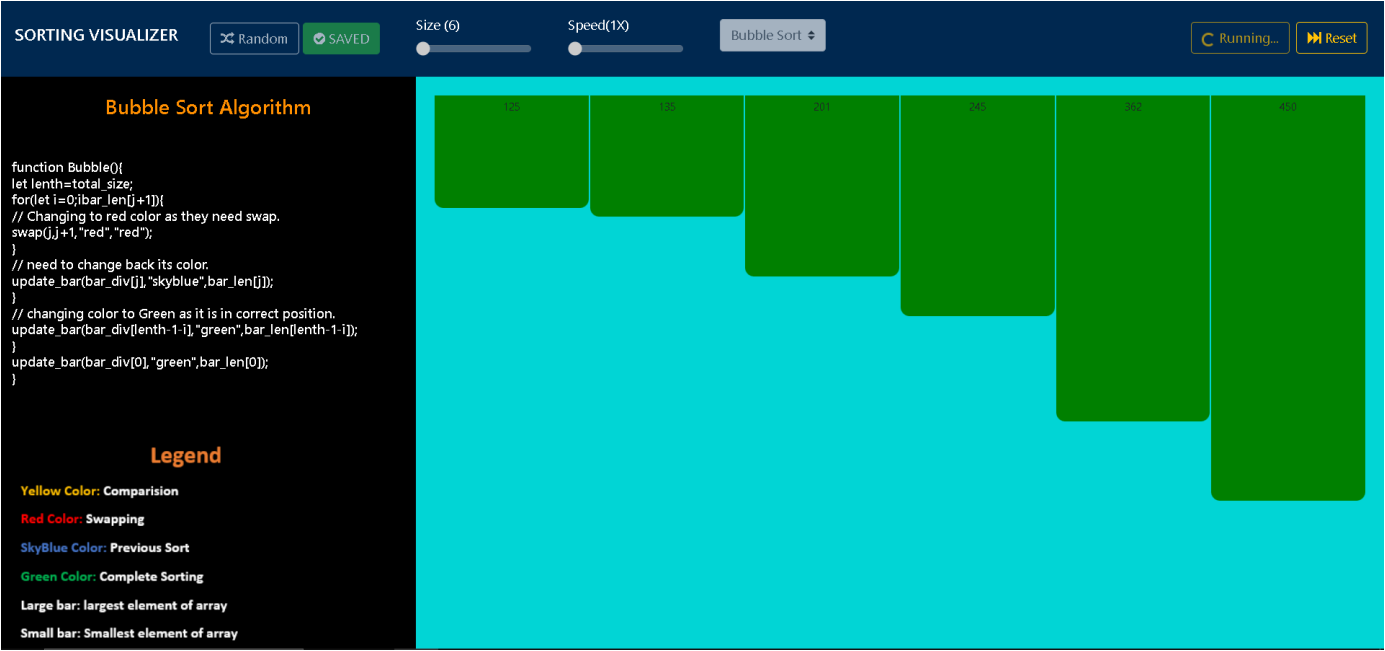


Fig : Previous Sort

## ❖ Successfully Sorted:



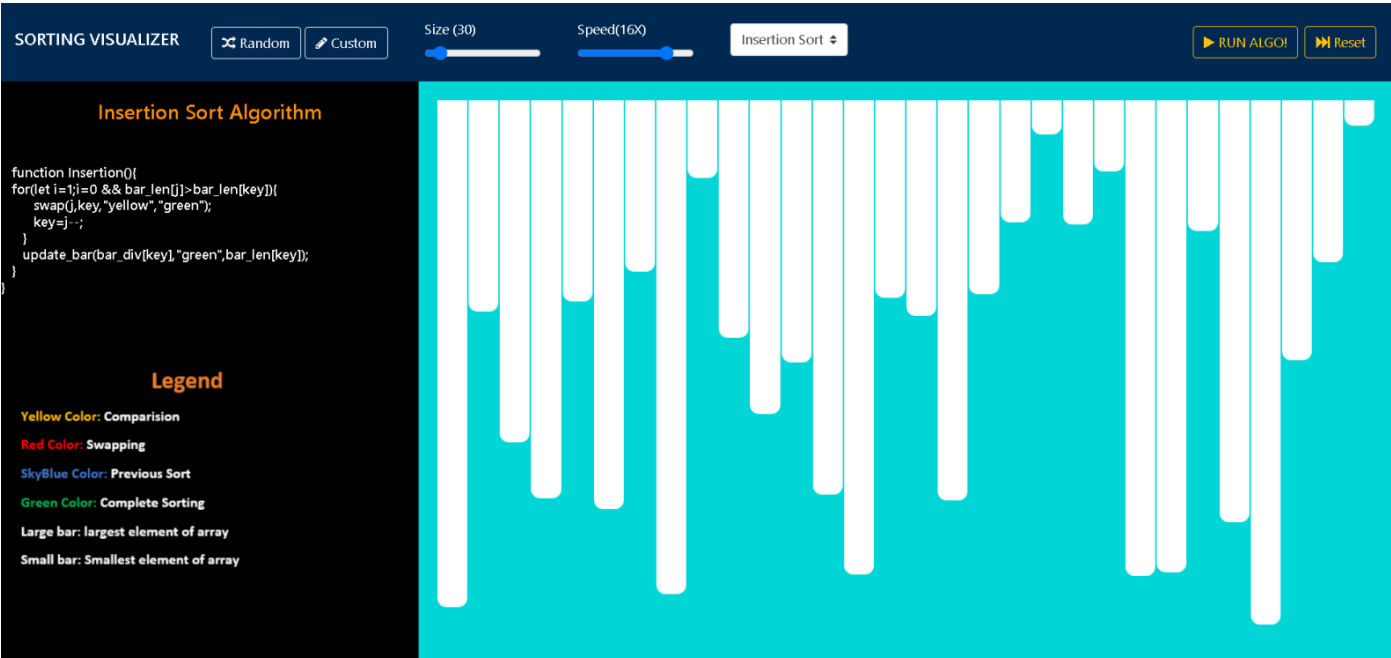Fig :Successfully Sorted

## ❖ Insertion Sort



Fig : Insertion Sort

**16. Expected Date Of Completion(May 2023)**

**17. Approximate Expenditure:**

| Sr. No | Project Stage | Formulae used | Effort in Days |
|---|---|---|---|
| 1 | Planning | 20 percent of Project Life Cycle effort | 20 Days |
| 2 | Requirement Gathering Requirement Analysis Design | 80 percent of Project Life Cycle effort | 90 days |
| 3 | Development Or Coding Effort | 25percent of Project Life Cycle effort | 30 days |
| 4 | Testing | 20 percent of Project Life Cycle effort | 23 days |
| 5 | Project Management Effort | 25 percent of Project Life Cycle effort | 29 |
| 6 | User Testing | 20 percent of Project Life Cycle effort | 23 |
| | Total No of days Effort Required | | 215 days |

| Sr. No. | Title | Calculation |
|---|---|---|
| 1 | Number of Hours Per Day | 3 Hours |
| 2 | Totals Hours Required | Hours * Days 3 * 215 645 Hours |
| 3 | Cost per hour | 81Rs |
| 4 | Total cost | 645*81 52,245Rs |

## 18. References

[1] D. Merlini, S. Petruzzi, R. Sprugnoli and M. C. Verri, "A system for algorithms' animation," *Proceedings IEEE International Conference on Multimedia Computing and Systems*, 1999, pp. 1033-1034 vol.2, doi: 10.1109/MMCS.1999.778649.
https://ieeexplore.ieee.org/document/778649

[2] E. Vrachnos and A. Jimoyiannis, "DAVE: A Dynamic Algorithm Visualization Environment for Novice Learners," *2008 Eighth IEEE International Conference on Advanced Learning Technologies*, 2008, pp. 319-323, doi: 10.1109/ICALT.2008.148.
https://ieeexplore.ieee.org/document/4561697

[3] Thakkar, Kavita, S. Dash and S. K. Joshi, "Sorting Algorithm visualizer," 2022 International Conference on Cyber Resilience (ICCR), 2022, pp. 1-5, doi: 10.1109/ICCR56254.2022.9996059.

https://ieeexplore.ieee.org/document/9996059

[4] Goswami, A. Dhar, A. Gupta and A. Gupta, "Algorithm Visualizer: Its features and working," 2021 IEEE 8th Uttar Pradesh Section International Conference on Electrical, Electronics and Computer Engineering (UPCON), 2021, pp. 1-5, doi: 10.1109/UPCON52273.2021.9667586.

https://ieeexplore.ieee.org/document/9667586

[5] V. Karavirta and C. A. Shaffer, "Creating Engaging Online Learning Material with the JSAV JavaScript Algorithm Visualization Library," in IEEE Transactions on Learning Technologies, vol. 9, no. 2, pp. 171-183, 1 April-June 2016, doi: 10.1109/TLT.2015.2490673.
https://ieeexplore.ieee.org/document/7298430

[6]  https://www.geeksforgeeks.org/

[7] https://www.researchgate.net/publication/315662067_Sorting_Algorithms

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**Date**

| Roll No. | Name of Student | Signature |
|----------|-----------------|-----------|
| **28** | Aishwarya Anand Kumbhar | |
| **26** | Rutuja Arjun  Mane | |
| **33** | Aarti  Madhukar Palande | |
| **20** | Muskan Hanif Shaikh | |

**Project Guide**                                             **HOD**