Path Finding and Sorting Visualizer

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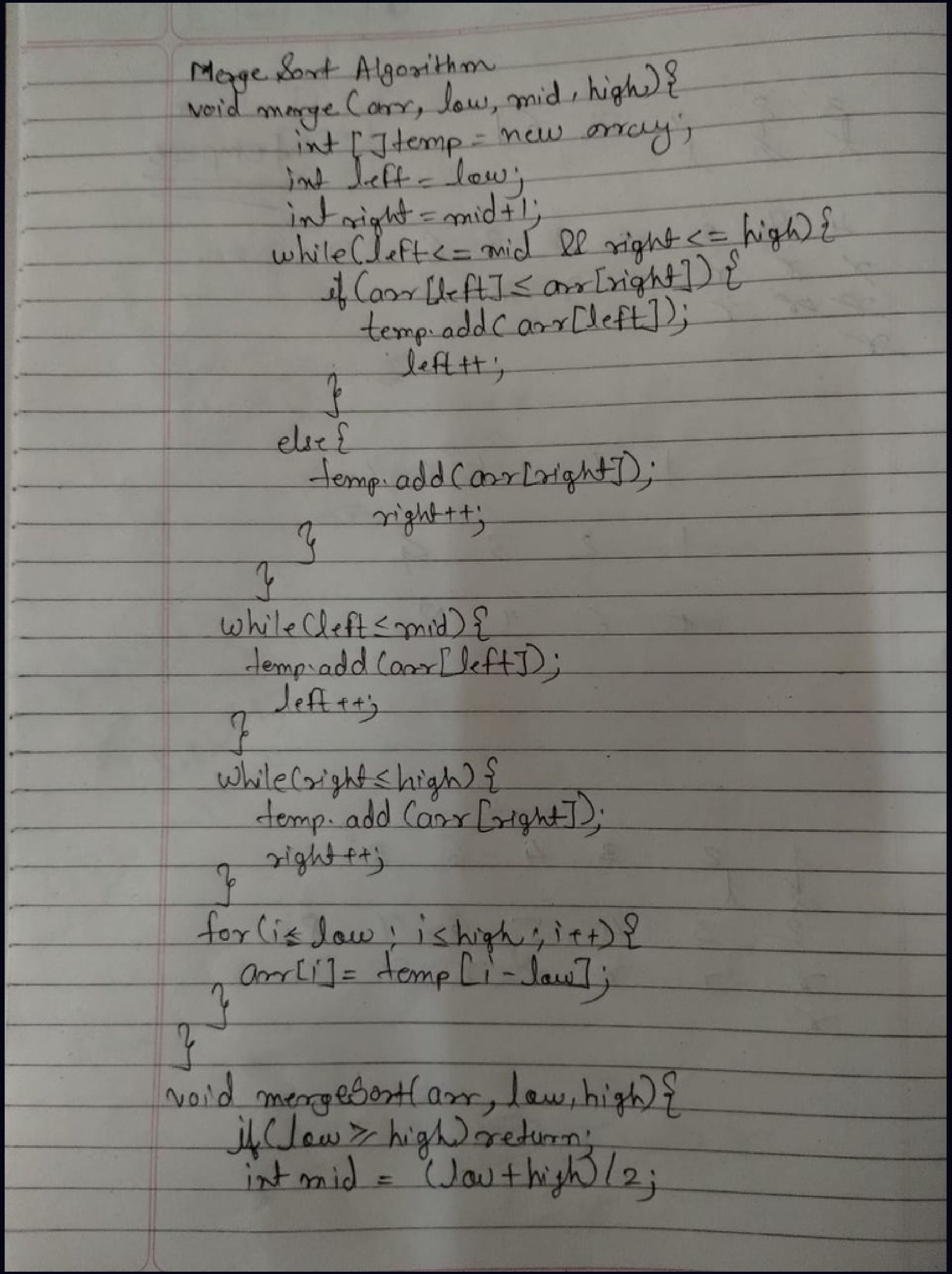
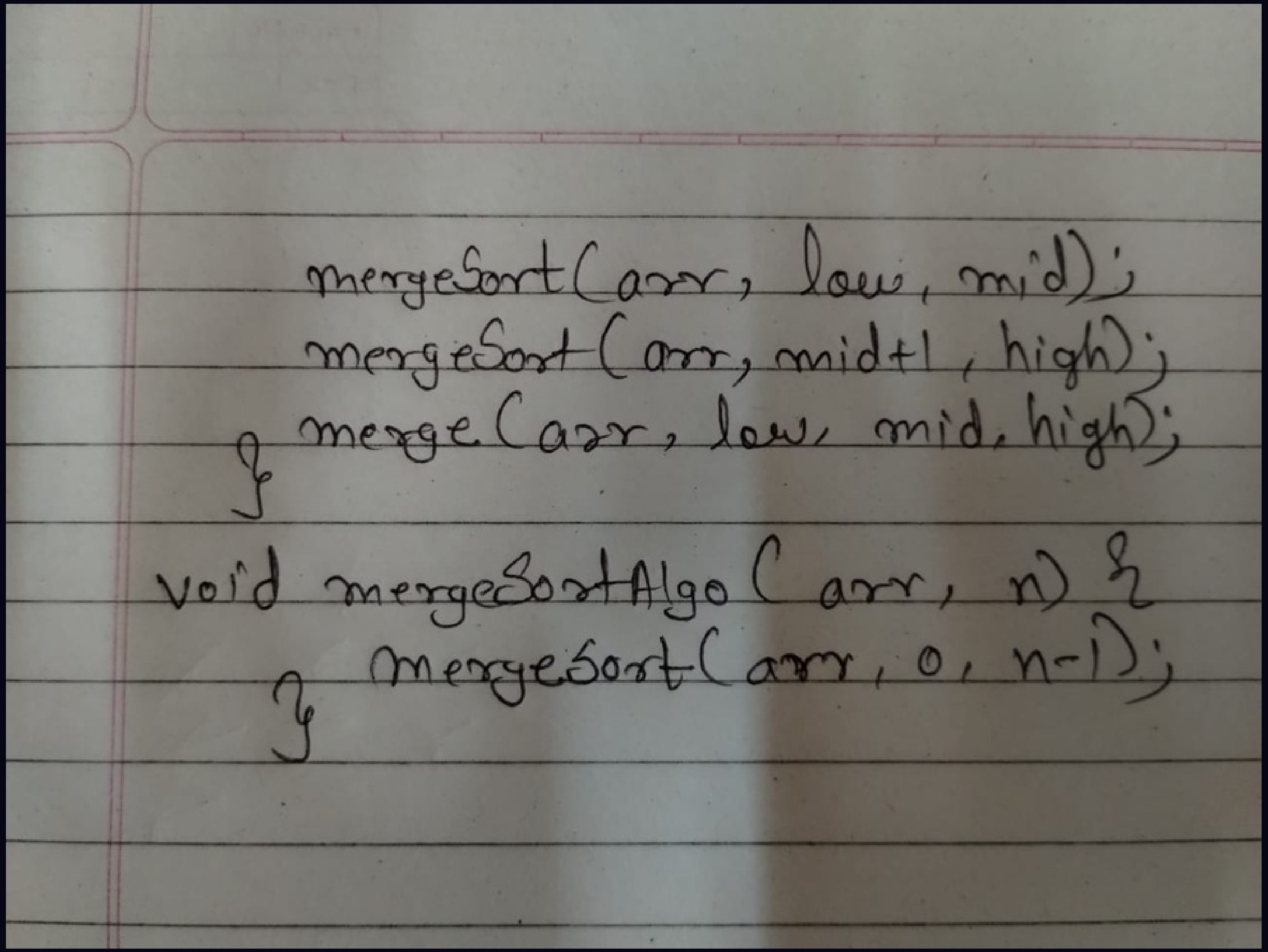
INTRODUCTION

- When we talk about complex subject topics like Algorithms, it becomes extremely necessary for students to have a strong grip over the topic as it would form the foundation of their computational thinking and programming skills.
- We had observed that through conventional methods of teaching it becomes a little difficult for students to understand the concept and also for teachers to explain their thoughts.

CONVENTIONAL METHOD



```
Merge Sort Algorithm
void merge(arr, low, mid, high){
      int[]temp = new array;
      int left = low;
      int right = mid+1;
      while(left<= mid && right <= high){
         if(arr[left] ≤ arr[right]){
            temp.add(arr[left]);
               left++;
         }
      else{
         temp.add(arr[right]);
            right++;
      }
   }
   while(left ≤ mid){
     temp.add(arr[left]);
       left++;
   }
   while(right ≤ high){
     temp. add(arr[right]);
      right++;
   }
   for(i≤ low ; i≤high ; i++){
      arr[i] = temp[i-low];
   }
}
void mergeSort(arr, low, high){
   if(low ≥ high) return;
    int mid = (low+high)/2;
```



```
         mergeSort(arr, low, mid);
         mergeSort(arr, mid+1, high);
         merge(arr, low, mid, high);
     }
void mergeSortAlgo(arr, n){
          mergeSort(arr, 0, n-1);
    }
```

INTRODUCTION

- Motivated by the age-old saying, “a picture speaks more than thousand words”, many researchers and educators assume that students would learn an algorithm faster and more thoroughly using algorithm visualization techniques.
- So, we developed a method of learning through visualization and hand-on experience over different searching and sorting algorithms which is bound to help the students and teachers.

PROBLEM STATEMENT

“An algorithm must be seen to be believed.” are the famous words said by Donald Knuth, a computer scientist. Just like that, with the help of this project we are trying to do the same. This tool can help beginners and even experienced programmers to visualize algorithms in a better manner. So we have made an interactive UI to visualize few of the most popular sorting and path finding algorithms.

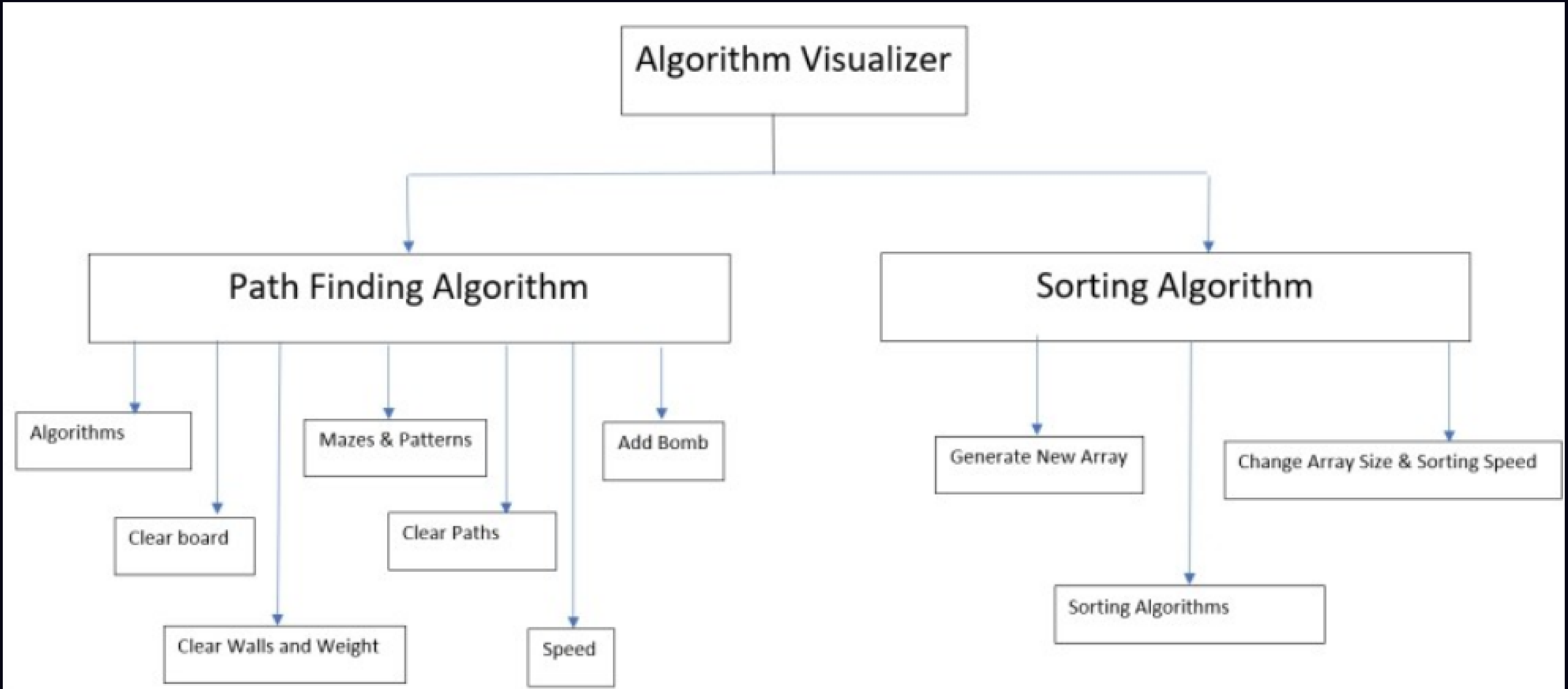
ABSTRACT

Dijkstra algorithm, A* algorithm, Breadth first search, and depth first search are some of the most popular path finding algorithms today. As a beginner's step to algorithms and their implementation, this project demonstrates how the path finding algorithm works. In the present work we have tried to develop a path finding and sorting visualizer using the technologies like HTML, CSS, JavaScript and Reactjs. Sorting visualizer will be displaying the working mechanism of various sorting algorithms like Bubble sort, selection sort, insertion sort, quick sort, and merge sort.

OBJECTIVES

- The goal of this project is to create a web based e-learning tool, which can be used to visualize shortest path and sorting algorithms.
- Students as well as experienced people can sharpen their skills using this tool.
- This tool introduces to a more mindful way to learn these data structures concept rather than a theoretical way of learning.
- User is allowed to choose the type of obstacles according to their will ,with the algorithm to function between the source and the destination.

WORKING


Algorithm Visualizer
Path Finding Algorithm
Sorting Algorithm
Algorithms
Clear board
Clear Walls and Weight
Mazes & Patterns
Clear Paths
Speed
Add Bomb
Generate New Array
Change Array Size & Sorting Speed
Sorting Algorithms

ALGORITHMS

Sorting Algorithms:

- Bubble Sort
- Selection Sort
- Insertion Sort
- Quick Sort
- Merge Sort.

Searching Algorithms:

- Dijkstra algorithm
- A* algorithm
- Breadth-first Search
- Depth-first Search

Literature Survey

DEVELOPMENT OF TOOL FOR VISUALIZING PATHFINDING ALGORITHMS

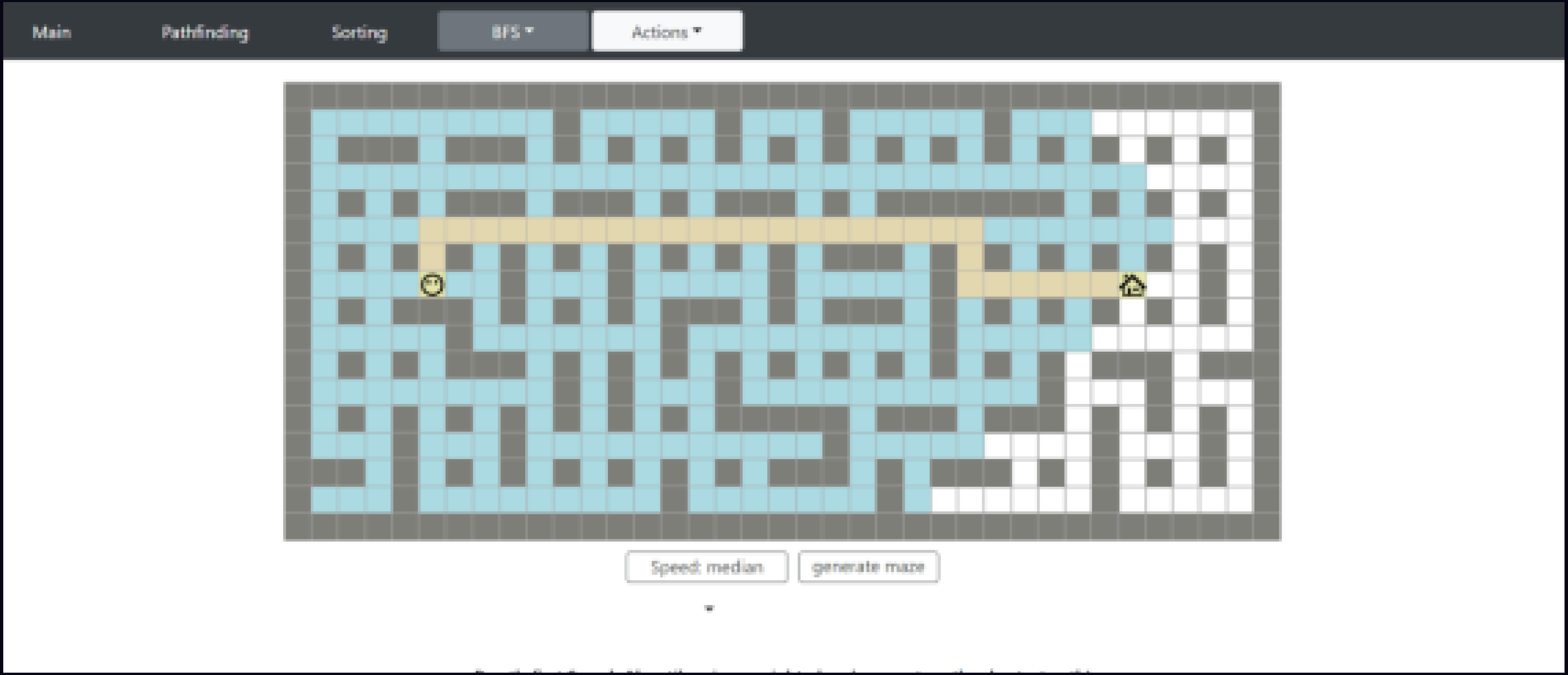
Dr. Simmi Dutta, 30 July 2021

The development of this project has been carved out in 6 phases. These phases include all the steps of the project, beginning from data collection and processing to output for the user.

The 6 phases are:

➢ Building of the graph matrix.
➢ Adding walls and event listeners.
➢ Embed the graph algorithms.
➢ Integrate the pathfinding functionality.
➢ Improve the design and UI.
➢ Added the timer functionality.

After all these phases the project is completely ready for the user to use. a pathfinding visualizer that
was implemented and created using entirely open source off the shelf software. By making this
particular project we made it easy to understand and learn about the algorithms.


Main
Pathfinding
Sorting
BFS
Actions
Speed: median
generate maze

DEVELOPMENT OF SORTING VISUALIZER

Dr. A. Vijay Kumar

➢ Visualization techniques are generally used for the graphical representation or presentation of data or information.

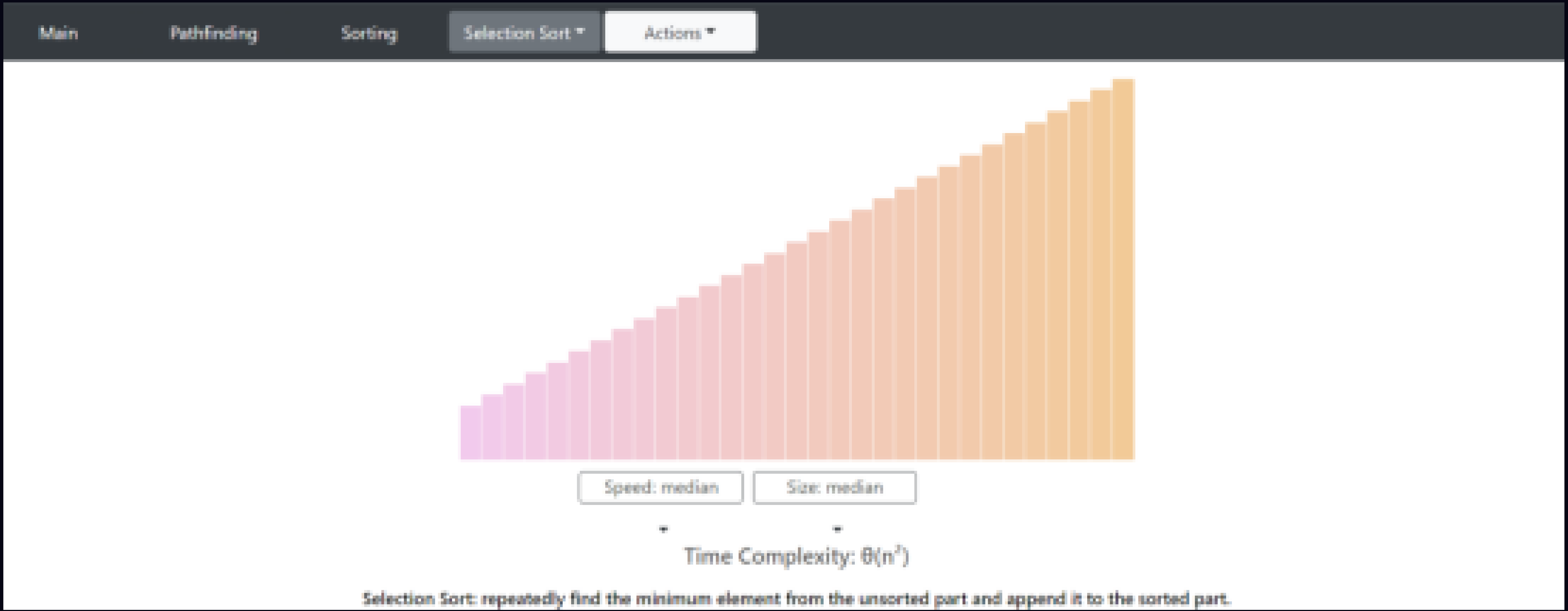
➢ This visualizations or simulations produce lot of files that contains data values. Data are converted into visual form so that it can be analyzed to solve the problems.

➢ By using Visualizer we can create new array, choose the size of the array, speed. The speed and size of the array are divided into 5 ranges.

➢ The speed of the visualization is directly depends upon the size of the array. The size of the array directly determines width and block size.

➢ The sorting process majorly depends upon the sorting algorithm used, array size, so the time taken to visualize the sorting process may also change. In the present work.

➢ When we choose generate new array, a new array with some random size is created using Math.random() and array is visualized in the form of a bar graphs.



Speed: median

Size: median

Time Complexity: $\Theta(n^2)$

Selection Sort: repeatedly find the minimum element from the unsorted part and append it to the sorted part.

PUBLICATIONS AND AWARDS

Publication: Kule Isha; Mahida Aesha; Sanskruti Sankhe: "Path finding and sorting Visualizer": A web based tool for learning and visualizing algorithms via animations.
Submitted to: Indian Journal
Awards: First runner up: Track-4(Web of things), VNPS-2023, Vidyavardhini's College of Engineering and Technology, Vasai, India

THANK YOU