Computer Graphics Project : Selection Sort Visualization

Software Requirement Specification

- Platform : A computing platform describes some sort of Framework either in software of hardware which allows the software to run (typical platform : Computer architecture, OS, programming language and runtime libraires.)
- API's and Drivers : software using extensive use of special hardware display adapters need special API's and drivers.

Minimum Software Requirement

- Programming language: C/C++ using OpenGL
- Operating system: Ubuntu
- Compiler: C Compiler
- Graphics library: GL/glut.h

Implementation of the Project

Overview

In computer science, selection sort is a sorting algorithm, specifically an in-place comparison sort. It has O(n^2) time complexity, making it inefficient on large lists, and generally performs worse than the similar insertion sort. Selection sort is noted for its simplicity, and it has performance advantages over more complicated algorithms in certain situations, particularly where auxiliary memory is limited.

Objectives

Sorting is a common algorithm studied in information technology, computer science, and engineering. In computer science particularly algorithm, selection sorting algorithm is an algorithm for sorting a series of data. This concept is difficult to be understood for students who study computer science, especially creating coding in programming language. Therefore one of the solutions is to provide the students algorithm visualization. Many of the phenomena treated in engineering are dynamic and/or three dimensional; often these phenomena are very difficult to be represented in the conventional print media, however it is anticipated that visualization has the capacity to do a much better job. Visualization is gaining its popularity to implement in education institutions either in distance learning or in blended learning. The development of algorithm visualization should be able to observe the condition of student concerned, due to the changes in paradigm of learning which is from teacher-centred learning to student-centered learning.

Algorithm visualization uses computer graphics or multimedia to show the actions of an algorithm step by step. In this research, the algorithm visualization is used to help students understand the concept of selection sort algorithm and creating coding to visualize it. Our goal is to develop algorithm visualization of Selection Sorting Algorithm. The visualization show how all data move to the proper position in order to be sorted. It can be easily understood by students how the algorithm should be implemented in coding.

Working

Selection sort algorithm starts by comparing first two elements of an array and swapping if necessary, i.e., if you want to sort the elements of array in ascending order and if the first element is greater than second then, you need to swap the elements but, if the first element is smaller than second, leave the elements as it is. Then, again first element and third element are compared and swapped if necessary. This process goes on until first and last element of an array is compared. This completes the first step of selection sort.

If there are n elements to be sorted then, the process mentioned above should be repeated n-1 times to get required result. But, for better performance, in second step, comparison starts from second element because after first step, the required number is automatically placed at the first (i.e, In case of sorting in ascending order, smallest element will be at first and in case of sorting in descending order, largest element will be at first.). Similarly, in third step, comparison starts from third element and so on.

Algorithm Implementation

```
Selection-Sort (A)
 For i ← 1 to n-1 do
 min j ← i;
 min x ← A[i]
 for j ←i + 1 to n do
 if A[j] < min x then
 min j ← j
 min x ← A[j]
 A[min j] ← A [i]
 A[i] ← min x
```

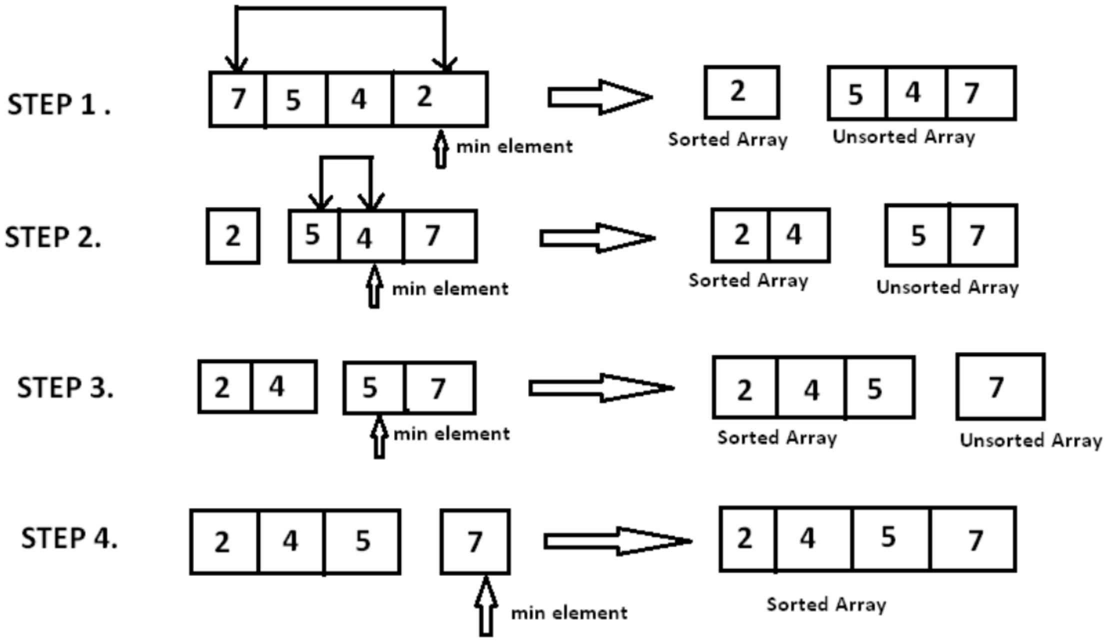
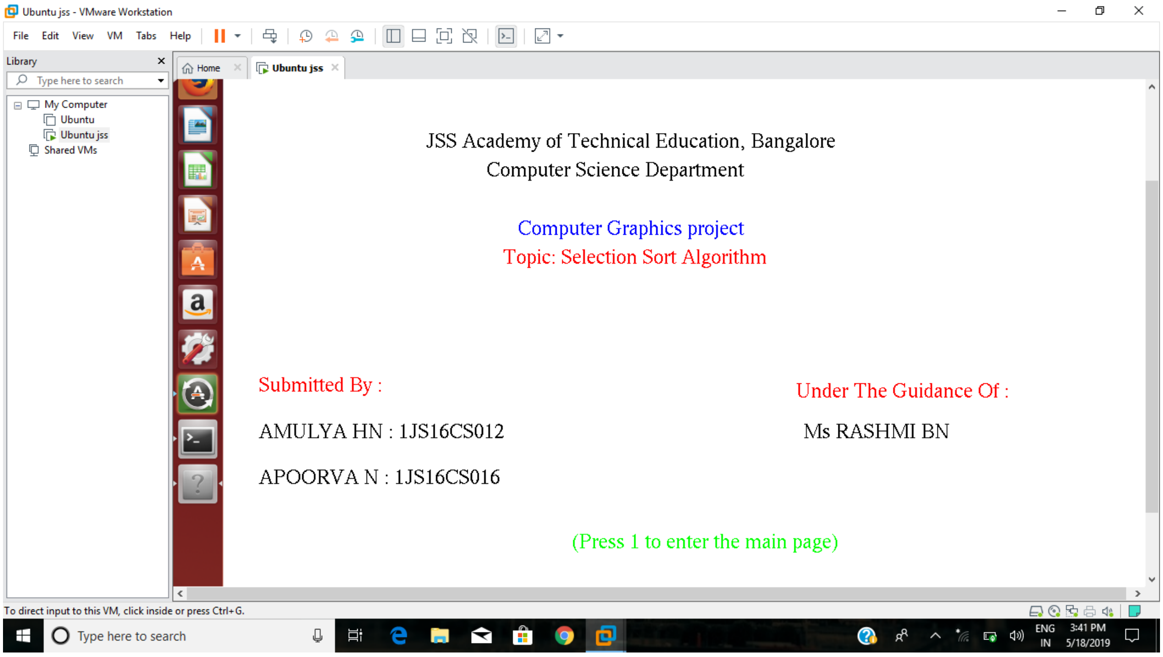


Fig: Pictorial representation of selection sort algorithm

Results and Discussion

Start Screen: In Figure 1, the front page of the program is displayed along with the names of the creators and their guiders.



JSS Academy of Technical Education, Bangalore
Computer Science Department

Computer Graphics project
Topic: Selection Sort Algorithm

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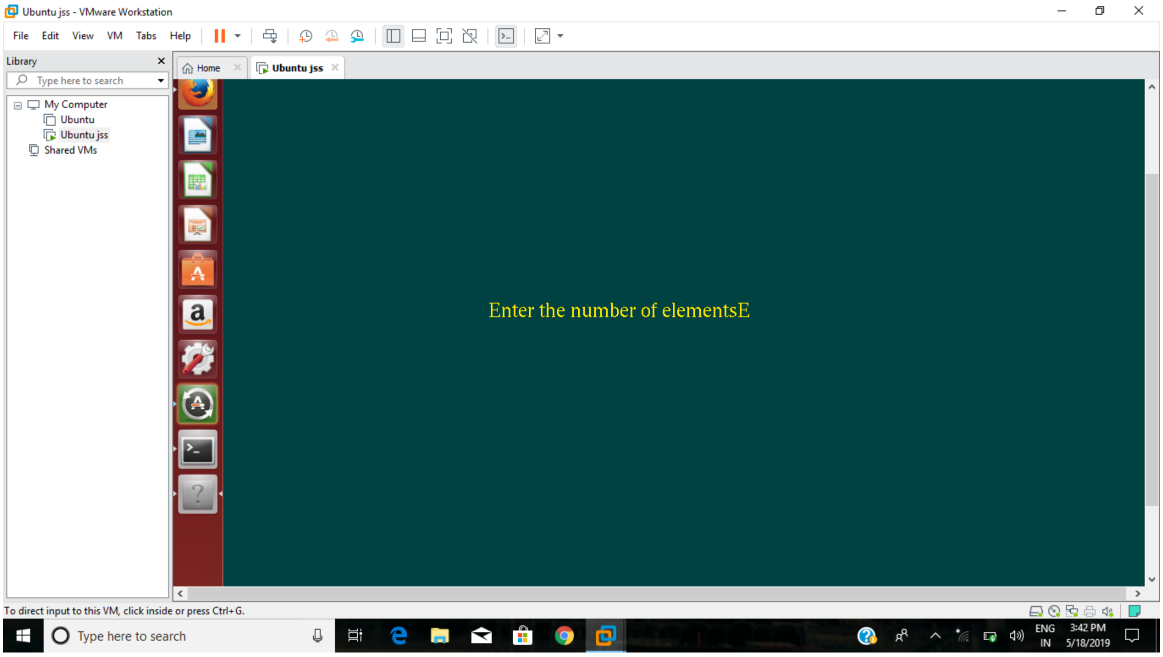
(Press 1 to enter the main page)

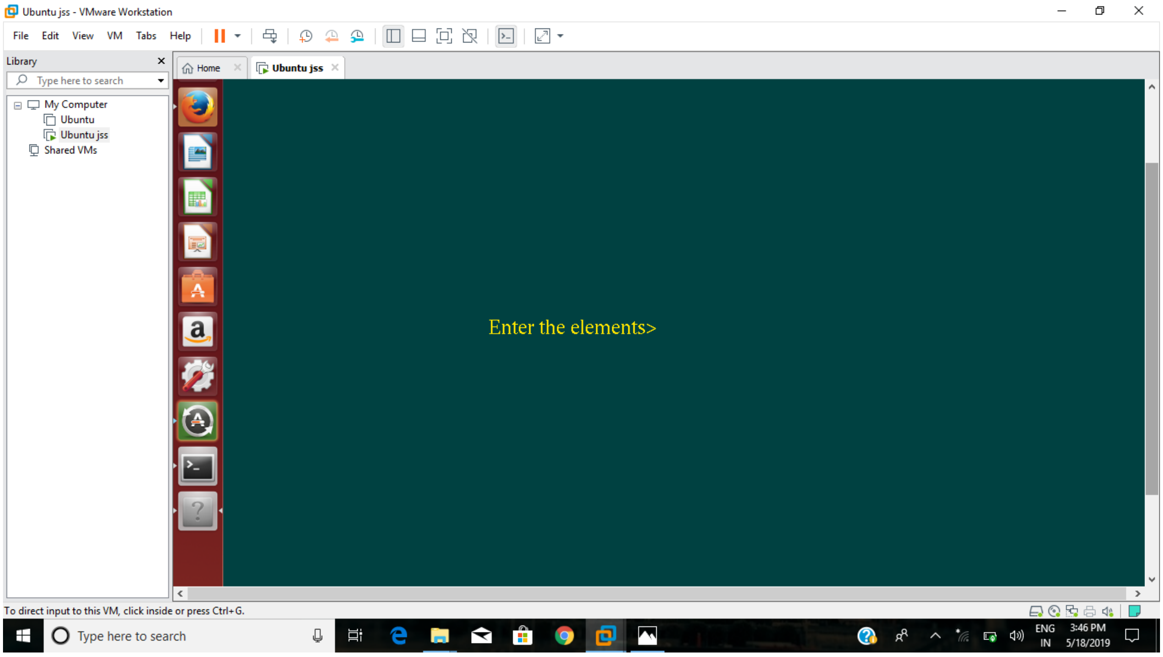
Fig 1 Start screen

User Input: In Figure 2, the program is requesting input from the user.



Enter the number of elementsE

Fig 2: User input for number of elements



```
Enter the elements>
```

Fig 2.1: User input to enter the elements

<u>Selection Sort</u>: Figure 3 depicts the process of sorting.

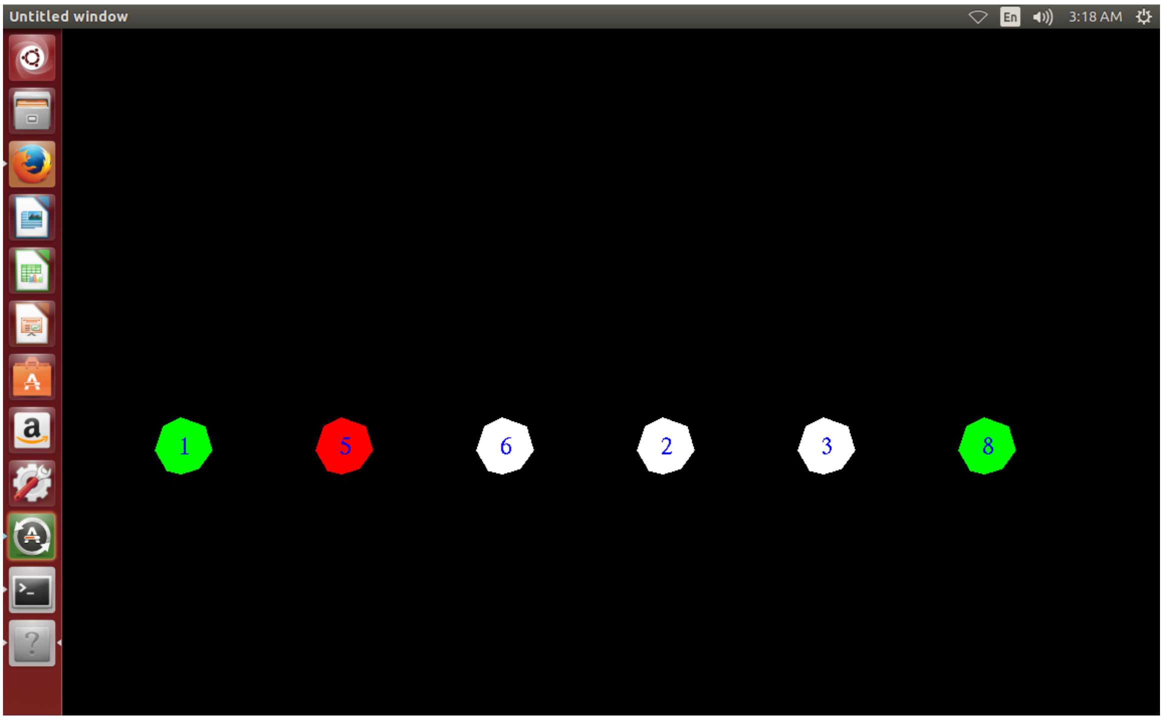
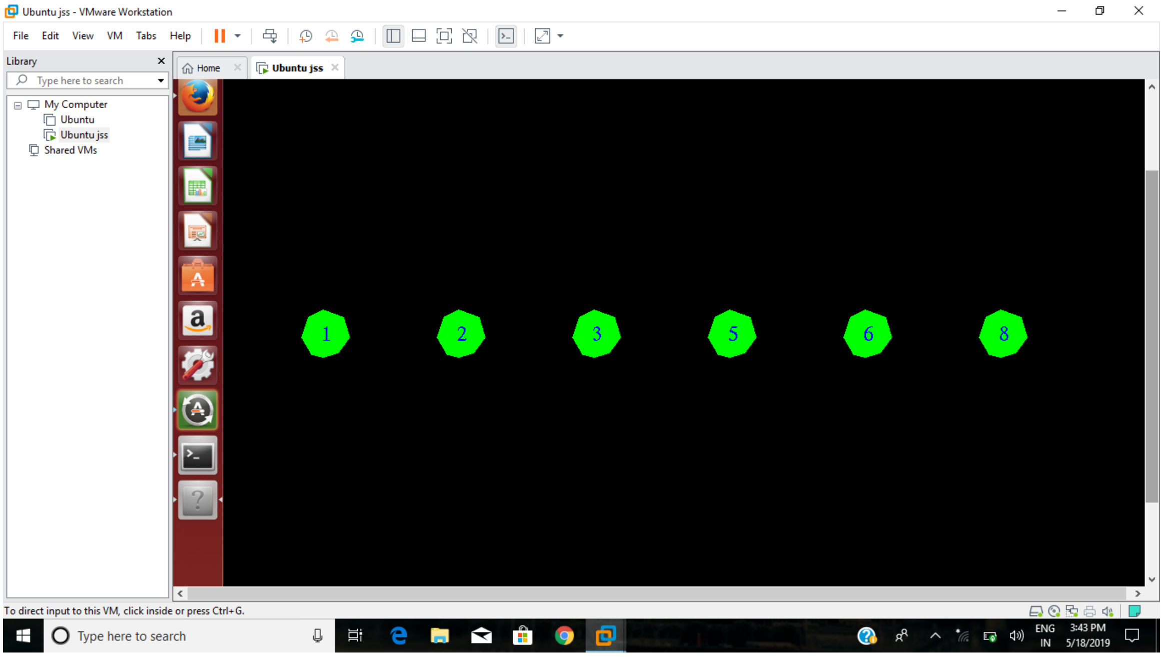


Fig 3: During the process of Selection sort



To direct input to this VM, click inside or press Ctrl+G.

Fig 3.1 After sorting is done

Menu: In Fig 4, we have implemented the a menu to change the background color of the graphics window.

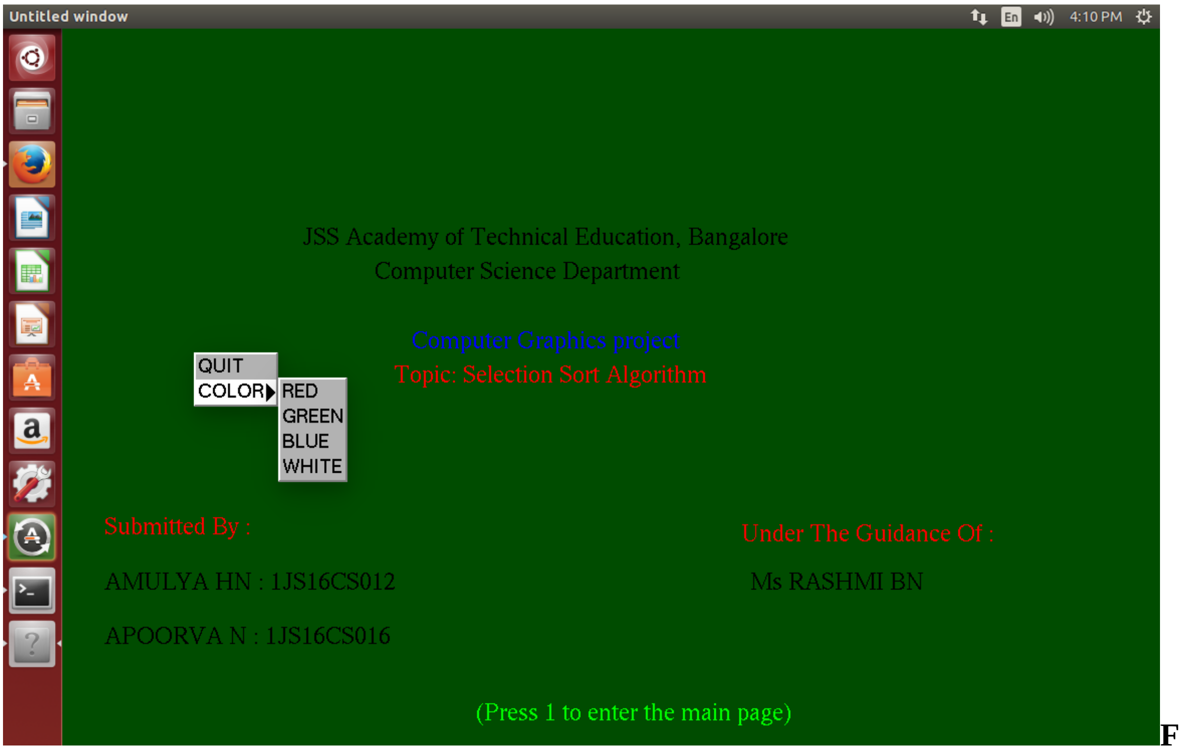


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Fig 4: Menu to change background color