

National University of Computer & Emerging Sciences
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[Sorting Algorithms Visualizer]
Project Report
Design and Analysis of Algorithms
Section: 5E-BSCS

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Abstract

There are many popular problems in different practical fields of computer sciences, database applications, Networks and Artificial intelligence. One of these basic operations and problems is sorting algorithm; the sorting problem has attracted a great deal of research. A lot of sorting algorithms has been developed to enhance the performance in terms of computational complexity. there are several factors that must be taken in consideration; time complexity, stability, memory space. This project aims to visualize all the elementary and advanced sorting algorithms suitable for different situations. It displays the time and space complexity and the time taken for each sorting function to run.

Introduction

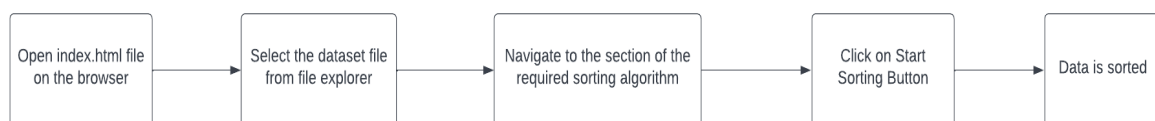
Sorting is the process of arranging a set of data in sequenced increasing or descending order based on common properties among the data items. Language Dictionary, Telephone directories, point table in any sport, posts in social media, waste sorting, etc. are a few examples of sorting in action in daily life. It is desirable to use an algorithm to perform the task for efficiency, consistency, and quality of the result. This project focuses on visualization of various sorting algorithms that can be used to sort a set of random numbers as a data set and visualize the sorting process using a web application.

Programming Design

The programming design of the project includes HTML, CSS and Bootstrap for the creation of user interface and JavaScript was used at the back to visualize the data bars and calculate the time taken for each function to run



Block Diagram representing the flow of application:

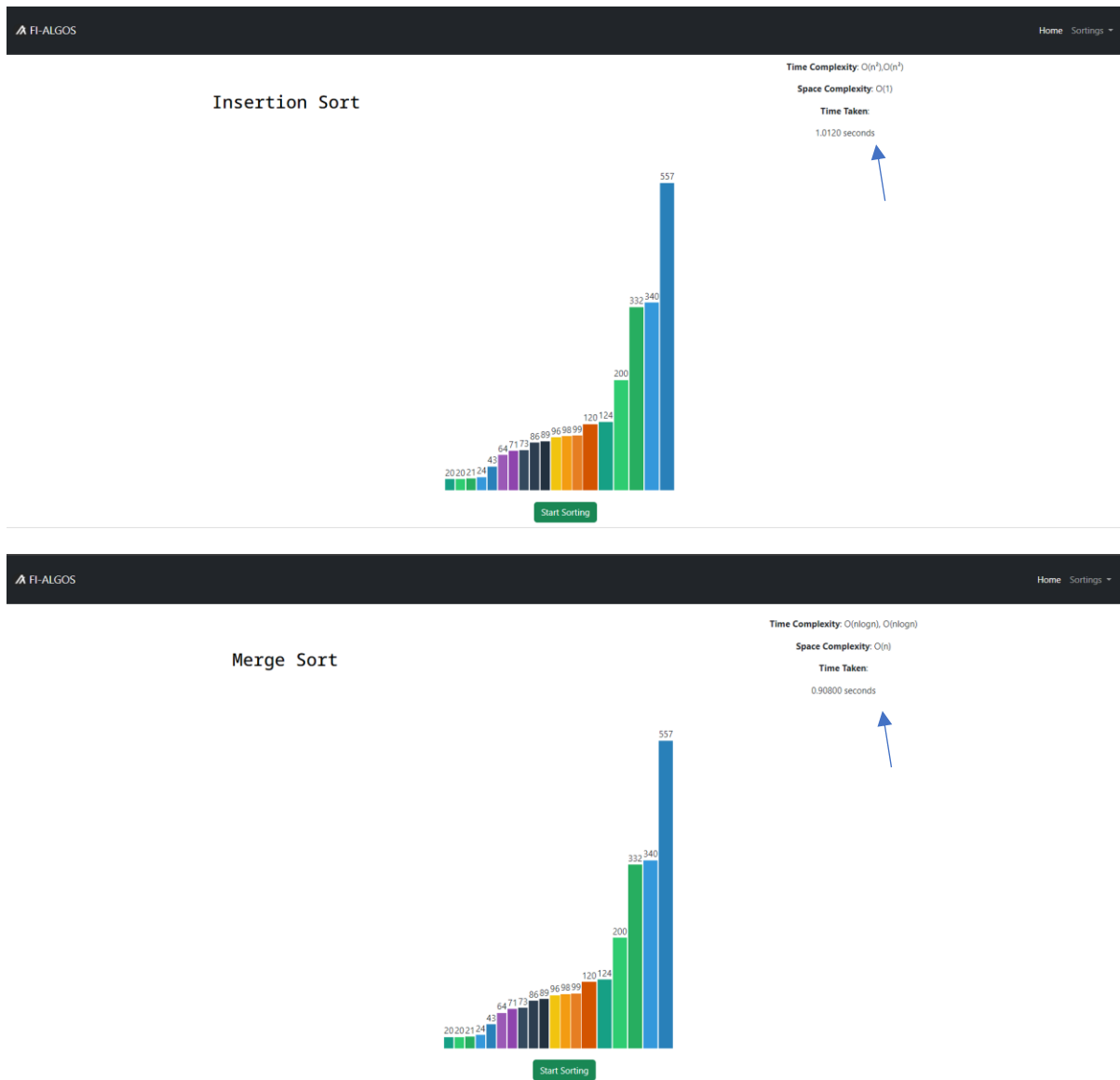


Experimental Setup

The code editor used to build this project was Visual Studio code and the version control system used to coordinate with the team members was Git for better understanding of the changes made by each member and making a clear label on the work done by each member.



Results and Discussion



As we know that the time complexity of insertion sort is n^2 while the time complexity of merge sort is $n \cdot \log(n)$ which is much better than that of insertion sort. This is clearly seen in the above pictures that when we took same array and applied insertion sort on it the time taken was 1.0120 seconds but when we applied merge sort the time taken was 0.90800 seconds, which will be a large difference if we take array of million length.

Conclusion

The goal and main objective of the thesis were to bring sorting algorithms and visualization together. The concept of sorting algorithm mostly expressed through codes and syntax was still abstract. Thus, this project was an attempt to eliminate that by creating a tool that can visualize the process and steps of sorting algorithms. The project was successful in delivering the idea of visualization of sorting algorithm through a web application and providing a separate look into the algorithm apart from lines of code and syntaxes.

References

- 1) https://www.ijsr.net/get_abstract.php?paper_id=SR211114140358
- 2) <https://ieeexplore.ieee.org/document/5987184>
- 3) https://www.researchgate.net/publication/259911982_Review_on_Sorting_Algorithms_A_Comparative_Study
- 4) https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3329410
- 5) https://www.theseus.fi/bitstream/handle/10024/507342/Bikram_Karki.pdf;jsessionid=108FBC779B80D2AEC143B89C985B68F4?sequence=2