**Objectives:** The primary objective of this lab assignment was to port a C++ class to Java, implementing the PointN class along with the base Element class. Additionally, it aimed to implement merge sort algorithms, both single-threaded and multithreaded, in Java, and analyze their performance.

**Learnings:**

* **Porting C++ Class to Java:**
  + Translated the PointN class along with the base Element class from C++ to Java, ensuring functionality and adherence to Java syntax and principles.
* **Single-Threaded Merge Sort:**
  + Implemented the merge sort algorithm using the norm of n-dimensional points in Java.
  + Generated random arrays of different sizes and measured the execution time for sorting to evaluate the algorithm's performance.
* **Multithreaded Merge Sort:**
  + Developed a multithreaded merge sort in Java using polymorphic base class references.
  + Ensured correctness by testing the algorithm with a dummy test case and measured its performance using the same set of test cases.

**Challenges:**

* Porting the C++ class to Java involved adapting the syntax, understanding differences in language features, and ensuring the translated class maintains its functionality, posing challenges in code translation and syntax conversion.
* Implementing multithreaded merge sort required careful synchronization and thread management, which was challenging due to potential concurrency issues and ensuring correctness in multithreaded execution.

**Key Notes:**

* Porting classes from one programming language to another involves understanding language-specific syntax and principles while maintaining the original functionality.
* Single-threaded merge sort may showcase different performance characteristics based on the array size, while multithreaded merge sort's performance might vary concerning system architecture and available resources.

**Conclusion:** This lab assignment encompassed porting a C++ class to Java, implementing merge sort algorithms in Java, and comparing the performance of single-threaded and multithreaded approaches. It facilitated understanding the intricacies of language translation, sorting algorithms, multithreading, and performance analysis in Java programming.

*Note: All the outputs are in* ***output.txt*** *file of* ***source\_code*** *folder.*