CS-499-10876-M01

Computer Science Capstone

Milestone 3 Enhancement 2 Algorithms & Data Structure

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#### **Milestone Three: Enhancement Two: Algorithms & Data Structures**

#### **Narrative**

**1. Briefly describe the artifact. What is it? When was it created?**

This artifact is still the same simple calculator application initially developed during the CS310 course. The calculator performs basic arithmetic operations and has been enhanced to showcase my skills in algorithms and data structures. This artifact was created to demonstrate foundational programming concepts and has been modified to include more advanced handling of operations and input.

**2. Justify the inclusion of the artifact in your ePortfolio. Why did you select this item? What specific components of the artifact showcase your skills and abilities in algorithms and data structures? How was the artifact improved?**

The calculator was chosen for its straightforward demonstration of essential concepts in data handling and algorithmic processing. The following enhancements illustrate significant improvements:

* **Improved Exception Handling**: Enhanced error management using std::invalid\_argument and std::out\_of\_range exceptions to handle invalid and out-of-range inputs robustly.
* **Data Structures Optimization**: Improved the efficiency of operation lookups by potentially switching from std::map to std::unordered\_map in Operations.h.
* **Generic Operation Handling**: Added support for dynamically defining new operations using GenericUnaryOperation, which showcases flexibility in handling various mathematical operations, such as sqrt.
* **Enhanced Input Parsing**: Introduced InputParser to manage and tokenize input strings efficiently, facilitating better command handling and data processing.

In these changes, I tried to highlight my ability to optimize performance and maintain code robustness, crucial aspects of effectively managing data structures and algorithms.

**3. Did you meet the course objectives you planned to meet with this enhancement in Module One? Do you have any updates to your outcome-coverage plans?**

Yes, I believe that the course objectives related to improving the algorithmic efficiency and robustness of the code have been met. The enhancements address performance improvements, error handling, and the flexibility of adding new operations. These changes reflect a deeper understanding of efficient data processing and error management strategies.

**4. Reflect on the process of enhancing and modifying the artifact. What did you learn as you were creating it and improving it? What challenges did you face?**

Enhancing this artifact involved a thorough understanding of how data structures impact the application's performance and usability. The main challenges included ensuring that new generic operations were integrated seamlessly and managing exceptions effectively. This process reinforced the importance of robust error handling and the benefits of using more efficient data structures. It also emphasized the need for clear and maintainable code, especially when introducing new functionalities.

Through this enhancement process, I realized the critical role that version control plays in software development. Having a robust version control system would have allowed better tracking of changes, facilitated debugging, and ensured that I could easily revert to previous states of the project; I had to do that manually in most cases. Version control not only aids in managing the evolution of the software but also serves as an essential tool for team collaboration and maintaining the integrity of the development process.