**CPT-281 Team Project 2A: Infix Expression Parser**

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Project Summary:

This project is an Infix expression parser System that helps parse an infix expression that supports arithmetic and logical operators with specified precedencies. The system utilizes stacks for efficient management of expression data.

Technical Requirements:

▪ The Infix expression parser system will support:

Operator Precedence Example

1) Power ( ‘^’ ) 7 2 ^ 8

2) Arithmetic ( ‘\*’, ‘/’, ‘%’ ) 6 6 \* 2

3) Arithmetic ( ‘+’, ‘-’ ) 5 6 - 2

4) Comparison ( ‘>’, ‘>=’, ‘<’, ‘<=’ ) 4 6 > 5

5) Equality Comparison ( ‘==’, ‘!=’ ) 3 6 != 5

6) Logical And ( ‘&&’ ) 2 6 > 5 && 4 > 5

7) Logical Or ( ‘| |’ ) 1 1 | | 0

▪ The infix expression parser is flexible with the given expressions. The user don’t need to worry about writing the spaces between operands and operators

▪ The file that keeps track of the infix expression is a plain text file. An original file input format is made based on this example:

((2 + 3) \* 4) - (5 \* (6 - 7))

(1 | | (0 && 1)) && (1^ ( 1 && 0 ))

(( 2 \*3) ^ 2 ) + ( 4\* 5) % 3

In the example above, each line stores a valid infix expression with appropriate suitable operators and operands.

**System Design:**

**Data Structures:**

**UML:**

A diagram of a function

Description automatically generated

**Test Cases:**

**Team Member Contributions:**

* **Athul Jaishankar:**
* **Expression\_Parser.h:** Implemented the Expression\_Parser class, responsible for parsing infix expressions and evaluating the result. Defined method for parsing and evaluating infix expressions, handling operator precedence. Also, created the handle\_error method for handling exceptions.
* **Expression\_Parser.cpp:** Implemented all methods of the Expression\_Parser class. Developed algorithms for parsing infix expressions while maintaining their format for efficiency. Ensured error handling by throwing exceptions and handling them.
* **Convert\_to\_postfix.h:** Defined a class called Convert\_to\_postfix with a method infix\_to\_postfix to convert infix expression to postfix notation.
* **Convert\_to\_postfix.cpp:** Implemented the functionalities declared in the header file for the Convert\_to\_postfix class. This implementation includes the constructor and destructor for the class, as well as the infix\_to\_postfix method.
* **Evaluate\_postfix.h:** Defined a class called Evaluate\_postfix with a method postfix\_evaluator to evaluate postfix expression.
* **Evaluate\_postfix.cpp:** Implemented the functionalities specified in the Evaluate\_postfix header file. This implementation includes the constructor and destructor for the class, along with the postfix\_evaluator method, which evaluates postfix expression to produce numeric outcomes.
* **Main.cpp:** Implemented the logic to read infix expressions from an input file, parser and evaluate each expression using the Expression\_Parser class, and display the result to the console. Integrated file I/O operations for input file handling and collaborated with team members to create and execute test cases. Addressed questions regarding program design and functionality.
* **Bug Fixes:** Addressed issues related to incorrect output for expressions like ‘2 ^ 3 ^ 2’ by fixing the power function to calculate the exponents correctly. Ensured that the program generates the expected output for all test cases.
* **Project Management:** Took the initiative to lead the project by designing the overall structure and goals of the infix expression parser system. Scheduled and organized team meetings to facilitate communication and collaboration among team members, ensuring smooth progress throughout the project.
* **Task Division:** Effectively divided tasks among team members, assigning responsibilities for coding, testing and documentation.
* **Testing:** Collaborated with team members to create test cases covering various expressions and scenarios. Verified the correctness of the program by comparing the actual output with the expected output.
* **Quality Assurance:** Ensured code quality by writing clean, well-commented code with meaningful variable names and function names. Maintained an organized repository structure and adhered to coding standards to facilitate code review and future maintenance. Effectively divided tasks among team members, assigning responsibilities for coding, testing and documentation.
* **Timothy Huffman:**
* **System Design Explanation:** Provided insights into the overall system design in the project report. Explained the architecture and structure of an infix expression parser system, ensuring clarity and coherence in the documentation.
* **Data Structures Explanation:** Detailed the role of data structures used in the infix expression parser system. Explained how each data structure contributed to efficient expression parsing and evaluation.
* **In-Line Comments**: Added in-line comments to the convert\_to\_postfix and evaluate\_postfix files, improving code readability and comprehension of team members.
* **Meeting Attendance and Questions**: Actively attended team meetings, contributing to discussions on project progress and asking follow-up questions to clarify requirements or resolve issues effectively.
* **Kathleen Dunn:**
* **Test Cases:** Responsible for creating test cases to validate the correctness of the infix expression parser program. Ensured that the test cases covered various expressions and scenarios, documenting them in the project report for future reference.
* **Program Correctness:** Verified the correctness of the program by executing the test cases and comparing the actual output with the expected output.
* **Future Requirements**: Contributed four ideas for future improvements to the infix expression parser system. These ideas were aimed at enhancing the functionality and usability of the system. Documented these suggestions in the project report to guide future development efforts.
* **Meeting Attendance and Questions**: Actively participated in team meetings, providing valuable input on system design, discussing project progress and asking follow-up questions to clarify requirements or resolve issues effectively.

**Future Improvements:**