NOAH PROGRAMMING LANGUAGE

SER502 Team 15 | Notation for Optimized Algorithmic Handling

Arizona State University

TEAM MEMBERS

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PROJECT OVERVIEW

NOAH (Notation for Optimized Algorithmic Handling) is a programming language designed to blend robust static typing with the flexibility of modern paradigms. This project, developed as part of the SER502 course, demonstrates the implementation of a high-performance, compiled language with advanced constructs for real-world use cases.

PROJECT OBJECTIVES

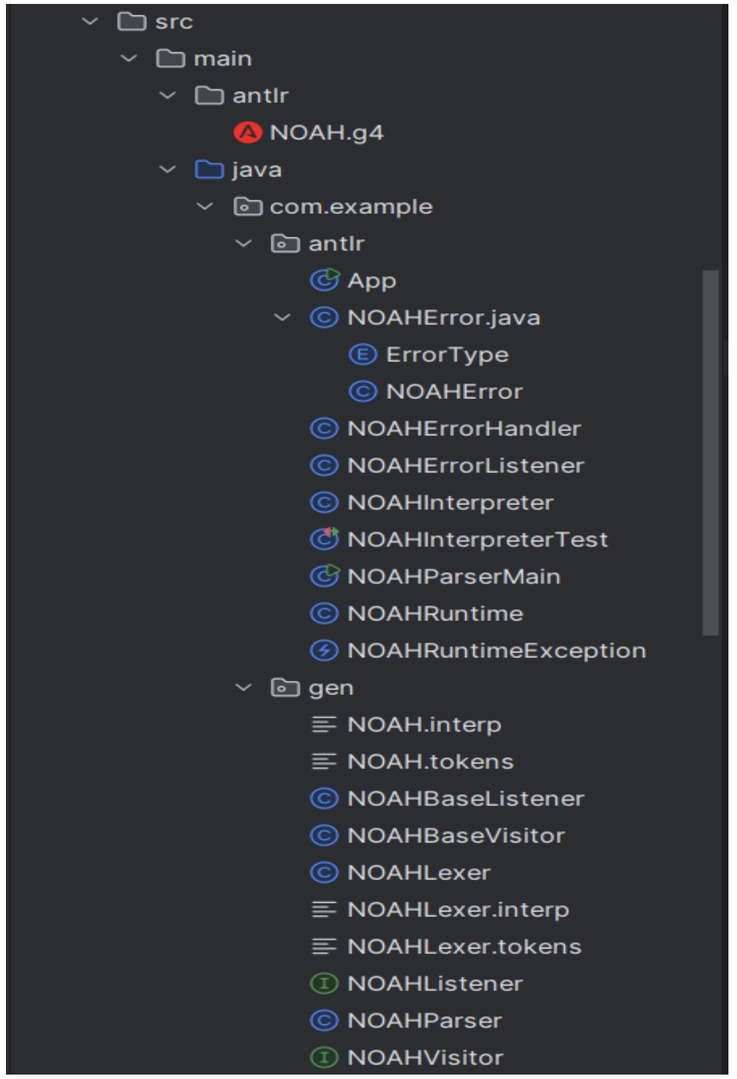
- Design a statically typed, high-performance language.
- Implement a robust parser and interpreter using ANTLR. Provide modern programming constructs for flexibility and usability.
- Demonstrate key features with well-documented sample programs.
- Ensure cross-platform compatibility and ease of use.

PROJECT ARCHITECTURE

- Components:
- 1. Lexical Analyzer
- Token generation
- Pattern matching
- Error detection

- 2. Parser
- Abstract Syntax Tree creation
- Grammar rule implementation
- Syntax validation

- 3. Interpreter/Runtime Environment
- Code execution
- Memory management
- Output handling



CORE LANGUAGE FEATURES

Data Types:*
- Boolean (true/false)
- Numeric (int, float)
- String with operations

Operators:*
- Arithmetic: +, -, *, /
- Boolean: and, or, not
- Relational: <, >, ==, !=

Control Structures:*
- Conditional statements
- Loop constructs
- Basic I/O operations

- Statically typed with compile-time type checking.

- Supports modern constructs such as conditional statements, loops, and operators.

- It Includes robust error handling mechanisms.

- Provides clear syntax and readability for developers.

GRAMMAR IMPLEMENTATION AND TOKEN DEFINITIONS

```
grammar NOAH;
program: statement* EOF;
statement: assignment
         | ifStatement
         | forLoop
         | whileLoop
         | printStatement;
```

Features:
- EBNF notation
- Clear syntactic rules
- Comprehensive expression handling

Token Types:*
- Keywords: if, else, for, while, print, true, false

- Operators: +, -, *, /, <, >, ==, !=, and, or, not, ?, :
- Delimiters: (,), {, }, ;, =

- Identifiers: [a-zA-Z_][a-zA-Z0-9_]*

- Numeric literals: [0-9]+(\.[0-9]+)?
- String literals: "[^"]*"

PARSER AND INTERPRETER

- The **NOAHParserMain** module converts NOAH code into an Abstract Syntax Tree (AST) and provides detailed error messages for syntax issues, ensuring code validity.

- The **NOAHInterpreter** processes the AST, executing nodes sequentially while managing variable declarations, evaluating expressions, and implementing control structures for program execution.

SAMPLE PROGRAMS

Program Types:-

- variables.noah: Variable operations
- operators.noah: Operator demonstrations
- booleans.noah: Logical operations
- control_flow.noah: Control structures
- loops.noah: Iteration examples
- logical1.noah: Nested conditionals

RUN INSTRUCTIONS

How to Run NOAH Programs

Steps:-

1. Navigate to project root

2. Execute command:Bash

```
java -cp target/classes com.example.antlr.NOAHParserMain
data/sample.noah
```

SYSTEM SUPPORT AND DEVELOPMENT TOOLS

Supported Operating Systems:

- Windows 10 and above
- macOS 10.15 (Catalina) and above
- Linux (Ubuntu 20.04 LTS and above)

Development Tools:

- ANTLR (4.13.2): Lexer and parser generation.
- GitHub: Version control and CI/CD pipelines.

FUTURE DEVELOPMENT

Planned Features:-

- Extended type system
- Advanced error recovery
- Performance optimization
- Additional language constructs
- Enhanced testing framework

CONCLUSION

Key Achievements:-

- Successful implementation of a new programming language
- Robust grammar and parser development
- Comprehensive testing and documentation
- Efficient team collaboration

TEAM CONTRIBUTIONS

Aksh Rajesh Chauhan:-
- Grammar rule definition
- Regular expression development
- Lexer optimization

Om Rajesh Chauhan:-
- ANTLR configuration
- Parser integration
- Error handling implementation

Nisarg Hemalkumar Desai:-
- Test program development
- Parser verification
- Designed sample NOAH programs

Harsh Sanjay Gohel:-
- Developed Interpreter
- Assisted in Testing & Integration
- Documentation & Repository management

THANK YOU

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