Cairo University
Faculty of Engineering
Computer Department

CMP(N)403 Languages and Compilers
Spring 2024

Simple Programming Language using Lex and Yacc

Number of Students per Group

3-4 Students

Overview

It is required to design and implement a programming language using the Lex and Yacc compiler generating packages.

Requirements

- Design a suitable programming language; you may use an existing one. The important constructs to be considered are:
  - ✓ Variables and Constants declaration.
  - ✓ Mathematical and logical expressions.
  - ✓ Assignment statements.
  - ✓ If-then-else statement, while loops, repeat-until loops, for loops, switch statement.
  - ✓ Block structure (nested scopes where variables may be declared at the beginning of blocks).
  - ✓ Functions
- ✓ Design a suitable and extensible format for the symbol table.
- ✓ Implement the lexical analyzer using Lex.
- Design suitable action rules to produce the output quadruples and implement your parser using YACC.
- ✓ Implement a proper syntax error handler.
- Build a simple semantic analyzer that checks for the following:
  - ✓ Variable declaration conflicts. i.e. multiple declarations of the same variable.
  - ✓ Improper usage of variables regarding their type.
  - ✓ Variables used before being initialised and unused variables.
  - **[Optional]** The addition of type conversion quadruples to match operators' semantic requirements, i.e. converting integer to real, etc.
- ✓ **[Optional]** Implement a simple GUI.

Project Phases

- **Phase I:** In this phase, you're required to deliver your lex and yacc files i.e, your lexer and parser.

- **Phase II:** In this phase, you're required to modify your implementations to include the following:
  - ✓ Design a suitable and extensible format for the symbol table.
  - Design suitable action rules to produce the output quadruples.
  - ✓ Implement a proper syntax error handler.
  - ✓ Build a simple semantic analyzer.

Deliverables

- Source code of your project.
- A Document that contains the following:
  - Project Overview
  - Tools and Technologies used
  - A list of tokens and a description of each
  - A list of the quadruples and a short description of each e.g:

Quadruple	Description
JMP L	Unconditional jump to label l
NEG V1, V2	V2 = -V1

Program evaluation

- The program is to be fed by a source code file containing your language and do the following:
  - Produce the corresponding quadruples.
  - ✓ Display syntax errors that exist in your program.
  - ✓ Display the semantic errors that exist in your program.
  - ✓ Display the symbol table.

Evaluation Criteria

- The correctness of your quadruples.
- Handling syntax and semantic errors.
- Teamwork and good documentation.

Notes

- Anything listed as optional will be considered **a bonus.**
- Any semantic checks implemented other than the ones mentioned above will be considered **a bonus.**

Due Dates

- Phase I delivery: week 11 | 20 April 2024 (11:59 PM)
- Phase II delivery: week 14 | 11 May 2024 (11:59 PM)