

## 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)