COL719 – Synthesis of Digital Systems
II Semester 2023-2024

Assignment 1: Data Flow Graph Construction
Submission Deadline: 5 Feb 2024 (11:55 PM)

Problem Statement

Given a specification in a simple language defined informally through the sample specification below, build an abstract syntax tree (AST), followed by a Data Flow Graph (DFG).

The tree corresponding to each statement should be as discussed in class, with '=' at its root, the LHS variable as its left child, and the RHS expression as its right child. The set of trees corresponding to the statements can be connected to a linked list.

The DFG should capture dependencies among the operations. Edges in the DFG should be annotated by the appropriate variable name, if relevant.

Assume sequential execution semantics for the specification.

Sample Specification:

a = b + c + d – 5
x = d * a
y = z + x

- All statements have one variable on the LHS and any number of operations on the RHS.
- There can be any number of statements.
- Terms in an expression can be either variable or constant.
- Ignore types of variables.
- There are 4 operators: +, -, *, and /. Assume normal precedence rules for operators (i.e., * and / have higher priority than + and -).
- There are no conditionals, loops, or aggregate data types (arrays, pointers, etc.).

Input and Output:

Input: Text file with the specification
Output: Display the DFG

Implementation Details:

You are free to use any programming language as well as any of the available graph templates or libraries to construct the graph. The code is expected to be able to print the adjacency list of the graph constructed, conforming to a format of your design choice. Here is a link that might help set up a template for graph construction (adding edges, nodes, graph traversal, printing the adjacency list)-https://www.lavivienpost.net/weighted-graph-as-adjacency-list/.

Input File Format:

A text file that conforms to the above-mentioned specification. example.txt has been attached for reference.

Submission Guidelines:

Please submit a zip file that contains the following files:

- Code file(s)
- A short writeup on how to run the code and the design specifications adopted to print the output

Kindly mention your entry number clearly in the submissions you make.