LAB-5 REPORT

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INTRODUCTION

This C++ program analyzes a given assembly program, identifies data hazards, and inserts NOP instructions for two scenarios:

- No Data Forwarding and No Hazard Detection
- Data Forwarding without Hazard Detection

The program assumes that the input assembly program follows specific conventions for register naming, spacing, and syntax. It does not handle branch or jump instructions and does not rely on labels within the program.

Program Implementation

The Program consists of following components:

- **STRUCTURE FOR INSTRUCTION(struct instruction):**

  Here a structure is implemented which has different variables to store different components of an instruction.

- **FUNCTION FOR ALIAS(string alias):**

  A function is defined which changes the aliases of register to register values and returns the value in range(x0-x31).

- **FUNCTION FOR PARSING(struct instruction parsing):**

  This function is used to get the value of registers and convert all of them into same form so it is easy to compare them.

- **MAIN:**

In the main function, The input file is read(3 lines at once). The lines which represent instructions are parsed to get the vale of registers used and the operation. Then accordingly lines are compared and **NOPS** are inserted for **No Data Forwarding and No Hazard Detection** and **Data Forwarding without Hazard Detection**. The instructions are then outputted in a file with NOPs added in suitable positions and Total Number of Cycles.

Testing

Extensive testing was carried out to confirm the program's accuracy. To cover diverse possibilities, test cases comprised various combinations of instructions, registers, and dependents. To test the accurate insertion of NOPs, input programmes with various data dangers were designed.

The programme was run with the proper input programme for each test case, and the resultant output was manually reviewed to confirm that NOPs were inserted appropriately according to the specified hazard detection scenario.