MIPS Processor Simulator

Overview

The MIPS Processor Simulator is a command-line application written in C++ that simulates the execution of MIPS assembly instructions. This project provides features such as instruction fetching, decoding, execution, and memory access. It is designed to help users understand how MIPS architecture works through simulation.

Features

Feature	Description
Instruction Fetching	Reads instructions from memory and updates the program counter.
Instruction Decoding	Decodes the fetched instruction to determine its type and operands.
Execution	Performs arithmetic, logical, and memory operations based on decoded instructions.
Memory Access	Supports load and store instructions for memory manipulation.
Register Operations	Implements register-based calculations and data movement.
Control Flow	Supports branch and jump instructions for control flow changes.

Installation

Follow these steps to install and run the MIPS Processor Simulator:

Clone the Repository:

```
git clone https://github.com/KiritoReborn/MIPS-Processor.git
```

Navigate to the Directory:

```
cd MIPS-Processor
```

Compile the Program:

```
g++ MIPS_processor.cpp -o mips_sim
```

Run the Simulator:

```
./mips_sim
```

File Structure

File	Purpose
MIPS_processor.cpp	Main source code implementing the MIPS simulator.
factorial.asm	MIPS assembly program to compute the factorial of a number.
fibonacci.asm	MIPS assembly program to compute Fibonacci numbers.
instructions.txt	Contains the binary instructions to be executed.
Factorial.txt	Machine code of the Factorial program.
Fibonacci.txt	Machine code of the Fibonacci program.

Usage

- The simulator reads binary MIPS instructions from `instructions.txt` and executes them.
- Users can modify `factorial.asm` and `fibonacci.asm`, convert them to binary, and test their execution.

Future Improvements

- Implement pipelining to simulate multiple instruction executions.
- Support additional MIPS instructions and optimizations.
- Enhance debugging tools for tracking register and memory values.

Credits

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Results

Factorial Execution Output:

Factorial Result of 6:-

```
Instruction: 00000000000000000000000000001100
Type: R
rs: 0
rt: 0
rd: 0
shamt: 0
funct: 001100
Control: R-type, ALUop = 10
ALU---After Add:0
Writeback ----->
Write Data: 0
After write back, value at destination: 0
Final value 720
```

Fibonacci Execution Output:

Fibonacci Result of 10:-

```
Instruction: 00000000000000000000000000001100
Type: R
rs: 0
rt: 0
rd: 0
shamt: 0
funct: 001100
Control: R-type, ALUop = 10
ALU---After Add:0
Writeback ----->
Write Data: 0
After write back, value at destination: 0
Final value 55
```

Contact

For any inquiries or suggestions, feel free to reach out via the emails listed above.