

# Lab 2:

Project 2 :: CPU Simulation Lab

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### **Lab Report Overview**

This report includes the Canvas provided example, Spec provided example, and a self-written example which was the Fibonacci sequence with inspiration drawn from the spec. All three of these examples have a brief overview of what the program does, a line-by-line description that shows what each command does, and what the terminal prints out when the example is ran. None of these were ran with the -s attached to them or exceeded the 10,000 clock cycle limit imposed on this lab. All of these examples were run with the Simpsim.java CPU that was built to receive machine opcodes and run the program based on what opcodes were passed to it. All output was done by use of terminal.

**Canvas Simple Test Example****1. Overview**

- “The Following code is an example that takes a single input and produces somewhat unpredictable, but fixed and non-random output (D. Posnett)”. The below execution shows the two test values 10 and 25 respectively which are pushed in at terminal execution.

**2. Line-by-line Description (Excluding header “v2.0 raw)**

- D000 Input from port 0 and push onto stack
- 301B Pop top to memory location 27
- 201B Push value at memory location 27 onto stack
- 1001 Push 1 onto stack
- F014 If next > top push next to top
- 5018 Move pc to 24 if top == 0
- 201B Push value at memory location 27 onto stack
- E000 Pop top to output port 0
- 201B Push value at memory location 27 onto stack
- 1001 Push 1 onto stack
- F00A Binary and (next & top)
- 5013 Move pc to 19 if top == 0
- 201B Push value at memory location 27 onto stack
- 1003 Push 3 into stack
- F002 Multiply next by top
- 1001 Push 1 onto stack
- F000 Add next to top
- 301B Pop top to memory location 27
- 4017 Jump pc to 23
- 201B Push value at memory location 27 onto stack
- 1001 Push 1 onto stack
- F005 Bitwise shift next to the right by top
- 301B Pop top to memory location 27
- 4002 Jump pc to 2
- 201B Push value at memory location 27 onto stack
- E000 Pop top to output port 0
- 0F00 Stop CPU Execution
- 0000 Do nothing

## 3. Terminal Execution

```
mel@Melvins-MacBook-Air src % java Simpsim.java textFile.out 10
```

Note: Simpsim.java uses unchecked or unsafe operations.

Note: Recompile with -Xlint:unchecked for details.

10

5

16

8

4

2

1

```
mel@Melvins-MacBook-Air src % java Simpsim.java textFile.out 25
```

Note: Simpsim.java uses unchecked or unsafe operations.

Note: Recompile with -Xlint:unchecked for details.

25

76

38

19

58

29

88

44

22

11

34

17

52

26

13

40

20

10

5

16

8

4

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1

### Provided Spec Example

#### 1. Overview

- This is a simple program that will add two values 225 and 15 together and will pop the result off of the stack. Since there are no output calls this example will not output any information to the terminal.

#### 2. Line-by-line Description (Excluding header)

- 10E1      Push 225 onto the stack
- 100F      Push 15 onto the stack
- F000      Add next to top
- 3005      Pop top to memory location 5
- 0F00      Stop CPU Execution
- 0000      Do nothing

#### 3. Terminal Execution

```
mel@Melvins-MacBook-Air src % java Simpsim.java textFile3.out
```

Note: Simpsim.java uses unchecked or unsafe operations.

Note: Recompile with -Xlint:unchecked for details.

**Fibonacci Sequence example****1. Overview**

- This example will take in a value passed in by the terminal and will print the Fibonacci sequence until the most recent number printed is the number passed. Due to this it expects a valid Fibonacci sequence number to be passed in. In the below example it is using the value 5 to show the terminal execution.

**2. Line-by-line Description (Excluding header)**

- D000 Input from port 0 and push onto stack
- 301C Pop top to memory location 28
- 201C Push value at memory location 28 onto stack
- 1000 Push 0 onto the stack
- 301D Pop top to memory location 29
- 201D Push value at memory location 29 onto stack
- E000 Pop top to output Port 0
- 1001 Push 1 onto stack
- 301E Pop top to memory location 30
- 201E Push value at memory location 30 onto stack
- E000 Pop top to output Port 0
- 201D Push value at memory location 29 onto stack
- 201E Push value at memory location 30 onto stack
- F000 Add next to top
- 201E Push value at memory location 30 onto stack
- 301D Pop top to memory location 29
- 301E Pop top to memory location 30
- 201E Push value at memory location 30 onto stack
- E000 Pop top to output port
- 201E Push value at memory location 30 onto stack
- F001 Subtract next by top
- 5019 Move pc to 25 if top == 0
- 301F Pop top to memory location 31
- 201C Push value at memory location 28 onto stack
- 400B Jump pc to 11
- 0F00 Stop CPU Execution
- 0000 Do nothing

### 3. Terminal Execution

```
mel@Melvins-MacBook-Air src % java Simpsim.java textFile2.out 5
```

Note: Simpsim.java uses unchecked or unsafe operations.

Note: Recompile with -Xlint:unchecked for details.

0

1

1

2

3

5