Bradley Department of Electrical & Computer Engineering Department

Project 1 Report

ECE 3504: Principles of Computer Architecture

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The program we designed implements the Collatz algorithm. To implement the algorithm, we first check if the number is positive. If the number is not positive, then an error message is thrown, and the program gracefully exits. To determine this, we do bgtz which jumps to the appropriate section if the value is greater than 0. If we determine the number is positive, then we implement the Collatz algorithm and print the next step.

For the extra credit portion, I added a section that keeps repeating as long as the value does not equal 1 using the bne command. The while loop keeps implementing the Collatz algorithm until it is one and then exits gracefully. Below Figure 1, shows the output from the program show casing how the program essentially is implemented.

Program Snapshots:

```
Enter a positive integer: 6
The next integer in the sequence is: 3
The hailstone numbers are: 3, 10, 5, 16, 8, 4, 2, 1
The number of steps is: 8
|
```

Figure 1 Output from the assembly program with an input of 6.

```
PC          = 400144
EPC         = 0
Cause       = 0
BadVAddr    = 0
Status      = 3000ff10

HI          = 0
LO          = 0

R0   [r0]  = 0
R1   [at]  = 10010000
R2   [v0]  = a
R3   [v1]  = 0
R4   [a0]  = 100100a1
R5   [a1]  = 7fffef2c
R6   [a2]  = 7fffef34
R7   [a3]  = 0
R8   [t0]  = 1
R9   [t1]  = 0
R10  [t2]  = 8
R11  [t3]  = 0
R12  [t4]  = 0
R13  [t5]  = 0
R14  [t6]  = 0
R15  [t7]  = 0
R16  [s0]  = 1
```

Figure 2 Register values at the end of the program.