Rose-Hulman Institute of Technology
Computer Science and Software Engineering
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Homework 7
Recursion and Stacks
Maximum points: 20 (Extra credit)

Directions

This assignment is due Thursday, 19th February 2004 by 5:00 PM for Sections 1 and 2. You must turn in at least one of the problems by the due-date. **If you do not, you will be penalized 10 points from the homework points you have earned so far.**

Learning Objectives

In the process of completing this homework assignment, students will develop their abilities to

- Use stacks to implement procedure calls in assembly language.
- Implement recursive procedures in an assembly language.

General Instructions

1. Submit your solutions on a separate sheet of paper.

Problems

1. [10 points] The MIPS program `hmwk07-1.asm` simulates the movement of a ball as it moves within a bounded region. The program uses two procedures "MoveObject" and "MoveBall". Also, "register spilling" is accomplished by using memory to hold the values that cannot be contained by the registers. Re-write the program so that a stack is used instead of memory to hold values that cannot be contained by the registers.

2. [15 points] The following JAVA code fragment and recursive method determine the Nth term in a Fibonacci sequence. Note that this Fibonacci sequence begins with 1(not 0). Write a MIPS program to implement the same. Use a stack to hold the values that need to be saved across procedure calls. You must use a recursive procedure.

```
public class Fibonacci {
    public static void main ( String []  args ){
          int n, result;
          n = 5;
          result = findValueAtN( n );
    }
    // Recursive method to calculate the Nth value in a Fibonacci sequence
    // that begins with 1.
    public static int findValueAtN( int x ){
          int fValue;
          if (x == 1 || x == 2) {
                return 1;
          } else {
                return (findValueAtN( x - 1) + findValueAtN( x - 2 ));
          }
   }
}
```