Project 1: **MIPS Simulator**

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Assigned: November 6, 2018

**Due: 11:59pm November 19, 2018**

1. **Description**

The goal of this project is to write a program that simulates the MIPS architecture (single cycle execution). Your simulator will perform fetching instructions from the instruction memory, decoding them, and performing the appropriate operation on “simulated” registers and/or memory, and determining the address of the next instructions. Your simulator will read a “binary” file that contains hexadecimal representations of the text (instructions). Your simulator will run a subset of the MIPS instruction set.

Your simulator should provide two modes: debug and run mode. In the debug mode, your simulator will show clock cycles, PC, and register values every cycle. In the run mode, your simulator will run the given program (binary) and show the clock cycles, PC and register values at the end of the simulation.

You can download a skeleton code (mips\_sim.c) and the binary file (runme.hex) from the material section of the LMS. You can use the skeleton code to make the simulator.

Please upload the mips\_sim.c file and a README file to the LMS system (project section). In the README file, you need to briefly explain your code and the contribution of each your team member.

1. **Instruction you must simulate**

add, addi, jal, j, jr, lw, sw, slti, beq

1. **How to run**

./mips\_sim 0 // debug mode

./mips\_sim 1 // run mode

1. **Expected output after running your simulator**

**4.1. Debug mode**

\* clock cycle is decimal number

\* Others are hexadecimal number

|  |
| --- |
| **$./mips\_sim 0**  **-------------------------------------------------**  **Clock cycles = 1**  **PC       = ?  R0  [r0] = 0 R1  [at] = 0 R3  [v0] = ?  R3  [v1] = 0 R4  [a0] = ? R5  [a1] = 0 R6  [a2] = 0 R7  [a3] = 0 R8  [t0] = ? R9  [t1] = ?** **R10 [t2]** = 0 **R11 [t3]** = 0 **R12 [t4]** = 0 **R13 [t5]** = 0 **R14 [t6]** = 0 **R15 [t7]** = 0 **R16 [s0]** = 0 **R17 [s1]** = 0 **R18 [s2]** = 0 **R19 [s3]** = 0 **R20 [s4]** = 0 **R21 [s5]** = 0 **R22 [s6]** = 0 **R23 [s7]** = 0 **R24 [t8]** = 0 **R25 [t9]** = 0 **R26 [k0]** = 0 **R27 [k1]** = 0 **R28 [gp]** = 0 **R29 [sp]** = **?** **R30 [s8]** = 0 **R31 [ra]** = **?**  **-------------------------------------------------**  **Clock cycles = 2**  **PC       = ?  R0  [r0] = 0 R1  [at] = 0 R3  [v0] = ?  R3  [v1] = 0 R4  [a0] = ? R5  [a1] = 0 R6  [a2] = 0 R7  [a3] = 0 R8  [t0] = ? R9  [t1] = ?** **R10 [t2]** = 0 **R11 [t3]** = 0 **R12 [t4]** = 0 **R13 [t5]** = 0 **R14 [t6]** = 0 **R15 [t7]** = 0 **R16 [s0]** = 0 **R17 [s1]** = 0 **R18 [s2]** = 0 **R19 [s3]** = 0 **R20 [s4]** = 0 **R21 [s5]** = 0 **R22 [s6]** = 0 **R23 [s7]** = 0 **R24 [t8]** = 0 **R25 [t9]** = 0 **R26 [k0]** = 0 **R27 [k1]** = 0 **R28 [gp]** = 0 **R29 [sp]** = **?** **R30 [s8]** = 0 **R31 [ra]** = **?**  **-------------------------------------------------**  **Clock cycles = 3**  **PC       = ?  R0  [r0] = 0 R1  [at] = 0 R3  [v0] = ?  R3  [v1] = 0 R4  [a0] = ? R5  [a1] = 0 R6  [a2] = 0 R7  [a3] = 0 R8  [t0] = ? R9  [t1] = ?** **R10 [t2]** = 0 **R11 [t3]** = 0 **R12 [t4]** = 0 **R13 [t5]** = 0 **R14 [t6]** = 0 **R15 [t7]** = 0 **R16 [s0]** = 0 **R17 [s1]** = 0 **R18 [s2]** = 0 **R19 [s3]** = 0 **R20 [s4]** = 0 **R21 [s5]** = 0 **R22 [s6]** = 0 **R23 [s7]** = 0 **R24 [t8]** = 0 **R25 [t9]** = 0 **R26 [k0]** = 0 **R27 [k1]** = 0 **R28 [gp]** = 0 **R29 [sp]** = **?** **R30 [s8]** = 0 **R31 [ra]** = **?**  ………. |

**4.2. Run mode**

\* clock cycle is decimal number

\* Others are hexadecimal number

|  |
| --- |
| **$./mips\_sim 1**  **Clock cycles = ?**  **PC       = ?  R0  [r0] = 0 R1  [at] = 0 R2  [v0] = 37  R3  [v1] = 0 R4  [a0] = a R5  [a1] = 0 R6  [a2] = 0 R7  [a3] = 0 R8  [t0] = 1 R9  [t1] = a** **R10 [t2]** = 0 **R11 [t3]** = 0 **R12 [t4]** = 0 **R13 [t5]** = 0 **R14 [t6]** = 0 **R15 [t7]** = 0 **R16 [s0]** = 0 **R17 [s1]** = 0 **R18 [s2]** = 0 **R19 [s3]** = 0 **R20 [s4]** = 0 **R21 [s5]** = 0 **R22 [s6]** = 0 **R23 [s7]** = 0 **R24 [t8]** = 0 **R25 [t9]** = 0 **R26 [k0]** = 0 **R27 [k1]** = 0 **R28 [gp]** = 0 **R29 [sp]** = **?** **R30 [s8]** = 0 **R31 [ra]** = **?** |

**Late Day Policy**

All homeworks are due at 11:59pm on the due date. A grading penalty will be applied to late assignments. Any assignment turned in late will be penalized 50% per late day.

**Plagiarism**

No plagiarism will be tolerated. If the assignment is to be worked on your own, please respect it. If the instructor determines that there are substantial similarities exceeding the likelihood of such an event, he will call the two (or more) students to explain them and possibly to take an immediate test (or assignment, at the discretion of the instructor) to determine the student's abilities related to the offending work.