Basics of Information Systems

Winter Semester 2022–23

For discussion on Wednesday, December 14, 2022

1. Recall the "simple language" from class, which has non-negative integer variables, the statements `incr(X)` and `decr(X)`, as well as while loops of the form

   ```
   while(X):
       loop body
   ```

   In class, we looked at a macro $Y \leftarrow X$ which assigns the value of `X` to `Y`, while setting `X` to zero. Modify this example so that the end of the operation, `X` retains its original value.

2. Write a RISC-V assembly program, and run it on the simulator

   $$\texttt{https://www.cs.cornell.edu/courses/cs3410/2019sp/riscv/interpreter/}$$

   which computes the difference $797 - 930$ and stores the result into memory location 0x00000000.

   Hint: `sub rd, rs1, rs2` computes $\texttt{rd} \leftarrow \texttt{rs1} - \texttt{rs2}$.

3. Write a RISC-V assembly program which stores the maximum of the integers in registers `x5` and `x6` into register `x7`, then store the result into memory location 0x00000000.

   Test this program on the simulator for two examples with different order of the given register values.

   Hint: `blt rs1, rs2, i` will execute the branch instruction if $\texttt{rs1} < \texttt{rs2} : \texttt{pc} \leftarrow \texttt{pc} + \texttt{i}$. Note that `i` must be a multiple of 4. To jump one instruction, you need to use $\texttt{i} = 8$.

4. Write a RISC-V assembly program, and run it on the simulator, that computes the product of two numbers, 3 and 7, say, by repeated addition and stores the result into memory location 0x00000000.