CDA-4101 # Overview of Asg4 **Summer 2016**

This simulator simulates the microarchitecture Mic-1 as shown on page 254 of the textbook. The simulator shows contents of all ten registers, MIR, MPC, ALU's inputs & output, and the console (standard out).

The behavior of the simulator is controlled by a microprogram that is stored in the control store (512 words of 36 bits each). The microprogram is a sequence of microinstructions where each microinstruction is a set of control signals that drives the datapath for one CPU cycle. The micro program is given as a binary file (*.mic1 - cannot be displayed or printed) that can be understood by the simulator.

The microprogram interprets (fetches, analyzes and executes instruction by instruction) a Level-2 program (macro program which is in integer java virtual machine bytecode). This macro program is given as a binary file (*.ijvm – cannot be displayed or printed).

To minimize the complexity of creating a binary macro program, a high level assembly language (JAS – Java Assembly Language) is used to create a macro program. All instructions that are supported by this JAS are given in ijvm.conf (IJVM configuration) ascii file. An IJVM Assembler (ijvmasm in L2 subdirectory) is provided that can translate a high-level macroprogram (*.jas) according to IJVM configuration (ijvm.conf) and create a binary version of the macroprogram (*.ijvm).

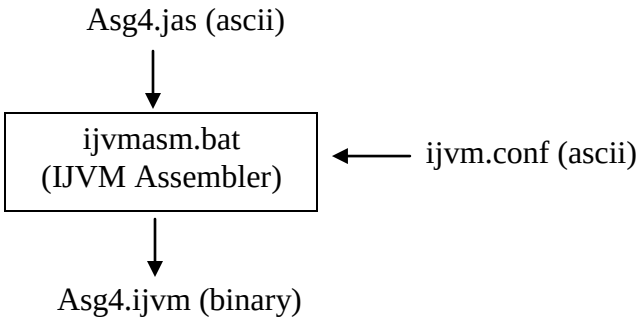
Creating a binary microprogram is very cumbersome. To simplify this task, a microprogram can be written in a micro assembly language (*.mal – ascii file) format as depicted in Figure 4-16 (page 269) and Figure 4-17 (page 272). Note that all memory operation (fetch, read, or write) takes two cycles (i.e. if a memory fetch operation is initiated in 7^{th} cycle, the value can be used only in 9^{th} or later cycles). A micro assembler (mic1asm in L1 subdirectory) has been included in this package that compiles a micro assembly language program (*.mal) into a binary version microprogram (*.mic1).

Once we have a microprogram (binary version) and a macroprogram (binary version), the simulator (mic1sim in Simulator subdirectory) can be invoked. The File menu allows us to interactively select the microprogram as well as macroprogram. The Step button executes one microinstruction and waits for next user response. The Reset button will reset the execution. The Run button initiates the execution until completion. The Stop button (in case of infinite loop) terminates execution.

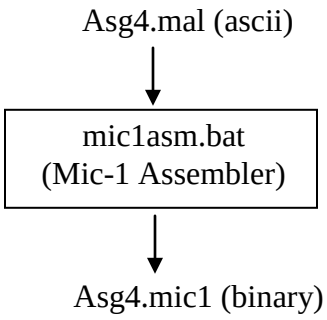
For asg4, the macroprogram asg4.jas and the corresponding asg4.ijvm along with ijvm.conf will be given. Also, stdmic1.mal (microprogram that interprets the standard 24 IJVM instructions) is provided. The objective of asg4 is to extend stdmic1.mal to interpret additional three IJVM instructions (ROT, ADDD, and OUTBIN) and prepare asg4.mal. After compiling asg4.mal into asg4.mic1 (using mic1asm), run the simulator with asg4.mic1 (microprogram) to interpret asg4.ijvm (macroprogram). Good Luck!

--Prabakar

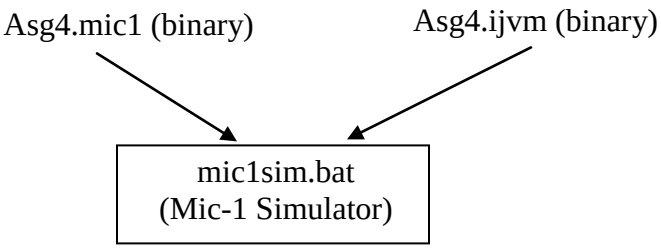
Creating a macroprogram:



Creating a microprogram:



Running the simulator:



ASG4 Startup steps

- Download Asg4 Zip file (Project4.zip) and uncompress it
- Read Readme.pdf file
- Edit env.bat files (change JDK path to your current JDK bin folder) in L1\, L2\, and Simulator\ directories
- Run simulator & test with OUTBIN\OutBinNibble.mic1 and OUTBIN\OutBin.ijvm
- Read L1\MALtips.txt
- Print OUTBIN\OutBinNibble.pdf
- Edit asg4\asg4.mal and append OUTBIN segment (44 micro instructions)
- Compile asg4\asg4.mal using L1\mic1asm
- Run simulator & test with asg4\asg4.mic1 and asg4\asg4.ijvm for OutBin operation
- Run simulator & test with asg4\prabu4.mic1 and asg4\asg4.ijvm for OUTBIN/ROT/ADDD operations
- Understand asg4\asg4alg.txt
  - logic for Rotate and AddDouble