

MIPS Simulator

이규성 20204946

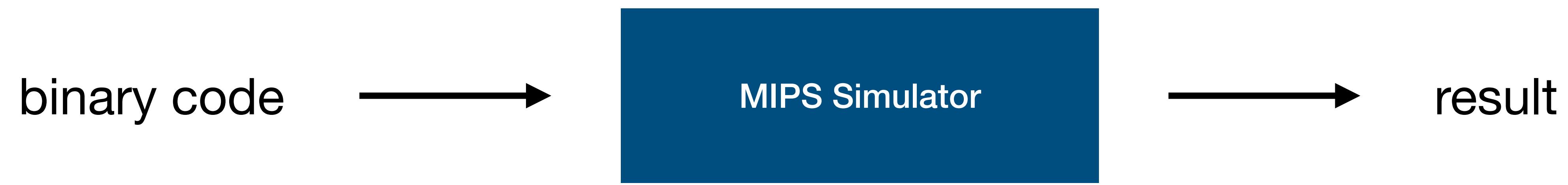
이병구 20203436

조영호 20203458

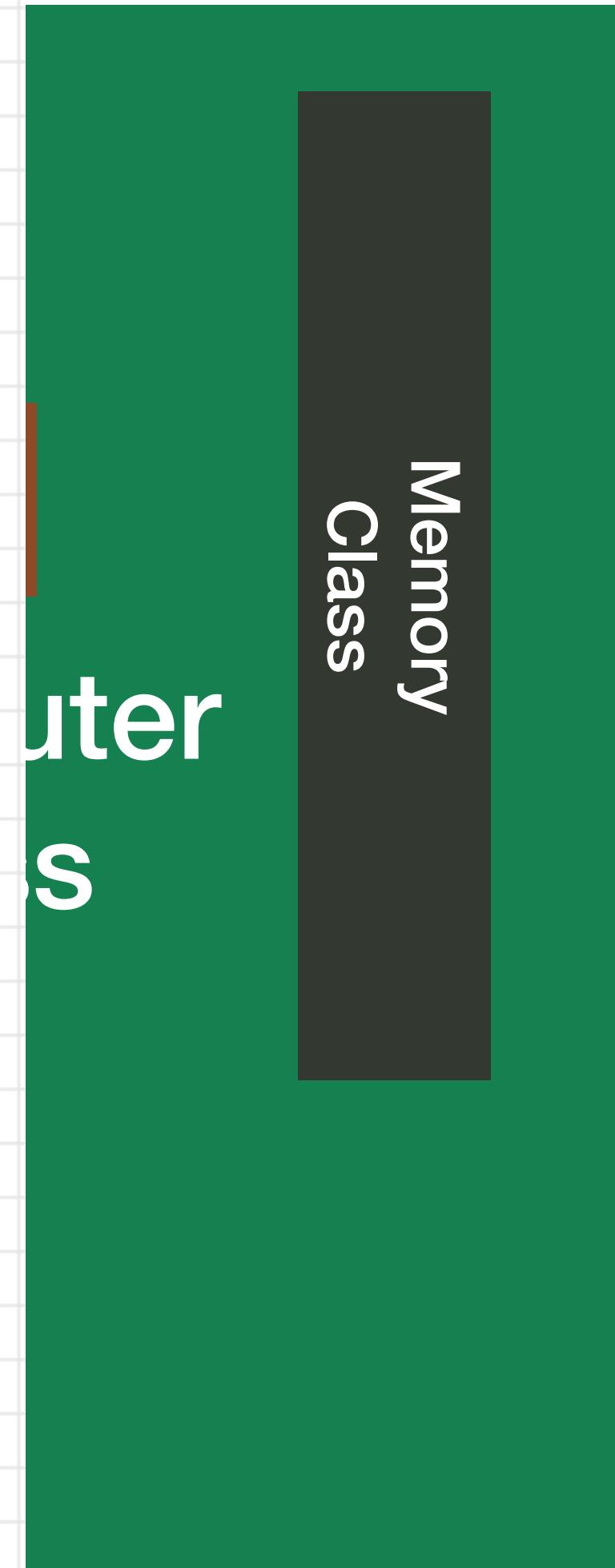
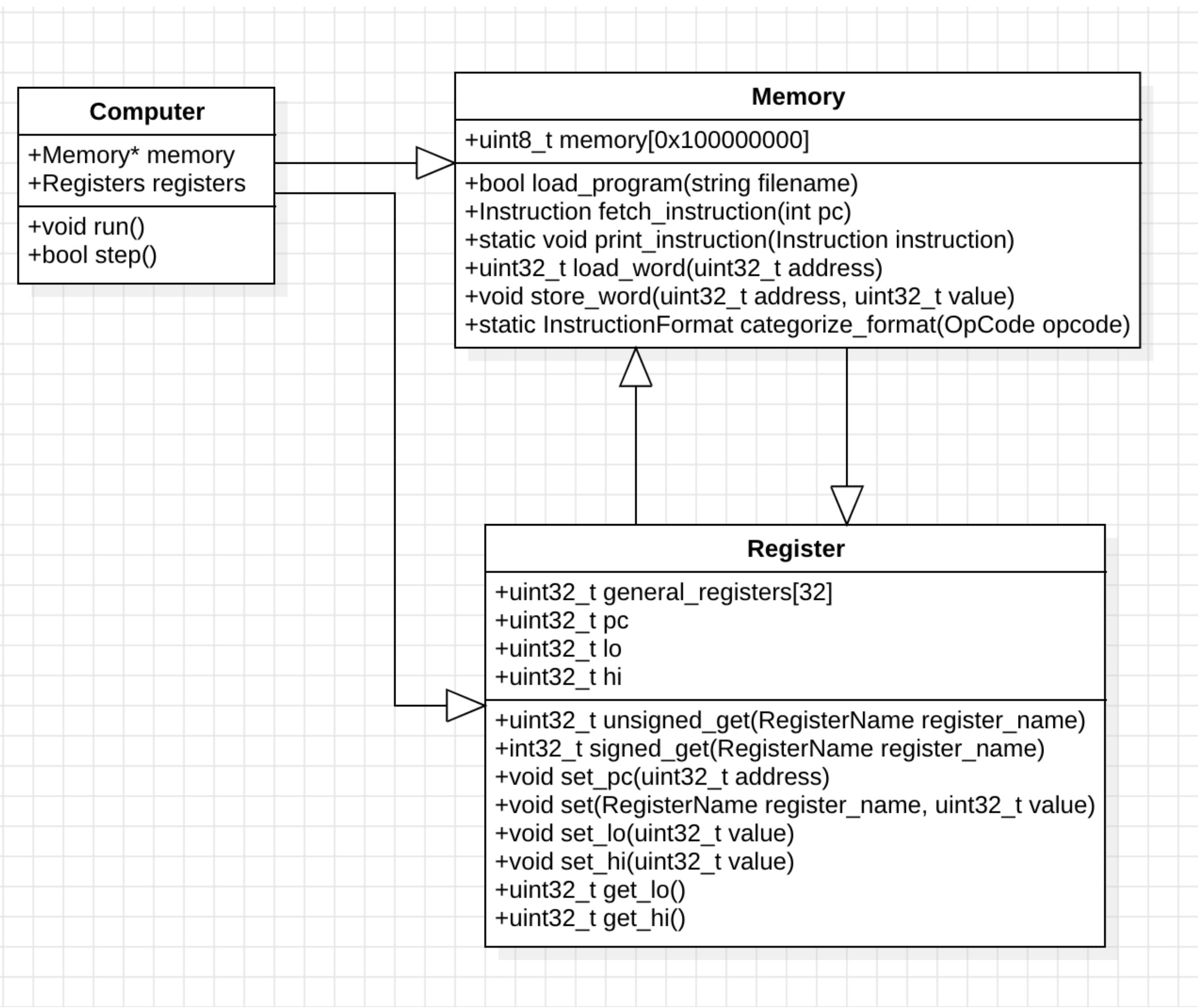
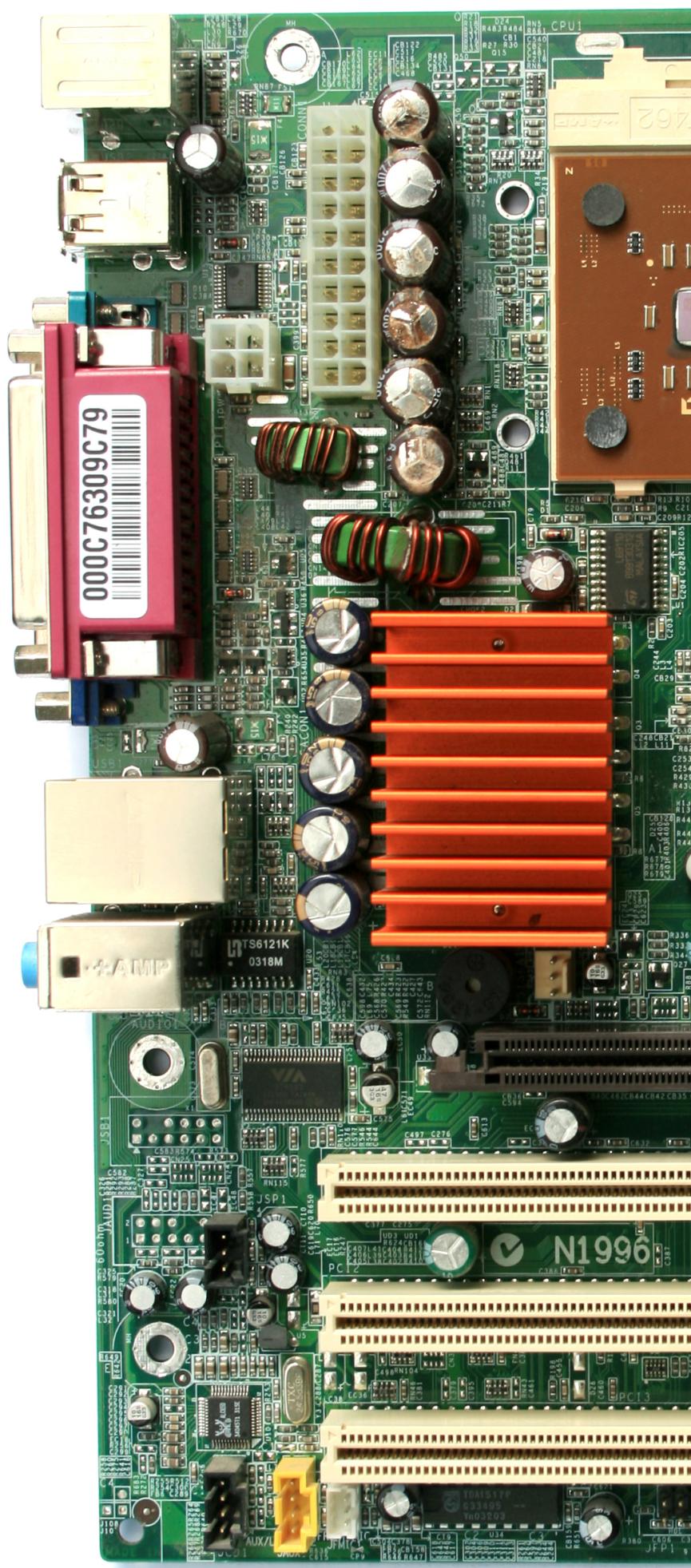
In this semester...

- Object Oriented Programming
- Computer Architecture

What is MIPS Simulator?

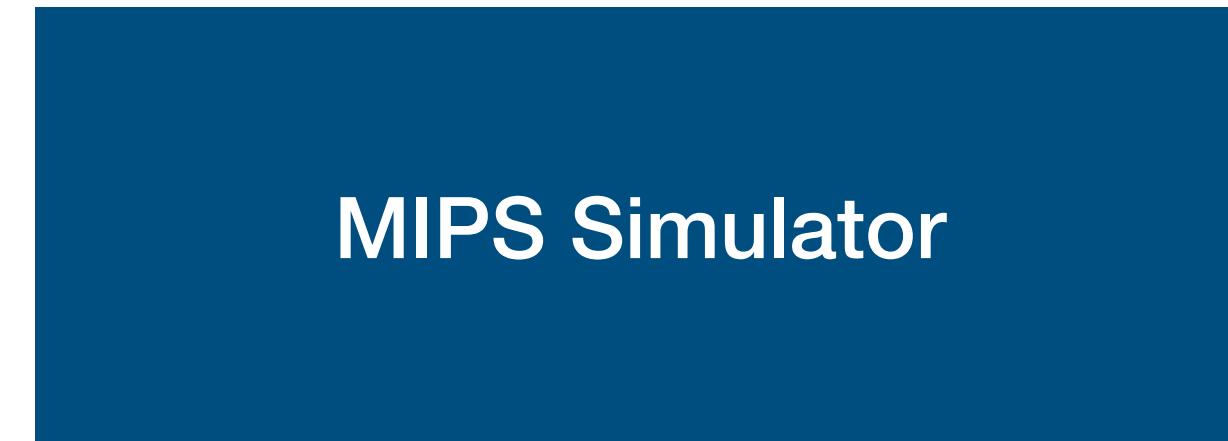


Von Neumann architecture



What is MIPS Simulator?

```
✓ 1 younghoc@joyeonghos-MacBook-Air...  
└─$ hexdump testcase/factorial6.bin  
00000000 0420 0600 000c 0a00 4000 2020 0220 0100  
00000010 0000 0c00 0420 0a00 0220 0b00 0000 0c00  
00000020 0220 0a00 0000 0c00 bd23 f8ff bfaf 0400  
00000030 a4af 0000 8828 0100 0810 0300 0220 0100  
00000040 bd23 0800 e003 0800 8420 ffff 000c 0a00  
00000050 a48f 0000 bf8f 0400 bd23 0800 4400 1800  
00000060 0000 1210 e003 0800  
00000068  
└─$
```



```
✓ 1 younghoc@joyeonghos-MacBook-Air...  
└─$ ./mipsv  
m testcase/factorial6.bin  
[info] program loaded  
[info] start computer  
720  
[info] terminated  
└─$
```

MIPS binary code (6 factorial)

$6! = 720$

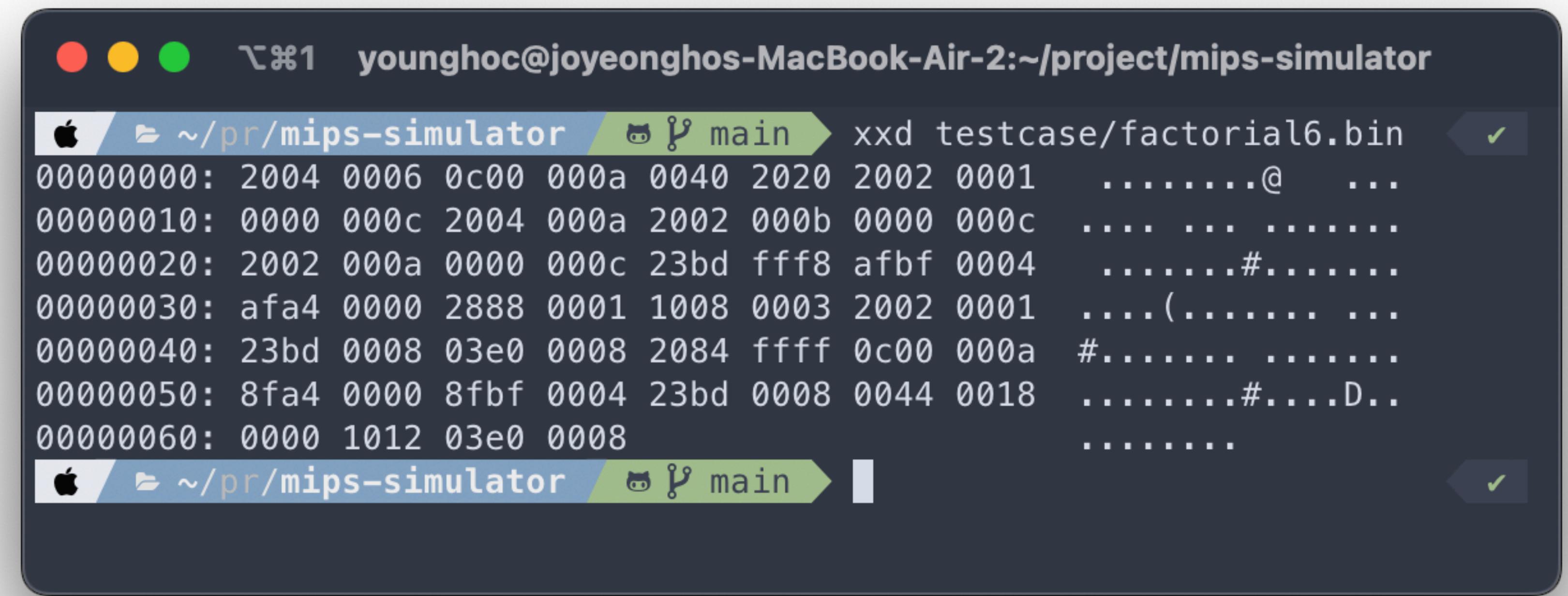
Input code

```
● ● ● ✘ 1 younghoc@joyeonghos-MacBook-Air-2:~/project/mips-simulator
[~ /pr/mips-simulator] main ➔ xxd testcase/factorial6.bin ✓
00000000: 2004 0006 0c00 000a 0040 2020 2002 0001 .....@ ...
00000010: 0000 000c 2004 000a 2002 000b 0000 000c .....
00000020: 2002 000a 0000 000c 23bd ffff afbf 0004 .....#
00000030: afa4 0000 2888 0001 1008 0003 2002 0001 ...(. ...
00000040: 23bd 0008 03e0 0008 2084 ffff 0c00 000a #.....
00000050: 8fa4 0000 8fbf 0004 23bd 0008 0044 0018 .....#...D..
00000060: 0000 1012 03e0 0008 .....  
✓
```

2004 0006
↓
001000 00000 00100 00000 00000 00000 000110

ADDI \$4\$zero 0x6

But..

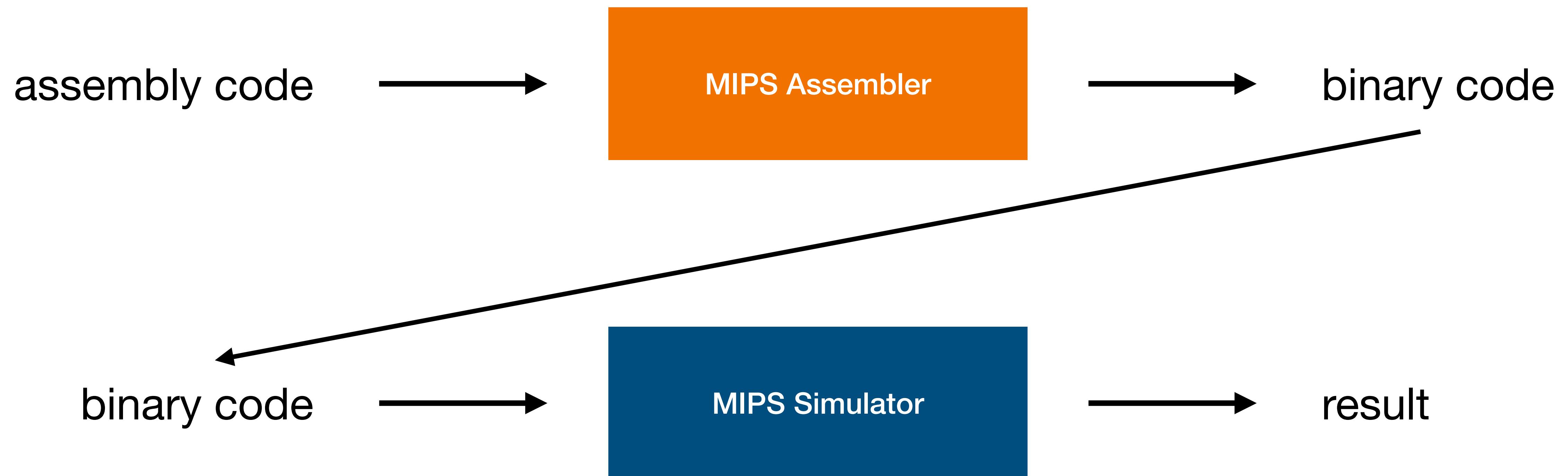


A terminal window showing the output of the `xxd` command. The terminal title is `main`. The command run is `xxd testcase/factorial6.bin`. The output shows the binary representation of the factorial6 program. The first few lines of the output are:

```
00000000: 2004 0006 0c00 000a 0040 2020 2002 0001 .....@ ...
00000010: 0000 000c 2004 000a 2002 000b 0000 000c .....
00000020: 2002 000a 0000 000c 23bd fff8 afbf 0004 .....#
00000030: afa4 0000 2888 0001 1008 0003 2002 0001 ....(...
00000040: 23bd 0008 03e0 0008 2084 ffff 0c00 000a #.....
00000050: 8fa4 0000 8fbf 0004 23bd 0008 0044 0018 .....#...D..
00000060: 0000 1012 03e0 0008 ......
```

MIPS Assembler

What is MIPS Assembler?



What is MIPS Assembler?

```
● ○ ● nvim testcase/factorial6.s
1      addi $a0    $zero 6
1      jal fact
2      add $a0 $v0 $zero
3      addi $v0 $zero 1
4      syscall
5      addi $a0 $zero 10
6      addi $v0 $zero 11
7      syscall
8      addi $v0 $zero 10
9      syscall
10     fact:> addi $sp $sp -8
11     sw $ra 4($sp)
12     sw $a0 0($sp)
13     slti $t0 $a0 1
14     beq $t0 $zero L1
15     addi $v0 $zero 1
16     addi $sp $sp 8
17     jr $ra
18     L1:>> addi $a0 $a0 -1
NORMAL ➤ ↵ main <op 1:4 ⏴ 13:52
```

MIPS Assembler

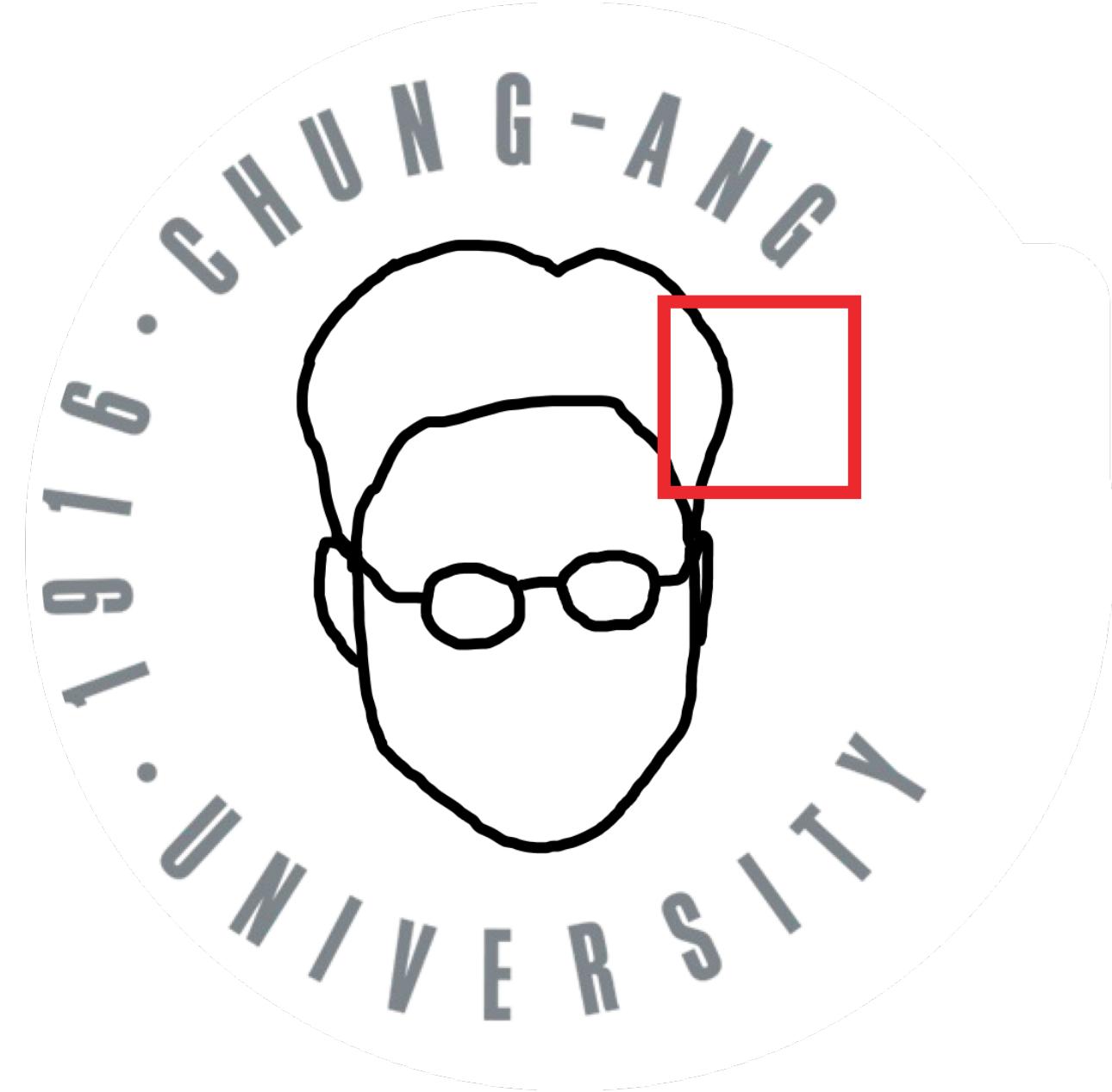
assembly code

```
● ○ ● ~%1 younghoc@joyeonghos-MacBook-Air...
  ➤ ~/pr/mips-simulator ➤ ↵ main ➤ hexdump
  testcase/factorial6.bin
  0000000 0420 0600 000c 0a00 4000 2020 0220 0100
  0000010 0000 0c00 0420 0a00 0220 0b00 0000 0c00
  0000020 0220 0a00 0000 0c00 bd23 f8ff bfaf 0400
  0000030 a4af 0000 8828 0100 0810 0300 0220 0100
  0000040 bd23 0800 e003 0800 8420 ffff 000c 0a00
  0000050 a48f 0000 bf8f 0400 bd23 0800 4400 1800
  0000060 0000 1210 e003 0800
  0000068
  ➤ ~/pr/mips-simulator ➤ ↵ main ➤ ✓
```

binary code

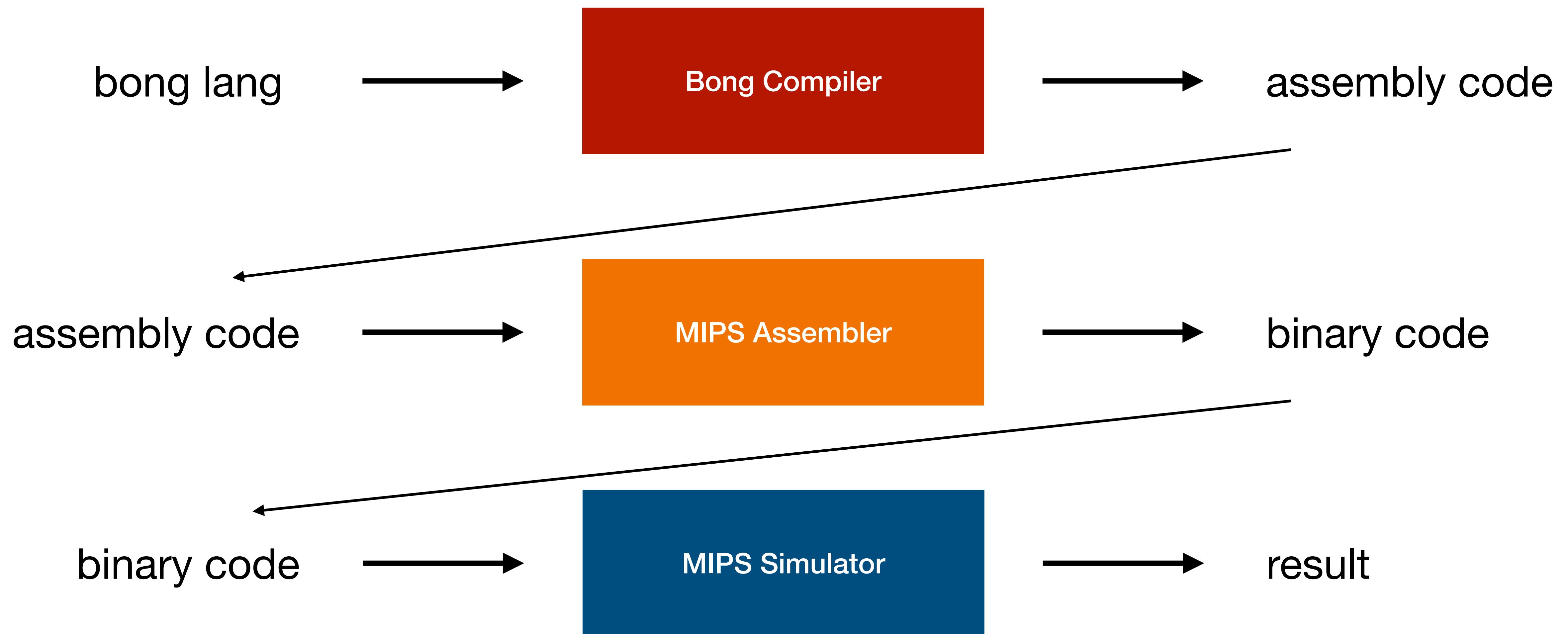
In this semester, we also learn...

- Object Oriented Programming
- Computer Architecture
- Automata and Formal Languages
- Principles of Programming Languages



Bong Lang

What is Bong Compiler?



Demo

MIPS Simulator

<https://github.com/chooh5/mips-simulator>

MIPS Assembler

<https://github.com/chooh5/mips-assembler>

Bong Compiler

<https://github.com/chooh5/bong-compiler>