

Homework 4 Guide

CIT 593 Fall 2007

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1/4

Additional Instructions

Multiply instruction

- Used reserved opcode
- MUL R#, R#, R# or MUL R#, R#, #

Subtraction instruction

- SUB R#, R#, R# is psuedo instruction
- It is equivalent to 2 LC3 instructions
- There is no immediate i.e. SUB R#, R#, #
- because we can do ADD R#, R#, # -

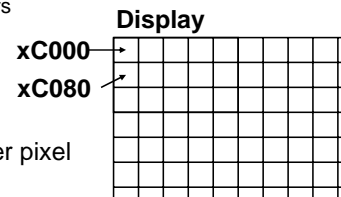
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2/4

Pixel-based Display

A display consists of many dots (pixels)

- Color of each pixel represented by a 16-bit value
 - > 5 bits for each of Red/Green/Blue
 - > 32 thousand distinct colors



Memory-mapped pixels

- One memory location per pixel
- 128x128 pixels
- Memory region xC000 to xFDFF
 - > xC000 to xC07F is first row of display
 - > xC080 to xC0FF is second row of display
- Set the corresponding location to change its color

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3/4

Subroutine Example

```
MAIN: .ORIG x3000
      JSR A
      OUT
      HALT
A:     AND R0, R0, #0
      ADD R0, R0, #5
      JSR B
      RET
B:     LD R1, ASCII
      ADD R0, R0, R1
      RET
ASCII: .FILL x0030
      .END
```

■ Suppose to print 5 to screen ?

■ It does not work!

■ What is the problem ?

- The linkage for subroutine A gets destroyed when subroutine B is executed

- R7 is overwritten when JSR B is executed

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4/4