Quiz 8: May 22, 2014

1. You have an array of integers with 50 rows and 60 columns (recall that in Array[i,j], i gives the row index and j gives the column index), and the base address of the array is 0x4000. (Hint, if you want any chance of partial credit, show your work!)

(a) (3 points) Using row-major ordering, what are the addresses of the array item at these index pairs: [0,0], [49,6], [6, 59] [49,59]?

\[
\begin{align*}
[0,0] & \quad = 0 \times 4000 + (60 \times 0) + 0 = 0 \times 4000 \\
[49,6] & \quad = 0 \times 4000 + (60 \times 49) + 6 \\
[6,59] & \quad = 0 \times 4000 + (60 \times 6) + 59 \\
[49,59] & \quad = 0 \times 4000 + (60 \times 49) + 59
\end{align*}
\]

(b) (3 points) Using column major ordering, what are the addresses of the same items?

\[
\begin{align*}
[0,0] & \quad = 0 \times 4000 + (50 \times 0) + 0 = 0 \times 4000 \\
[49,6] & \quad = 0 \times 4000 + (50 \times 6) + 49 \\
[6,59] & \quad = 0 \times 4000 + (50 \times 59) + 6 \\
[49,59] & \quad = 0 \times 4000 + (50 \times 59) + 49
\end{align*}
\]

2. (1 point) Below is a short PUSH subroutine in LC-3.

```
PUSH STR R0, R6, #0
ADD R6, R6, #-1
RET
```

(a) (2 point) From this code, what is in R0? What is in R6?

- \( R0 \rightarrow \text{value to be pushed} \)
- \( R6 \rightarrow \text{stack pointer} \)

(b) (2 point) Is this code using the caller-saves subroutine convention or the callee-saves? Why, or why not?

Neither, since nothing needs to be saved.