COMP-462
Embedded Systems

Lecture 10: Midterm

Agenda

Topic

- 50% assembly, 50% C
- Parameter-passing
- Pointers
- Arrays
- Strings
- Structs
- Interfacing
- Port initialization
- Interrupt setting for I/O devices
- Linked structures
- FSM

Midterm review

- 1) Understanding differences between data and address, being able to use pointers and indices
- 2) Understanding differences between 8-bit, 16-bit data and 32-bit data
- 3) Understanding differences between signed and unsigned integers
- 4) Programming if-then if-then-else for-loops while-loops and do-while-loops in assembly
- 5) Processing a variable-length array or string, either size first or terminating code at end
- 6) Addition, subtraction, multiplication, division, shift, and, or, xor

Midterm review

- 7) Structures
- 8) Call by value, call by reference, return by value
- 9) AAPCS Program conventions
  - Save and restore R4-R11,LR if you wish to modify
  - Parameter passing in registers R0,R1,R2,R3
  - Return parameter in R0
  - Push/Pop even number of registers

- 10) Implementing FSM (Moore)
- 11) Accessing arrays strings and structures using pointers and indices
  - Stepping through two or more arrays at a time
  - 8/16/32-bit data, signed/unsigned numbers

Midterm review

- **A) You may be given one or more variable length arrays of data, buf[i]**
  - The size may be the first entry
  - There may be a termination code
  - The data may be 8-bit ASCII characters or integers
  - The integers may be 8 16 or 32 bits
  - Integers may be signed or unsigned
  - A pointer to this array may be passed in R0
  - You may be asked to deal with special cases: size=0, size too big, overflow

Midterm review

- Determine the size of the array
- Return the first element of the array
- Find the maximum or minimum element in an array
- Find the sum of all the elements
- Find the average of all the elements
- Find the mode of all the elements
- Find the range = maximum - minimum
- Find the maximum or minimum slope (**buf[i+1]-buf[i]**)
- Find the maximum or minimum absolute value
- Count the number of times a particular value occurs (**buf[i]==1000**)
- Search for the occurrence of one string in another
- Concatenate two strings together
- Delete characters from a string
- Insert one string into another
- Move data from one place to another within an array or string
- Sort the array (we will give the steps)

Midterm review

Assembly (50%)

- Find the maximum in an array
  - 32 bit unsigned and 16 bit signed
- Find the average of all the elements
  - 8-bit unsigned, 255 termination code

C (50%)

- Search for the occurrence of char in string return position
- Concatenate two strings together and put in third
- Given an array of structs find min field(member)

Advice:

- *Watch for size and datatype*
- *Address calculations*
- *Call-by value vs. reference*
- *Structs - declaration and access*
- *Global vs parameter*