Characters and Strings

• We have used strings already:
  - `n = input('Next number:')`
  - `fprintf('Answer is %d', ans)`
  - `'Next number:'` and `'Answer is %d'` are strings

• Use single quotes to enclose characters:
  - `'100'` is a (character) vector of length 3
  - `100` is a numeric value

• A string is made up of individual characters, so a string is a 1-d array of characters

Strings as vectors

Vectors
• Indexing
  \[ v = [7, 0, 5] \]
  \[ x = v(3); \text{ } \% x is 5 \]
  \[ v(1) = 1; \text{ } \% v is [1 0 5] \]
• Colon notation
  \[ v = 2:5; \text{ } \% v is [2 3 4 5] \]
• Appending
  \[ v = [7, 0, 5]; \]
  \[ v(4) = 2; \text{ } \% v is [7 0 5 2] \]
• Concatenation
  \[ v = [v, [4, 6]]; \]
  \[ \% v is [7 0 5 2 4 6] \]

Strings
• Indexing
  \[ s = 'hello'; \]
  \[ c = s(2); \text{ } \% c is 'e' \]
  \[ s(1) = 'J'; \text{ } \% s is 'Jello' \]
• Colon notation
  \[ s = 'a':'g'; \text{ } \% s is 'abcedefg' \]
• Appending
  \[ s = 'duck'; \]
  \[ s(5) = 's'; \text{ } \% s is 'ducks' \]
• Concatenation
  \[ s = [s, ' quack']; \]
  \[ \% s is 'ducks quack' \]

Some useful string functions

\[ \text{str} = 'Cs 101'; \]

- `isletter(str)` % [1 1 0 0 0 0]
- `isspace(str)` % [0 0 1 0 0 0]
- `lower(str)` % 'cs 101'
- `upper(str)` % 'CS 101'
- `ischar(str)` % is str a char array?
  \% Yes, so returns 1

Example: capitalize 1st letter

Write a function to capitalize the 1st letter of each word in a string. Assume that the string has lower case letters and blanks only.

Look for the spaces

Look For The Spaces

ASCII characters

\begin{tabular}{|c|c|c|c|}
\hline
\text{ascii code} & \text{Character} & \text{ascii code} & \text{Character} \\
\hline
: & : & : & : \\
: & : & : & : \\
: & : & : & : \\
48 & '0' & 65 & 'A' \\
49 & '1' & 66 & 'B' \\
50 & '2' & 67 & 'C' \\
: & : & : & : \\
57 & '9' & 90 & 'Z' \\
: & : & : & : \\
\hline
\end{tabular}
Character vs ASCII code

str = 'cs101M'
% 1-d array of characters
code = double(str)
% convert chars to ascii values
str1 = char(code)
% convert ascii values to chars

Arithmetic and relational operations on characters

- 'c'-'a' gives 2
- 'c'>'a' gives true
- '6'-'5' gives 1
- letter1='e'; letter2='f';
  letter1-letter2 gives -1
- letter1==letter2 gives false
- 'A' + 2 gives 67
- char('A'+2) gives 'C'

Example: toUpper

Write a function toUpper(cha) to convert character cha to upper case if cha is a lower case letter. Return the converted letter. If cha is not a lower case letter, simply return the character cha.

Hint: Think about the distance between a letter and the base letter 'a' (or 'A'). E.g.,

- a b c d e f g h ...
- A B C D E F G H ...
  distance = 'g'-'a' = 6 = 'G'-'A'

Of course, do not use Matlab’s function upper!