CZ1106 Problem Solving and Computation II

Tutorial 3

8 March 2007, 6:00pm
Venue: Temasek Hall

Students will present their answers to questions 5 to 6. Please prepare the solutions.

1. Memory storage is always wasted when we use fixed-length string to store the name of persons. To resolve this problem dynamic memory allocation technique is used to reserve just enough storage for the name. Write a program to read in the contents of a text file which contains only one name (assume unknown length), and use the *malloc* and *realloc* functions to allocate just sufficient storage to store the name. Also, allocate one more byte to store the string terminator. Before the program terminates, print out the contents and the size of the allocated storage on the screen as follows.

```
Contents of Allocated Storages :  ????????
Number of allocated Bytes : ??
```

2. Rank the cpu times of the following three instructions in ascending order. If it is not possible, give reasons. Otherwise, justify your ranking.

   - `malloc (20 * sizeof(long) + 80)`
   - `calloc (40, sizeof(long) )`
   - `realloc(p, 40 * sizeof(long) )`

     (`p` is a pointer to long integer with an allocated storage of 156 bytes)

3. Write a main function to perform the following tasks :

   (i) Use the calloc function to allocate memory storages for an array of up to 20 floating-point numbers.

   (ii) Compute and display the sum of existing contents in all allocated storages.

   (iii) Read in real numbers one by one from the keyboard until a • is entered, and store them in the allocated storages.

   (iv) Repeat step (ii).

   (v) Use the free function to de-allocate the storages.

4. True or False:

(i) C's memory management functions reserve memory during program execution.
(ii) Memory is arranged for fixed-size arrays during compilation.
(iii) C's memory management functions cause the stack to grow and shrink during execution.
(iv) The function realloc can be the first memory management function called by a program.
(v) The function malloc initializes the bits of the reserved memory to 0.
(vi) The function calloc initializes the bits of the reserved memory to 0.

5. Write a program that uses malloc to reserve memory to store the following table of characters and initialize them with the values specified. After the initialization, print the contents of the initialized slots as formatted.

a	c	e	g	i	k	m	o	q
	c	e	g	i	k	m	o	q
		e	g	i	k	m	o	q
			g	i	k	m	o	q
				i	k	m	o	q
					k	m	o	q
						m	o	q
							o	q
								q