Algoritmi e Strutture Dati 11929

Corso di Laurea in Informatica per il Management

Università di Bologna.

This assignment should be completed without collaboration and must be delivered to the following address donat@cs.unibo.it by 11.59pm on Thursday 8/02/2024.

The oral test must be taken on 13/02/2024, Aula E3 Dip. di Informatica, 9.00.

The programs will be compiled from the command line using Java 11 (OpenJDK 11) with the command:

javac Programx.java

and run from the command line:

java -cp . Programx input_parameters

Moreover, programs do not have to specify the package.

Problem 1.0

The Historical Bookshops Association decides to put the data of its members online.
Each member provides the following data:

- library name;
- city;
- foundation year;
- link to the library website;
- unique identification code (CIU).

The (unique)code of each individual member, consists of a positive integer.
Moreover, in the same city there are no bookstores with the same name.

Write a program (Java) that accepts the name of a file as the one and only command line parameter.
The program must open and read the text file and record the data having the following format:

—— library city year link code ——

Example:

athena Bologna 1920 xxx 00001
liberty Pisa 1915 zzz 00002
popular Trento 1899 zzy 00003
April-25 Lecce 1945 yyy 00004

sitor Naples 1919 kkk 00005

Beta Napoli 1925 qqq 00006

progress Bologna 1921 sss 00007

Intorcia Benevento 1940 cvs 00008

belloni Pisa 1919 inc 00009

Kitor Catania 1918 nio 00010

belleri Udine 1899 ppp 00011

The data structure must be organized in the following way:
the libraries, whose names begin with the same letter (it is assumed that the first character of the names consists of a letter (uppercase or lowercase)), will be inserted in a list which must be kept ordered with respect to the name, and in the case of identical names, to the identification code.

The lists (one for each letter) must then be inserted into an array (each position of the array will contain a reference to a list).

Once the data of individual subscribers has been stored, the program should offer a menu with six choices:

1-search (by name) for a member and, if on the system, display it on the screen;
2- list on the screen all members of the association;
3- list on the screen all members of the same city;
4- cancellation of a member;
5- insertion of a new member.

the sixth choice is to stop the program execution.

The searching (1), deletion (4), insertion (5) and printing (2, 3) operations must be implemented efficiently.

Problem 1.1

The Binary Company has been entrusted with the management of the book heritage of the Historical Bookshops Association (HBA)

Initially, HBA manages N libraries with CIU values equal to

$\{i_1, i_2, ..., i_N\}$.

For each library, a <CIU, PR> pair was created:

CIU is the unique identification code of the library, while PR is a reference (obtained from the library website) to a list that contains all the books of the specific library.

Write a program (Java) that accepts the name of a file as the one and only command line parameter.
The program must open and read the text file and record the data having the following format:

CIU PR.

Example:

00001 xxx/PR

00002 zzz/PR

000013 zzzz/PR

000040 yyyy/PR

000053 kkks/PR

000061 qqqw/PR

000067 sssq/PR

000068 cvsc/PR

000091 incqw/PR

000110 nios/PR

00114 pppw/PR

The input data is assumed to be sorted by increasing CIU values.

After the program has read the data and populated a binary search tree, it should offer a menu with four choices:

1 - search (by CIU) for a member and, if on the system, display it on the screen;

2 – change; search (by CIU) for a member and, if on the system, change its PR value;

3- list on the screen all members of the association.

The fourth choice is to stop the program execution.

The searching (1), updating (2) and printing (3) operations must be implemented efficiently.

Problem 2.0

The Area51 Company manages a dictionary (D) of M elements.
The single element of D consists of a triple:
<key, info, hs>:

Type key: String;
Type information: char;
Type hs: integer in the range [0, K], K ε N^+ .

Note that each possible key appears at most once in D.

The values of hs variable are calculated for each dictionary element using a function F. F has as input the value of the key and produces as output an integer value within the range [0, K]. F is not a bijective function, but it is designed to uniformly distribute the values in [0, K].

Write a program (Java) that accepts the name of a file as the one and only command line parameter.
The program must open and read the text file and record the data having the following format:

M K
---- key info hs -----

Example:

10 3
Key1 a 1
Key2 b 2
Key3 c 1
Key4 c 0
Key5 a 3
Key6 x 3
Key7 e 2
Key8 a 0
Key9 a 1
Key10 s 1

Note that the hs values are provided in the unput file.
Once the data have been stored, the program should offer a menu with three choices:

a) search an element <key, info hs>; if in D, display it on the screen, otherwise display a ‘not found’ message;

b) search by hs value: list on the screen all elements having the same hs value.

The third choice is to stop the program execution.

Area51 requires to implement D so that the average number of accesses for the a) and b) operations is $\Theta(1+ M/(K+1))$.