Programming Assignment #1- NOTE

Deadline: 15:00 (pm), Jan. 3rd , 2020

Submission: Place all of your files into a folder and zip it. Name the zip file after your student ID. E.g. if your student ID is A12345678, the file name should be "A12345678.zip". Upload the zip file to "ceiba". The folder must contain the following.

- Program files (source, object…). Your code must can be cross-platform compiled and readable.

- A README file named "readme.txt". It contains information about the programming language, the libraries, and their versions which you use, and configuration, installation, and compiling instructions. We suggest you only use stander or common libraries. If there is any non-common library used in your program, please include it in the folder. Notice that the upload limit of a file to ceiba is 15mb.

- Output files. After reading "input.txt", the program outputs computation results to file "BTree.txt", "BTree_PRep.txt", "BTree_boundary.txt", "STree.txt", "STree_PRep.txt", and file "STree_boundary.txt", respectively. All these files are encoded in "UTF-8" and all space characters are non-breaking space, U+00A0. Notice that the rules of the format for all output files should be abided by. The contents of the input and output files are as follows.

  ■ input.txt: There are 100 lines in this file. Each line is a sequence of numbers range between 1 and 999 and ends with the newline control character, U+0085 or \n. Please output the corresponding stander BST, the parenthesis presentation and left boundary of the stander BST, splay tree, and the parenthesis presentation and left boundary of the splay tree into "BTree.txt", "BTree_PRep.txt", "BTree_boundary.txt", "STree.txt", "STree_PRep.txt", and   "STree_boundary.txt", respectively.
  Refer to "test_case_input.txt". The sequence in line 1 is "50 48 2 49 1 33 66 57 777 995" and its corresponding stander BST is as in Figure 1.

  ■ BTree.txt: It contains 100 stander BSTs' textual printings. Since the range of the key of a node is from 1 to 999, every 3 characters are a group. For example, in in-order traversal, ① and ㉝ in Figure 1 are the 1st and 3rd node visited and both are on level 4, so the 1st, 7th, and 8th characters of line 4 are 1, 3, and 3, respectively and character 2 to 6 are all non-breaking space. Also ㊿ is the 6th visited node and on level 1, then the 16th and 17th characters of line 1 are 5 and 0, respectively. Refer to "test_case_Btree.txt".

In "BTree.txt", each tree is started with a new line and do not skip a line between every two trees.

- ■ BTree_PRep.txt: It contains the 100 parenthesis presentations of the trees in "BTree.txt". Each line in the file is the presentation of a tree and ends with the newline control character, \n. Use dash "-", U+002D, to denote the missing child and every two numbers are separated by a non-breaking space character.

- ■ BTree_boundary.txt: It contains the 100 left boundaries of the trees in "BTree.txt". Each line in the file is the left boundary of a tree and ends with the newline control character and every two numbers are separated by a non-breaking space character.

- ■ STree.txt: It contains 100 splay trees' textual printings. The format is same as "BTree.txt".

- ■ STree_PRep.txt: It contains the 100 parenthesis presentations of the trees in "STree.txt". The format is same as "BTree_PRep.txt".

- ■ STree_boundary.txt: It contains the 100 left boundaries of the trees in "STree.txt". The format is same as "BTree_boundary.txt".

- A simple report. Describe your project, analyze the algorithms and your program (such as time-complexity, space-complexity, ext.), discuss the relation between the heights of the trees and the input data, or/and include any other things which you think should be mentioned. This report should not exceed 3 pages excluding bibliography.

Should you have questions, please send your inquiries to the TA, Di-De Yen, at bottlebottle13@gmail.com.
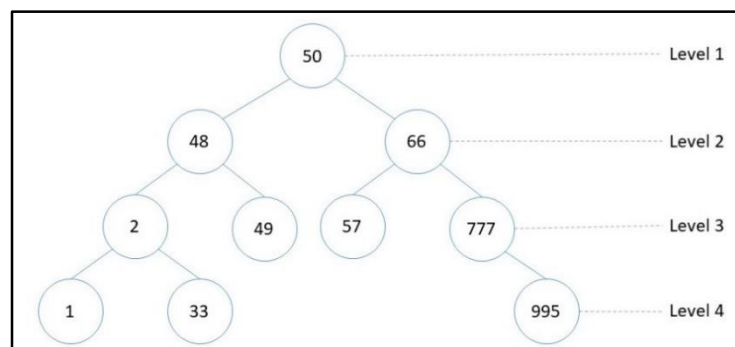

Figure 1

程式作業 #1 繳交說明

繳交期限: 15:00 (pm), Jan. 3rd , 2020

繳交方式: 上傳至 ceiba

繳交格式: 請將所有檔案壓縮到一個 zip 檔，並以你的學號作為檔案名稱。例: 假設你的學號為 A12345678，則上傳的檔案為 "A12345678.zip"。其中，須包含下述檔案。

- 程式檔(source, object…)。你的程式碼必須可跨平台編譯並執行，且須有一定的可讀性。

- 自述文件(readme.txt)。以說明所使用之程式語言，函式庫及其版本與任何編譯執行須考慮之事項。建議只使用標準或常見之函式庫。若有使用特殊函示庫，請一併打包在資料夾裏，但請注意 ceiba 上傳之檔案有 15mb 之限制。

- 輸出檔。對 "input.txt" 輸入並運算後分別輸出 "BTree.txt"、 "BTree_PRep.txt"、 "BTree_boundary.txt"、 "STree.txt"、 "STree_PRep.txt"、 及 "STree_boundary.txt" 等檔案。所有檔案編碼皆為 UTF-8。空格皆使用不換行空格(U+00A0)。所有檔案名稱與輸出格式請務必遵循規定。檔案格式與內容分別如下。

  - input.txt: 共包含 100 行數列，數值範圍為 1~999。每一行數列為一組輸入以換行(U+0085 or \n)作為結束。請分別將它們所對映到 standard BST、其 parenthesis presentation 及 left boundary，與 splay tree 其 parenthesis presentation 及 left boundary 分別且依序輸出到 BTree.txt、 BTree_PRep.txt、BTree_boundary.txt、STree.txt、STree_PRep.txt、 及 STree_boundary.txt。
    參考 "test_case_input.txt"，數列 "50 48 2 49 1 33 66 57 777 995" 所對映到的 standard BST 如 Figure 1。

  - BTree.txt: 依序儲存 input.txt 中每一組數列所對映到 standard BST 的 textual printing。因為數值的範圍為 1~999，故對每一個節點，或任兩節點間的間隔皆以 3 個字元的倍數為基準。
    以 Figure 1 為例。①和㉝皆在 level 4 且分別是 in-order traversal 的第 1 和 3 個節點，故第 4 行的位置 1 所儲存的數值為 1 而位置 7 與 8 儲存了 33，位置 2-6 則皆為空格(U+00A0)。又㊿在 level 1 且為 in-order traversal 的第 6 個節點，故第 1 行的第 16 和 17 個位置儲存了 50。另外，每一行在輸出完非空的數值後都以換行(\n)作為結束。請參閱 "test_case_BTree.txt"。
    因此，在"BTree.txt"中包含了 100 棵樹的 textual printing。每一棵樹的輸出都從新的一行開始，但任兩棵樹間，請勿跳行。

  - BTree_PRep.txt: 共 100 行。依序儲存 BTree.txt 中每一棵樹的 parenthesis presentation，並以換行(\n)作為結束。如一節點只有一個 child，則以

"dash -" (U+002D)，代表遺失的 child。任兩數，或一數與一 dash 間皆空一間隔。

- ■ BTree_boundary.txt: 共 100 行。依序儲存 BTree.txt 中每一棵樹的 left boundary，並以換行(\n)作為結束。任兩數間皆空一間隔。
- ■ STree.txt: 儲存每一組數列所對映到 splay tree 的 textual printing。輸出格式同 BTree.txt。
- ■ STree_ PRep.txt: 依序儲存 STree.txt 中每一棵樹的 parenthesis presentation。輸出格式同 BTree_PRep.txt。
- ■ STree_boundary.txt: 依序儲存 STree.txt 中每一棵樹的 left boundary。輸出格式同 STree_boundary.txt。
- 簡明報告。簡單說明你的作業內容、對問題的分析(如運算複雜度之分析，不同資料結構(tree)、數據對樹高的影響、統計等等。)、或任何其他你認為值得說明的事項。此份文件的長度以 3 頁為上限(不含參考資料)。

如對上述如有任何疑問，請寄信至 bottlebottle13@gmail.com 與助教(顏玥德)聯絡。