

Assignment 1

January 20, 2018

Write a Java program to compute the *bias* of each node in the input binary tree. We define the $\text{bias} \in \{-1, 0, 1\}$ of a tree node to indicate if the *weight* of the left child is less (-1), equal (0), or more (1) than that of the right child. The weight of a node is the sum of its weight and the weights of its children. We assume the weight of the *null* node to be 0.

The program (main file should be named P1.java) should take two inputs: 1) a file name, 2) number of threads. If the file contains the information about a tree (format given below) then the program should compute and print the bias of all the nodes of the tree.

For example the following set of commands should lead to the o/p given below:

```
$ cat graph.txt
4
1 5 2 3
2 3 0 4
3 2 0 0
4 6 0 0

$ javac P1.java
$ java P1 graph.txt 2 # => compute the bias using 2 threads.
1 1
2 -1
3 0
4 0
```

Notes: Use java thread-creation, join, and synchronized constructs for this assignment. We will test the program for varying number of threads and see 1) the correct o/p is generated all the times, 2) how it scales.

Input format: The input is given in a format that matches the following grammar.

```
Graph := NumNodes NodeDescriptions
NodeDescriptions := (NodeDescrip)*
NodeDescrip := NodeIndex NodeWeight LeftChildIndex RightChildIndex
NumNodes := PositiveInteger
```

```
NodeIndex := PositiveInteger
NodeWeight := NonNegativeInteger
LeftChildIndex := NonNegativeInteger
RightChildIndex := NonNegativeInteger
```

Grammar:<http://www.cse.iitm.ac.in/~krishna/cs6868/Graph.html>

You can check the validity of the input (say present in a file `graph.txt`) by using the following command:

```
java -jar GraphFormat < graph.txt
```

Download GraphFormat.jar here:

<http://www.cse.iitm.ac.in/~krishna/cs6868/GraphFormat.jar>

Output format: The output is a sequence of node and bias pairs (one pair per line). It follows the grammar given below.

```
BiasList := (BiasEntry)*
BiasEntry := NodeIndex BiasVal
NodeIndex := PositiveInteger
BiasVal := -1 | 0 | 1
```

Grammar:<http://www.cse.iitm.ac.in/~krishna/cs6868/Bias.html>

You can check the validity of the output (say present in a file `output.txt`) by using the following command:

```
java -jar BiasFormat < output.txt
```

Download BiasFormat.jar here:

<http://www.cse.iitm.ac.in/~krishna/cs6868/GraphFormat.jar>