CS 583 PROJECT DOCUMENTATION.
COMPLETE BALANCING VIA ROTATIONS.

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INSTRUCTIONS TO THE READER:

- The language used was Java 13.0.2.
- Run the Main.java file in the project folder to generate output. There are 3 code files Main.java, Tree.java and Node.java.
- Comments have been included in the code to describe the respective code.
- The IDE used was IntelliJ.

IMPLEMENTATION OF THE PROJECT:

- The research paper on which the project is based on is "Complete Balancing via Rotation" by Fabrizio Luccio, Bernard Mans, Luke Mathieson and Linda Pagli, published in 2016.
- The main objective of this project is to implement three algorithms (A1, A2, A3) from the paper whose main functionality is to convert an arbitrary tree into a complete Binary Search Tree.
- The number of rotations required for the conversion are determined with the help of these algorithms.

A1 Algorithm:

For Tree 1

- 1. The number of rotations calculated for n = 1000 is 1964. (4 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 2060. (6 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 2362. (8 minutes run time).

For Tree 2

- 1.The number of rotations calculated for n = 1000 is 1966. (6 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 2162. (7 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 2362. (7 minutes run time).

For Tree 3

- 1. The number of rotations calculated for n = 1000 is 1964. (4 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 2060. (6 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 2360. (8 minutes run time).

For Tree 4

- 1. The number of rotations calculated for n = 1000 is 1964. (4 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 2060. (6 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 2362. (8 minutes run time).

For Tree 5

- 1.The number of rotations calculated for n = 1000 is 1966. (6 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 2162. (7 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 2360. (7 minutes run time).

A2 Algorithm:

For Tree 1

- 1. The number of rotations calculated for n = 1000 is 1964. (4 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 2060. (6 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 2360. (8 minutes run time).

For Tree 2

- 1.The number of rotations calculated for n = 1000 is 1966. (6 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 2160. (7 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 2362. (7 minutes run time).

For Tree 3

- 1. The number of rotations calculated for n = 1000 is 1966. (4 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 789. (6 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 1100. (8 minutes run time).

For Tree 4

- 1. The number of rotations calculated for n = 1000 is 1966. (4 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 2060. (6 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 2362. (8 minutes run time).

For Tree 5

- 1.The number of rotations calculated for n = 1000 is 1964. (6 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 2060. (7 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 2362. (7 minutes run time).

A1 Algorithm:

For Tree 1

- 1. The number of rotations calculated for n = 1000 is 1964. (4 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 900. (6 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 1100. (8 minutes run time).

For Tree 2

- 1.The number of rotations calculated for n = 1000 is 1966. (6 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 900. (7 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 2362. (7 minutes run time).

For Tree 3

- 1. The number of rotations calculated for n = 1000 is 1964. (4 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 789. (6 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 2360. (8 minutes run time).

For Tree 4

- 1. The number of rotations calculated for n = 1000 is 1964. (4 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 789. (6 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 1100. (8 minutes run time).

For Tree 5

- 1.The number of rotations calculated for n = 1000 is 1966. (6 minutes run time).
- 2. The number of rotations calculated for n = 1100 is 2162. (7 minutes run time).
- 3. The number of rotations calculated for n = 1200 is 980. (7 minutes run time).

It can be understood that the rotations sometimes range lower or higher than the other sizes.