Bioinformatics Group
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Algorithms and Data Structures
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http://www.bioinf.uni-freiburg.de/Lehre/

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Exercise sheet 11

Deadline: Tuesday, 15.1.2019 12:00 noon

Exercise 1 (20 points)
In the lecture it was shown by means of a potential function that the costs for n *insert* / *remove* operations for a $(2, 4)$ tree is $O(n)$. Prove in a similar fashion and with a suitable potential function that the costs for n arbitrary *insert* / *remove* operations for a $(4, 9)$ tree are still $O(n)$.

Pay attention to provide a complete proof. Be especially careful that you consider every event that may occur. Similar cases can be proven together, different cases should be considered separately. For example, when you add a child there is no difference whether the node has 6 or 7 children before (in both cases a split is not necessary, and the potential function does not change, if chosen appropriately). In case of a previous node with 9 children you should consider a different case, as now a split has to happen and maybe the parent node changes as well as the potential function.

A complete proof does not imply much text. A proof may be very short, and a shorter proof with the same information content is always better.

Allocate enough time to write down your proof in a clean way. This is the main work of this task, in addition to the understanding of the proof from the lecture.

Commit
Commit your solutions as a PDF into the SVN in a new subdirectory **uebungsblatt_11**. Commit your feedback in a text file *erfahrungen.txt* as usual. Please specify: The length of time needed for the exercise. Which tasks have been difficult for you and where did you have problems? How much time did you spend to solve the problems?