THE REPORT ON THE DOCTORAL THESIS 'GRAPH ALGORITHMS' BY MARTIN MAREŠ

The main topic of this thesis are algorithms for minimum spanning forest and thus the title is rather confusing. The great attention is primarily devoted to a good presentation and some technical details are omitted. It is a good practical guide over this topic. From this point of view this paper is closer to the habilitation thesis than to the doctoral thesis. The first chapter contains three basic algorithms (Borůvka's algorithm, Jarník's algorithm and Kruskal's algorithm) and their basic modifications. Here is also presented the author's example of the lower bound of the contractive Borůvka's algorithm. The second chapter describes used computation models and their connections. The basic technics and data structures used in the next chapters are presented here. The third chapter brings the survey of the current state of knowledge in this topic. The algorithms with the best time complexity are presented. The author's results that the construction of minimum spanning forest in the minor-closed graph classes requires a linear time counts among them. The fourth chapter is devoted to the optimal algorithm in the computation model using comparison of weights of edges as a basic operation. The decision trees are the main tool. The fifth chapter presents a dynamic algorithm for minimum spanning forrest. The sixth chapter gives applications of these algorithms. The last chapter brings algorithms for computing ranks of permutations. It is motivated by data structures used in the linear algorithm for minimimum spanning forest problem of integer wieghts (Q-heap). The author's results form the content of this chapter.

The main trouble is the fact that several simple notions are not formally defined and there exist several versions of them. Thus the reader must determine the author's version. The text contains only small misprints and therefore readability of this thesis is good.

Several misprints:

Page 12, Notation 1.3.8, E is a set of two-element subsets of V, thus E and $M \times (V \setminus M)$ are disjoint.

Page 25, line 15 from below, it has to be Algorithm not Lemma.

Page 49, the algorithm is unclear, what is it n and m in the algorithm?

Page 51, Proof of Corollary 3.2.17, it has to be $\beta(n, n)$ instead of $\beta(1, n)$.

Page 68, line (5) of algorithm, probably it has to be $q \leftarrow$ the successor of p.

Page 101, Algorithm 5.5.10, the update of r in items of H is unclear.

Page 109, Definition 7.1.1, the symbol $R^{-1}(x)$ is unclear.

Page 125, Definitions A.2.3 and A.2.4 are confusing, the definition of $m(x)$ is bad, letters are confused.

The paper is nice, the results are interesting and the presentation is good. Therefore **I recommend to accept it as the doctoral thesis**.