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Ing. Tomáš Fencl:

ALGORITHM FOR NETWORK TOPOLOGY DESIGN

Review of the PhD. dissertation

The dissertation of Ing. Tomáš Fencl submitted in the study branch of CONTROL ENGINEERING AND ROBOTICS of the PhD Programme ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY is devoted to the network topology design with the different fault tolerance in different parts of the network. The work presents detail description of the whole system, theoretical background based upon genetic algorithms and results achieved. The work presents both the summary of possible methods described in references and own approaches to this problem.

Submitted dissertation is devoted to very interesting, modern and useful problems of networked systems with the extensively growing importance and wide applications in distributed systems covering both communication and control problems. The precise definition of problems to be solved and goals of the thesis defined in its initial part are followed by the overview of selected methods and related works (page 19) going back to history as well.

The main part of the dissertation presents the network topology design with different fault tolerance demands. To solve the network topology issue genetic algorithms were selected. It is possible to state that this choice was an appropriate one as genetic algorithms in their basic version can relatively easily implement complex constrains of the solution using genetic operators. These methods with their mathematical description, analysis and experimental results form the main part of the work. The algorithm for network design (section 4.5) combines both physical and logical design important for control engineering applications. Ing. Tomáš Fencl has proved in these sections of the dissertation a very good knowledge of all methods used in this research area.

Results of the dissertation presented include numerical experiments and the analysis of time complexity of the algorithm proposed. It is also necessary to appreciate notes to reduction or expansion of the tree topology network common in controlled technology applications.

Appendices are devoted to selected topics related to specific mathematical problems of the dissertation, algorithm setting and selected simulation results.

I have the following comments and notes to the dissertation:

- Page 38, section 4.2.2.1 - the probability of mutation to define the new population during the genetic algorithm application should be discussed and analysed into more details
- Page 115, Conclusions - results achieved are very valuable and it would be useful to discuss the most important areas for further research into more details
- Page 115, Conclusions - it is not clear whether results of the dissertation are on the author's web page
- Page 123, Appendix - subsection numbering is not correct

The formal part of the dissertation is very good having a precise logical structure and the list of figures and tables. It would be useful to include into Nomenclature on page *iv* abbreviations used in the text as well. The language level is also very good (initials in section titles should be capital only). It is necessary to appreciate relatively extensive list of references including several recently published works, further references should be added (Goldberg D., Genetic Algorithms, 1988).

The dissertation is carefully written describing all main research topics, results of own studies and presentation of own original methods. It is possible to summarize that the dissertation is both from the research and formal point of view very good and it clearly presents all methods used to solve the given problem. Selected research topics have been moreover published and presented during international conferences after the review proces by independent reviewers already. The list of own publications of Ing. Tomáš Fencel proves the quality of results achieved.

The dissertation of Ing. Tomáš Fencel forms a contribution to the research in the very important area of the network topology design.

Owing to facts presented above it is possible to state that the dissertation of Ing. Tomáš Fencel agrees with the generally accepted international demands for a dissertation and it is possible to recommend its defence.



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