

Master's Thesis Review

Optimal Program of Resistance to Propagation of Malwares in Computer Networks

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Protection of confidential information is one of the most actual challenges in IT-security. This study considers different solutions for very important problem – malware intervention in computer networks. Antivirus patches provide preventive and healing measures for such actions, and mathematical models help to estimate the relevancy of their application, effectiveness, reliability. Classical Susceptible-Infected-Recovery (SIR) model and its extension are suggested in this work. It analyses behavior of two malware types with different parameters in the network, which is sensible from practical point of view.

First part of the research describes an optimal control problem for extended SIR model with two forms of malwares, based on Pontryagin's Maximum principle. Author shows a structure of optimal strategies to protect the network. In the second part author proposes SIR model with impulse protection strategies. Additionally, equilibrium state stability is considered in both cases.

Impulse and continuous treatment modes for software protection are compared, and advantages of both antivirus forms are emphasized. Directions for further research are presented in the conclusion.

All research parts contain theoretical results, which are proved correctly. Auxiliary propositions are considered in Appendices. All the results are illustrated by numerical simulations. Appropriate biological analogies are used in some explanations.

Results of the study have been published in three papers and presented at Russian and International conferences, and this also emphasizes the importance of the problem considered. Reference list shows that investigations of the problem are studied in details by the author. Mathematical models and methods are chosen correctly, and optimal solutions were established for the problem with various parameters. Summarizing all above-mentioned information, I suppose that the research work earns an excellent mark.

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