NYU TANDON SCHOOL OF ENGINEERING

Quanyan Zhu
Assistant Professor
Department of Electrical and Computer Engineering

Tandon School of Engineering
5 MetroTech Center
Brooklyn, NY 11201
P: 646 997 3371
F: 646 997 3906
quanyan.zhu@nyu.edu
engineering.nyu.edu

May 17, 2016

To Whom It May Concern:

This letter is to review the Master thesis of Taynitskiy Vladislav Aleksandrovich entitled "Optimal Program of Resistance to Propagation of Malware in Computer Networks" advised by Prof. E. A. Gubar at the Department of Mathematical Game Theory and Statistical Decisions of Saint Petersburg State University. The work of Mr. Aleksandrovich has introduced important mathematical frameworks that describe the spreading of multi-type malware in large-scale computer networks. The work of Mr. Aleksandrovich has focused on the design of optimal control policies that trade off between the cost of damage of the malware to computer networks and the mitigation costs. The significance of this work to apply Pontryagin's minimum principle to find threshold policies that are computable and implementable to minimize the long-term cost. The student has a good understanding of the optimal control theory and has derived results that are strongly applicable to today's cyber security issues. The numerical experiments done in this work have also demonstrated the student's strong grasp of computational tools to connect theory and the practice.

The second important contribution of this thesis is Chapter 5 on impulse control. The application of impulse control at a finite and countable number of times is a practical implementation of virus control strategies in complex networks. The extension of the control paradigm to an optimal impulse control problem is not a trivial task. The student has made an effort to understand the problem and the associated control techniques to solve the problem. The results obtained in this work are promising for publications in leading conferences and journals in automatic control and computer security. This thesis would also lead to an outstanding Ph.D. dissertation if the student would choose to continue his research in a Ph.D. program on this topic.

In summary, the thesis has demonstrated the ability of the student to understand the application and the theory for designing control strategies for coupled epidemic dynamics over complex networks. This work will lead to promising publications and a potential topic for a Ph.D. dissertation to be studied further.

Sincerely,

Quanyan Zhu

Assistant Professor
Electrical and Computer Engineering
New York University