Resilience of Complex Networks

-

Big Data Analytics and Optimization within Critical Infrastructures Systems
The Role of Executive Control Units

Prof. Dr. Stefan Pickl
Universität der Bundeswehr München
Fakultät für Informatik
Werner-Heisenberg-Weg 39
85577 Neubiberg
stefan.pickl@unibw.de

Our modern society relies more and more on increasingly interconnected technological infrastructures. Communication systems control terrestrial- and air traffic which requires electrical power supply to assure the logistic of industrial production and consumption of goods. These many mutually dependent networks are vulnerable towards a multitude of external and internal risks.

Therefore, there is a great interest in the characterization and analysis of dynamic resilience concepts and the development of adaptive security structures for an holistic risk management. We introduce the main concepts and present actual examples of control and optimization theory in that challenging context.

We characterize the behavior ("Big Data Analytics") and present some new optimization approaches which could be embedded in reachback processes. As innovative approach we introduce the concept and characterization of a control tower. In an „executive way", we optimize and control the process. We present the underlying mathematical theory and first numerical results.

We refer mainly to Predictive Analytics and Big Data Approaches & Optimization Techniques especially within Critical Infrastructures Systems.