RESTORATION OF SERVICE PROBLEMS

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ABSTRACT

The restoration problem in this research will focus on "getting life back to normal as soon as possible". The objective of this research is a timely, efficient recovery of services from disruptions caused by natural, technological and willful disasters. This research will develop a mathematical representation of the problem of restoration of services and propose an integrated algorithm for solving it. Both representation and algorithm will be implemented by applying into realistic problems. The contribution of this research will be an improvement in society's resilience to disasters that disrupt services critical to public health and safety, economics and security. This improvement will be achieved by providing disaster planners and emergency response and recovery managers with assistance in their decision-making processes for mitigating the impact of disasters.

In the application to infrastructure systems, models and algorithms are exercised by a realistic data set. Using data provided by the respective system managers, a realistic representation of the power, communications and subway systems of a large portion of Manhattan was developed. A disruption with effects similar to the September 11, 2001 attacks on the World Trade Center was proposed. Disrupted infrastructure systems are modeled as ILN. They are solved for the best restoration plan that considers interdependencies, the limit of resource and assignment and scheduling cost.

Another application is in the field of supply chain management. This research on supply chain management is unique in that it considers infrastructures and their influences on the supply chain. The supply chain network is modeled not in isolation, but dependent on infrastructures, and these dependencies are explicitly represented. We proposes a framework of generating efficient restoration strategies, which involve not only processes of redesigning the network and decision-making on production, inventory and distribution, but also cooperation between the supply chain and infrastructure system to mitigate the impact of a disruption.