Preface

Network analysis originated many years ago. In the eighteenth century Euler solved the famous Königsberg bridge problem. Euler's solution is considered to be the first theorem of network analysis and graph theory. In the nineteenth century Gustav Kirchhoff initiated the theory of electrical networks. Kirchhoff was the first person who defined the flow conservation equations, one of the milestones of network flow theory.

After the invention of the telephone by Alexander Graham Bell in the nineteenth century the resulting applications gave the network analysis a great stimulus.

The field evolved dramatically after the nineteenth century. The first graph theory book was written by Dénes König in 1936. As in many other fields, World War II played a crucial role in the development of the field. Many algorithms and techniques were developed to solve logistic problems from the military. After the war, these technological advances were applied successfully in other fields. The earliest linear programming model was developed by Leonid Kantorovich in 1939 during World War II, to plan expenditures to reduce the costs of the army.

In 1940 Tjalling Koopmans also formulated linear optimization models to select shipping routes to send commodities from America to specific destinations in England. For their work in the theory of optimum allocation of resources these two researchers were awarded with the Nobel Prize in Economics in 1975.

The first complete algorithm for solving the transportation problem was proposed by Frank Lauren Hitchcock in 1941. With the development of the Simplex Method for solving linear programs by George B. Dantzig in 1957, a new framework for solving several network problems became available. The network simplex algorithm is still in practice, one of the most efficient algorithms for solving network flow problems. Many other authors proposed efficient algorithms for solving different network problems. Joseph Kruskal in 1956 and Robert C. Prim in 1957 developed algorithms for solving the minimum spanning tree problem. In 1956 Edsger W. Dijkstra developed his algorithm for solving the shortest path problem, one of the most recognized algorithms in network analysis.

As it happened in other fields, computer science and networks influenced each other in many aspects. In 1963 the book by Lester R. Ford and Delbert R. Fulkerson introduced new developments in data structure techniques and computational complexity into the field of networks.

In recent years the evolution of computers has changed the field. We are now able to solve large-scale network problems. In addition, new approaches and computer environments such as parallel computing, grid computing, cloud computing, and quantum computing have helped to solve very large-scale network optimization problems.

Network Analysis has become a major research topic over the last years. The broad range of applications that can be described and analyzed by means of a network is bringing together researches from numerous fields such as Operations Research, Computer Science, Transportation, Biomedicine, Energy, Social Sciences, and Computational Neuroscience. This remarkable diversity of the fields that take advantage of Network Analysis makes the endeavor of gathering up-to-date material a very useful task.

The objective of Net 2013 conference was to initiate joint research among different groups, in particular Center for Applied Optimization (CAO) at the University of Florida and the Laboratory of Algorithms and Technologies for Networks Analysis (LATNA) in Nizhny Novgorod.

We would like to take this opportunity to thank all the contributing authors, the referees for their constructive efforts to improve the quality of the chapters, and CAO and LATNA for support. Research of the editors is partially supported by NRU HSE, RF government grant, ag.11.G34.31.0057.

Nizhny Novgorod, Russia — Mikhail V. Batsyn
Nizhny Novgorod, Russia — Valery A. Kalyagin
Gainesville, FL, USA — Panos M. Pardalos

http://www.springer.com/978-3-319-09757-2

Models, Algorithms and Technologies for Network Analysis
From the Third International Conference on Network Analysis
Batsyn, M.V.; Kalyagin, V.A.; Pardalos, P.M. (Eds.)
2014, X, 139 p. 41 illus., 23 illus. in color., Hardcover
ISBN: 978-3-319-09757-2