Master thesis of *Ju-Chun Lin*

Maximum flows in distribution networks

Ju-Chun Lin

Institute of Information Management

National Cheng Kung University

The maximum flow (max-flow) problem is a fundamental network optimization problem which computes for the largest possible amount of flow sent through the network from a source node to a sink node. This problem appears in many applications and has been investigated extensively over the recent four decades. Traditional max-flow problem may require some modification in its constraints to deal with real-world applications. Fang and Qi propose a new max-flow model, named as manufacturing network flow model, to describe a network with special distillation nodes or combination nodes. Based on this new model, Ting proposes a multi-labeling method to solve the max-flow problem in a distribution network which contains both ordinary and distillation nodes. The approach identifies an augmenting subgraph connecting both source and sink nodes which can be further decomposed into several components where flows in each component can be expressed by a single variable and solved by a system of homogeneous linear equations. The method requires manual detection for components and thus is not trivial to implement. In this paper, we present a preprocessing procedure that reduces the size of a distribution network in polynomial time and then give detailed procedures for implementing the multi-labeling method. We also implement a random network generator that generates random distribution networks guaranteed to be acyclic, connected and in a compact form for our computational testing. Modification on the preflow-push algorithm and the max-flow min-cut theorem is investigated and discussed to provide more theoretical insights as well.

***Keywords*:** maximum flow, distribution network

Thesis advisor: *I-Lin Wang*, ilinwang@mail.ncku.edu.tw
http://ilin.iim.ncku.edu.tw
***Ju-Chun Lin* entered IIM of NCKU in 2003, graduated in 2005.**