University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Applied Science

of

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BSc (Isfahan University of Technology, 2013)

"Linear Network Codes on Cyclic and Acyclic Networks"

Department of Electrical and Computer Engineering

April 21, 2016
1:30 P.M.
Engineering Office Wing
Room 230

Supervisory Committee:
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Abstract

Consider a network which consists of noiseless point to point channels. In this network, the source node wants to send messages to a specific set of sink nodes. If a node v has just one input channel then the received symbol by that node can be replicated and sent to the terminal nodes of the outgoing channels from v. But if v has at least two incoming edges then the received symbols by v via its incoming channels should either be transmitted one-by-one, one symbol at each time unit, or v transmits a combination of the received symbols; the former choice is not in general appropriate as it takes more time compared to the latter option. The former method of sending messages is known as routing, while the latter approach is called network coding.

In [4], Li et al. showed that in a single source finite acyclic network the maximum throughput can be achieved by using linear network codes. After the work done by Li et al., a plenty of efforts were made to efficiently construct good network codes. Jaggi-Sanders proposed an algorithm in [2] which is a polynomial time algorithm for constructing a linear network code on a given network.

Yang, Ming and Huang [8] proposed an algorithm for constructing a linear multicast code on a given acyclic network. The authors of [6] have proposed a method for finding a representation matrix for the network matroid of a given network *G*. This matrix can be used for constructing a generic code.

In this thesis we first provide a review of some the known methods in the literature for constructing linear multicast, broadcast and dispersion codes for cyclic and acyclic networks. We then give a method for normalization of a non-normal code, and also give a new algorithm for constructing a linear multicast code on a given cyclic network; construction of generic network codes is also addressed.