Sharif University of Technology

Faculty of Electrical Engineering

M.S. Thesis

Design of a Congestion Control Algorithm for TCP Protocol Using Neural Networks

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January 2005

Abstract

In 1988, Jacobson proposed congestion control mechanisms, which nowadays constitute the major part of TCP protocol. Along with the fast advances in internet, we need to improve congestion control algorithms. One of the reasons of high rate of data loss in computer networks is the inability of the network to predict the congestion and inform the transmitters on time. This made the IETF to propose Active Queue Management method in computer network routers. The idea behind this technique is to inform the TCP transmitters of congestion before it happens, and to make transmitters decrease their data sending rate to a level which does not overflow the routers buffer. **RED/ECN** is an AQM-based mechanism which has led to data packet loss and data packet delay decrease.

A time series can be found by monitoring the average queue length of routers buffer of computer network, then we can use a TDNN neural network to predict the future value of time series, which is in fact the future value of average queue length of router buffer. We should first design a proper neural network and train it with the above mentioned time series, then we should implement this trained neural network inside the router buffer, so that it could predict the future value of the average queue length of the router buffer based on the present and previous values of it. Afterwards, based on the result of this prediction, the implemented neural network will recall the RED/ECN mechanism to inform TCP transmitters of congestion before it happens and make them decrease their data sending rate; we call this novel algorithm as **Neuro RED/ECN**. We have implemented the neural network program code along with RED/ECN mechanism in the well-known open source computer network simulator, **NS**, and have compiled it again. The simulations using NS show that, our proposed algorithm can decrease average data packet delay and can improve the computer network aggregate throughput, up to 10-15 percent, in comparison to the RED/ECN mechanism.