

Cognitive Congestion Control for Data Portal

Ershad Sharifahmadian, Shahram Latifi

University of Nevada, Las Vegas

Network congestion is one of challenging tasks in communication networks and leads to queuing delay, packet loss or the blocking of new connections. Here, a data portal is considered as an application-based network, and a cognitive method is proposed to deal with congestion in this kind of network. The cognitive method is proposed to improve bandwidth sharing, and deal with congestion in a data portal. When the data portal is about climate change data, congestion control is more emphasized, because the scientific climate data is voluminous and there is a high traffic to/from data portal by the scientific community, research groups, and general readers. In fact, this study is performed to improve congestion control in data portals like climate change portal.

Unlike previous methods for congestion control, the proposed method is an effective approach for congestion control when the link capacity and information inquiries are unknown or variable. The variation of link capacity has an influence on the queue. Here, the controllable parameter α dynamically changes over the time and helps the queue to have a smoother behavior while guaranteeing that is set based on pre-defined operating conditions.

The learning phase is a key step in the cognitive method. During this step, the cognitive node exploits the collected information in the observation phase using the Bayesian network model to build a probabilistic structure which connects desired parameters.

To build the DAG representing the probabilistic relation between the variables, the scoring approach and the constraint approach are utilized. The Bayesian information criterion is selected for scoring, and is based on the maximum likelihood criterion. The Maximum Likelihood Estimation (MLE) technique is used to build a predictive model and estimate the appropriate set of the parameters describing the conditional dependencies among the variables.

The cognitive method was tested under different situations such as unexpected variations of link capacity, oscillatory behavior of the bandwidth. Based on simulation results, the proposed method is capable of adjusting the available bandwidth by tuning the queue length, and providing a stable queue in the network.