Development of Adaptive Controller AWNPID for Improving Active Queue Management (AQM)*

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Abstract:

Internet represents a shared resource, wherein users contend for the finite network bandwidth. Contention among independent user demands can result in congestion, which, in turn, leads to long queuing delays, packet losses or both. Congestion control regulates the rate at which traffic sources inject packets into a network to ensure high bandwidth utilization while avoiding network congestion. In the current Internet, there are two mechanisms which deal with congestion, the end-to-end mechanism which is achieved by the Transmission Control Protocol (TCP) and the intermediate nodes algorithms such as Active Queue Management (AQM) in routers.

In this research, an adaptive wavelet network PID (AWNPID) controller is developed for active queue management (AQM) in an end-to-end TCP network. It is based wavelet network with an infinite impulse response (IIR) recurrent structure. The IIR is combined by cascading the network to provide double local structure resulting in improving speed of learning. PI and PID algorithms have been used for AQM. But these algorithms show weakness in the detection and control of congestion under dynamically changing network situations. So, AWNPID controller is designed to overcome these problems. It adaptively controls the dropping probability of packets by training wavelet network parameters (weight, dilation, translation, and feed-forward and feedback IIR coefficients), revise these parameters online by LMS learning rule, and then, tune PID controller coefficients according to wavelet network output.

The contribution of this pa per is represented by inserting a new program in C++ language into NS2-simulator (version 2.27) bodywork to enable the simulator simulates computer network by both, AWNPID and PID controllers in addition to PI controller which is built in the simulator.

Keywords: **Adaptive controller, Wavelet network, Active queue management, Transmission control protocol.**

* For The paper in Arabic see pages (226-209)

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