CHAPTER 6

Conclusion

In this thesis, the basic principles of ATM networks have been discussed. The ATM network is capable of supporting various type of traffic with different requirements efficiently. Users of the network share ATM resources such as bandwidth and buffers. These resources are allocated to users only when they have something to send. Therefore, ATM uses statistical multiplexing to efficiently share transmission resources and to improve on effective throughput. However, because of the different and unpredictable characteristics of traffic sources, the task of providing the desired quality of service for each user is more complex. Proper traffic management is needed to ensure fairness and efficient operation of the network.

The ATM Forum has defined a set of traffic and congestion control functions for the ATM network and these functions have been extensively studied in the literature. The main objectives of the traffic and congestion control functions are to ensure efficient utilization of network resources and ensure that all connections get their desired quality of service. Therefore, the traffic control functions must take decisive actions so that these objectives are met. Rejecting new connections or discarding cells from violating sources are some examples of the action that the traffic control functions may take.

In this thesis, a fuzzy logic traffic controller has been proposed as an alternative to conventional algorithms for controlling traffic and congestion in ATM networks. The proposed fuzzy logic traffic controller consists of the Fuzzy Policer and Fuzzy Congestion Controller. The design of the Fuzzy Policer and Fuzzy Congestion Controller has been presented. The fuzzy controllers incorporate expert's knowledge in the construction of the rule base. Thus, the fuzzy controllers can make better decisions in performing these control functions.

Simulation has been carried out to gauge the performance of the proposed fuzzy controllers. The simulation results showed that the Fuzzy Policer outperforms the leaky bucket algorithm in both violation of mean rate and mean burst size. The FP is able to detect violations efficiently and thus discards cells to protect the network from severe congestion. As for the Fuzzy Congestion Controller, results showed that it reduces the cell loss ratio by substantial margin when compared to one without fuzzy control, under different load conditions. The Fuzzy Congestion Controller sends feedback to the source to adjust its transmission/cell rate according to the state of the system.

The proposed fuzzy controllers are more effective because both uses linguistics terms and rules to handle the complexity of the traffic and decision process. Also, the fuzzy controllers are simple to implement, can easily be modified and provide soft control.

Future work may be directed to expanding the fuzzy controller to other areas of traffic and congestion control functions. For example, a combination of fuzzy controllers can be implemented to perform both CAC and UPC functions together. This may provide an overall solution to the traffic and congestion problem rather than focusing on controlling certain functions.

Also, recently neural networks have been applied in fuzzy logic controllers. The idea is to develop a fuzzy controller that learns to adjust its performance using a neural network structure. Hence, the fuzzy controller has the ability to learn and adapt to the environment by accumulating experiences. Therefore, application of neural networks in fuzzy controllers is worthy of further study.