Abstract

The mobile ad hoc network consists of a set of identical nodes that move freely and independently and communicate via wireless links. Each node can independently move, join or leave a network due to absence of fixed infrastructure or central management. A frequent topology changes and multiple link failures occur due to arbitrary and random movement of nodes. This dynamic environment challenges the delivery of data and forces to find better models for network parameters especially which are shifting with time. These models may be used for tracking changes in a network environment and subsequently determine the future environment of the network. In this research work, we take up the challenge of identifying the network parameters, which are time dependent and have a great impact on working of mobile ad hoc network. The parameters identified are neighbour count, link load, path length, cluster count and delay. We have put above parameters in the framework of time series because all the said parameters have a temporal aspect. The said parameters when modelled using time series framework exhibits a sound fit with Autoregressive $AR(p)$ model of order $p$. The order $p$ is evaluated for each fitted model and found be lying between one and three. These fitted models are applied for predicting the future values of the said parameters. The forecast values are found to be in full accordance with the real values when validated by statistical tests.

We also analysed the dependence of end-to-end delay of ad hoc network on various external factors such as the number of nodes, routing protocol, mobility models and path length. We proposed two prediction models for end-to-end delay in mobile ad hoc network based on soft computing tools using neural network and fuzzy logic. In our first delay prediction model, we employed artificial neural network using the path length as input variable. In second delay prediction model, we employed regression and fuzzy time series with trapezoidal fuzzy numbers to achieve further enhanced results.