Nonlinear Analysis of Traffic Measurements

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Abstract

We applied a *nonlinear* time series analysis approach [1] to the traffic measurements obtained at the input of a medium size local area network. In order to reconstruct the underlying dynamical system, we estimated the correlation length and the embedding dimension of the traffic series. The calculation of the embedding dimension, based on the Grassberger-Procaccia algorithm [1], has shown that the analyzed series may have a very high dimension. In order to extract the regular part from traffic data and to decrease the system's dimension, we filtered out a high-frequency, *"noisy"* part, applying the wavelet filtering [2]. Using the Principal Components Analysis (PCA) [3] we estimated the number of feature components in the traffic series. The reliable values of the correlation length and the embedding dimension provided the application of a layered neural network for identification and reconstruction of the dynamical system [4]. We have found that the trained neural network [5] reproduces the statistical features of real measurements and confirms the PCA result on the dimension of the traffic series.

References

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