

An Advance Modeling and Control Strategy for a Real Freeway

Azita Dabiri, School of Electrical & Control Engineering, Shiraz University, Shiraz, Iran¹

Ali Akbar Safavi, School of Electrical & Control Engineering, Shiraz University, Shiraz, Iran²

Ali Safavi, School of Electrical & Control Engineering, Shiraz University, Shiraz, Iran³
Gabriel Gomes, California PATH, 1357 S. 46th Street, Bldg. 452, Richmond, CA 94804-4648, USA⁴

azitadabiri@yahoo.com¹

safavi@shirazu.ac.ir²

safavi.ali2003@gmail.com³

gomes@path.berkeley.edu⁴

Abstract:

In this paper an advance modeling and control strategy for a real freeway a based on neural networks and model predictive control is proposed. Because of the nonlinearity of freeway traffic flow, neural network is a promising method for modeling of this system. However, as the freeway length is increased, complexity and dimension of the neural network models will increase. It is shown that by using principal component analysis, the network dimension can be decreased while the accuracy of the models will be reasonably preserved. Then, the simplified neural network can be used within an MPC framework for ramp metering control within a wider area. The approach is then evaluated based on some collected real data from a freeway in USA. The simulation results demonstrate that the proposed approach can alleviate traffic congestion and improve efficiency of the freeway.

Keywords: *Traffic control, MPC, PCA, Neural Network, Modeling*

