Genetic Programming to Investigate Design Parameters Contributing to Crash Occurrence on Urban Arterials

Journal Transportation Research Record: Journal of the Transportation Research Board

Publisher Transportation Research Board of the National Academies

ISSN 0361-1981

Issue Volume 2147 / 2010

Pages 25-32

DOI 10.3141/2147-04

Online Date Friday, October 01, 2010

Authors

Abhishek Das¹, Mohamed Abdel-Aty¹, Anurag Pande²

Abstract

Nonlinear models were developed to estimate crash frequency on urban arterials with partial access control. These multilane arterials consist of midblock segments joined by signalized and unsignalized intersections (or access points). Crashes included in the analysis are of three major types: rear-end, angle, and head-on. Each crash type is further sorted into mutually exclusive categories on the basis of the roadway element responsible for the crashes: midblock segment, signalized intersection, and access point. Genetic programming (GP) is adopted for predicting crash frequency. GP, which is primarily based on genetic algorithms, uses the concept of evolution to develop models through the processes of crossover and mutation. The GP modeling approach gives independence for model development without restrictions on distribution of data. The models developed were compared to the basic negative binomial models. Morning and afternoon peak periods are observed to have fewer occurrences of rear-end crashes at all roadway elements. Higher traffic volume results in an increased number of angle crashes. Instances of angle crashes have increased at signalized intersections, even at lower maximum posted speeds. A higher average truck factor increases the instances of head-on crashes on midblock segments and at signalized intersections.

¹Department of Civil, Environmental, and Construction Engineering, University of Central Florida, 4000 Central Florida Boulevard, Orlando, FL 32816-2450

²Department of Civil and Environmental Engineering, California Polytechnic State University, San Luis Obispo, CA 93407