Safety evaluation algorithm for signalized intersections in Abu Dhabi (UAE) using artificial intelligence

H. Al-Harthei1 A. M. Garib2 Y. Hassan3 A. O. Abd El Halim3

1Head, Traffic Engineering & Road Safety Section, Abu Dhabi Police GHQ, Abu Dhabi, UAE
e-mail: alharthei@hotmail.com
2Roads Directorate, Abu-Dhabi Municipality, Abu-Dhabi, UAE
e-mail: agarib@emirates.net.ae
3Department of Civil and Environmental Engineering, Carleton University, Canada
e-mail: yasser_hassan@carleton.ca, a_halim@carleton.ca

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Abstract
Vehicles traveling through signalized intersections in Abu Dhabi (UAE) experience high crash occurrence. An investigation was carried out to improve highway safety in Abu Dhabi. The research study identified the most significant factors contributing to the occurrence of road crashes at each intersection included in the study. Subsequently, this research provides a detailed signalized intersection safety evaluation algorithm. The algorithm utilizes expert opinions and employs artificial intelligence techniques to estimate a hazard index for signalized intersections. Using crash data, the algorithm is calibrated and the correlation between the algorithm results (hazard index) and crash rates in some selected signalized intersections is performed. The developed model and technique can be extended to be utilized in other regions and cities of similar environment and driving conditions.

Keywords – safety evaluation, signalized intersection, expert opinion, artificial intelligence, safety index

1. Introduction
Abu Dhabi is the capital of the United Arab Emirates (UAE), a country established in 1971 as a federation of seven States: Abu Dhabi, Dubai, Sharja, Ras Al Khimah, Fujairah, Umm Al Qaiwain, and Ajman. Since that time, the Emirate of Abu Dhabi has gained prominence within the Arabian Gulf region, and internationally. Over the past 25 years, population in the Abu Dhabi Emirates has grown from 200,000 in 1975 to over 900,000 in 2000. The City of Abu Dhabi, which is the capital of both UAE and the Emirate of Abu Dhabi, was reported by the US television network CNN to be the richest city in the world [1].

The urban structure of the City of Abu Dhabi is laid in a grid network of major high-capacity urban arterial. The road network in is a modern, rectilinear system. Major arterials typically have dual three-lane carriageways. Junctions of major arterials include signalized intersections, roundabouts, and few grade-separated interchanges. More than 100 signals are controlled by a central computer system. Recognizing the detrimental effect road crashes have on the quality of life and the local economy, both the UAE federal government and the Abu Dhabi government have stressed the need to reduce road crashes.