



Prediction of traffic accident severity based on fuzzy logic

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Abstract

Prediction of traffic accident severity is one of the most important issues in traffic safety. Identification of effective characteristics in traffic accidents and their efficiency in severeness of crashes makes engineers able for further emprise which can reduce the number and probability of car accidents. Various parameters affect this prediction, theses parameters are vehicle speed, driver's age, driver' gender, type of vehicle, safety of vehicle, type of collision, seat belt use, point of impact, weather condition, traffic flow, behaviors of drivers. So eleven parameters and three injury severity levels are selected as input and output variables. In this paper, the effectiveness of the parameters and level of injury severity are predicted by using fuzzy logic. Traffic accident data of freeways were collected as train data in fuzzy system. Modeling result showed that the prediction accuracy was 88/3% for fuzzy logic. These results indicate a more accurate prediction ability of injury severity for fuzzy logic over other traditional methods. Results of the fuzzy logic indicated that driver's age, speed, and seat belt, type of vehicle affect chances of experiencing a severe injury.

Keywords: Fuzzy Logic, Traffic accident, Prediction

1. INTRODUCTION

Road traffic accidents are events that are amenable to rational analysis and remedial actions. In the 1960s and early 1970s, many highly motorized countries began to achieve large reductions in casualties through outcome-oriented and science-based approaches. This response was stimulated by campaigners including Ralph Nader in the United States of America (Nader, R., 1972) and given intellectual strength by scientists such as William Haddon Jr (Haddon Jr, W., 1968). Traffic safety has been a serious concern because of the economic and social effects of traffic crashes. More than 28000 people were killed per year on Iran roads. In recent years, increasing attention has been directed at determining the factors that significantly affect drivers' injury severity in traffic crashes. Fuzzy set theory techniques have also been recently applied to the issue in the area of accident analysis and prevention. Akiyama and Sho (1993) investigated the problem of constructing traffic safety facilities on urban expressways (Akiyama and Sho., 1993). In the planning phase, consideration must be given to construction costs and benefits from reducing the number of accidents. Bush et al. (1995) used fuzzy reasoning for traffic state estimation and incident detection on motorways (Bush, F., and Cremer, M., 1995). Shankar et al. (1996) applied a two level nesting logic formulation to predict crash severity given that a crash has occurred (Shankar, V., 1996). Mussone et al. (1999) applied artificial neural networks to analyze vehicular crashes that occurred at intersection in Milan, Italy (Mussone, L., Ferrari, A., and Oneta, M., 1999).

2. METHODOLOGY

Fuzzy logic theory initiated by Zadeh in 1965 with his seminal paper fuzzy sets (Zadeh, L., 1965) is capable of dealing with systems where the precise descriptions are too complicated to obtain and where human knowledge is available to combine into a system. The basic elements of each fuzzy logic system are rule, fuzzifier, inference engine, and defuzzifier. Figure (1).