



Mapping patterns of pedestrian fatal accidents in Israel

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ABSTRACT

This study intends to provide insight into pedestrian accidents by uncovering their patterns in order to design preventive measures and to allocate resources for identified problems. Kohonen neural networks are applied to a database of pedestrian fatal accidents occurred during the four-year period between 2003 and 2006. Results show the existence of five pedestrian accident patterns: (i) elderly pedestrians crossing on crosswalks mostly far from intersections in metropolitan areas; (ii) pedestrians crossing suddenly or from hidden places and colliding with two-wheel vehicles on urban road sections; (iii) male pedestrians crossing at night and being hit by four-wheel vehicles on rural road sections; (iv) young male pedestrians crossing at night wide road sections in both urban and rural areas; (v) children and teenagers crossing road sections in small rural communities. From the perspective of preventive measures, results suggest the necessity of designing education and information campaigns for road users as well as allocating resources for infrastructural interventions and law enforcement in order to address the identified major problems.

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1. Introduction

Yearly, over 400 people are killed and thousands more are injured in Israel, with foreseeable costs to the society in terms of human lives, property damages and congestion delays. Statistics reveal that a major problem concerns the most vulnerable road users, since over one-third of the traffic fatalities are pedestrians. In fact, in recent years a decrease in the number of accident fatalities has not been accompanied by a proportional decline in the number of pedestrian fatalities (Gitelman et al., 2009).

The literature shows a great interest in comprehending pedestrian accident patterns in order to design preventive measures and to allocate resources for identified problems. In the last thirty years, the main interest has shifted from examining pedestrian accidents involving children (e.g., Bagley, 1992; Brison et al., 1988; Fortenberry and Brown, 1982) and elderly (e.g., Sklar et al., 1989; Zegeer et al., 1993) to analyzing determinants of collisions between pedestrian and vehicles (e.g., Al-Ghamdi, 2002; Ballesteros et al., 2004; Kim et al., 2008a; Lee and Abdel-Aty, 2005). In the last decade, the main interest has further shifted toward investigating factors

that characterize pedestrian accidents at various spatial aggregation levels (e.g., Beck et al., 2007; Eluru et al., 2008; Fontaine and Gourlet, 1997; Harruff et al., 1998; Kim et al., 2008b; Mabunda et al., 2008; Preusser et al., 2002).

The most common factors used to characterize pedestrian accidents are age and gender of the pedestrians, with emphasis given to the higher vulnerability of children and elderly (Al-Ghamdi, 2002; Eluru et al., 2008; Fontaine and Gourlet, 1997; Harruff et al., 1998; Kim et al., 2008b; Preusser et al., 2002) and to the higher involvement of males (e.g., Al-Madani and Al-Janahi, 2006; Beck et al., 2007; Harruff et al., 1998; Kim et al., 2008a; Mabunda et al., 2008). Other factors frequently utilized to exemplify pedestrian crashes are the location in urban residential areas (e.g., Al-Ghamdi, 2002; Beck et al., 2007; Harruff et al., 1998), the intoxication of pedestrians by alcohol or drugs (e.g., Fontaine and Gourlet, 1997; Mabunda et al., 2008; Kim et al., 2008b; Öström and Eriksson, 2001), the fault of pedestrians and drivers (e.g., Al-Ghamdi, 2002; Preusser et al., 2002) and the type of vehicle involved in the collision (e.g., Ballesteros et al., 2004; Kim et al., 2008a). Generally, the relevance of these factors is evaluated independently rather than being examined jointly to provide a broad picture of concurrent characteristics of pedestrian accidents.

This study contributes to the knowledge about pedestrian accidents by uncovering their patterns and their recurrent underlying characteristics. The implementation of cluster analysis and the retrieval of accident patterns that emerge from the data enable providing an integrative and multi-faceted map of pedestrian accidents

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