Chapter 60
Analysis of Pedestrian Road Crossing Behaviour in Urban Areas

Eleonora Papadimitriou
National Technical University of Athens, Greece

George Yannis
National Technical University of Athens, Greece

John Golias
National Technical University of Athens, Greece

ABSTRACT

The objective of this research is the analysis of pedestrians behaviour along entire trips in urban road networks, with focus on their interaction with the traffic and the road environment while crossing roads. For this purpose, a special field survey was designed and carried out, which involved the recording of pedestrians road crossing behaviour along entire trips in real time by means of camera in motion at the centre of Athens, Greece. Based on the results of the field survey, an analysis of road crossing behaviour of pedestrians is presented, concerning characteristics of the trips, the pedestrians, the road environment and the traffic conditions. The results indicate that basic parameters of pedestrian trips (i.e. trip length, walking speed, number of crossings) can be described by appropriate probability distributions. They also reveal a tendency of pedestrians to cross either in the beginning or in the end of the trip, an increased probability of crossing at signalized junctions when these are available, and increased probability of crossing at mid-block in low traffic volume and on one-way roads. Furthermore, there is an overall tendency of pedestrians cross to at mid-block when the road and traffic conditions are favourable. On the contrary, more traffic lanes and increased traffic volume appear to discourage pedestrians from accepting important interaction with the vehicles and to lead them towards the choice of protected crossing locations. The proposed data collection method and the results of the analysis can be exploited in further research for the development of models of pedestrian crossing behaviour along entire trips in urban areas.

INTRODUCTION

The analysis of user behaviour within networks or systems has received increased attention in the fields of transportation (Timmermans, Van Der Hagen, & Borgers, 1992; Dijkstra & Timmermans, 2002), operations research (Ferris & Liu, 2010; Bierlaire & Crittin, 2004) and information systems (Skogster & Uotila, 2008; Núñez-Muñoz & Montoya-Torres, 2009). Especially as regards road transport networks, existing research largely focused on the behaviour of drivers and public transport users, whereas the need for analysis of pedestrian behaviour is becoming more and more pronounced (Papadimitriou, Yannis, & Golias, 2009). More specifically, in recent researches, it is underlined that the analysis of pedestrians behaviour can contribute to the better adaptation of urban transport systems to the needs and to the characteristics of pedestrians, since in most cases the planning of road infrastructure and the traffic control schemes are based on the needs and on the characteristics of vehicles (Kanellaidis, 1996; Phillips, Karachepone, & Landis, 2001). It can also contribute to a more precise assessment of the road accident risk exposure of pedestrians in urban areas (Lassarre, Papadimitriou, Golias, & Yannis, 2007) and accordingly to the improvement of road safety of pedestrians.

The observed behaviour of pedestrians in urban areas is a result of their interaction with the road environment, the vehicles, as well as the other pedestrians, and it is based on a joint evaluation of the probability of accident occurrence during the trip and the cost of delays, within a set of traffic or social behavioural rules (Das, Manski, & Manuszak, 2002). Especially as regards road crossing, although signalized junctions provide pedestrians the chance to cross in designated locations facing stopped vehicle flows, it has been observed that pedestrians have the tendency to prefer the natural intervals in the arrivals of vehicles (traffic gaps) (Hamed, 2001). Also, actions such as diagonal crossing / jaywalking, or crossing

outside designated locations (mid-block crossing) are widespread practices (Chu, Guttenplan, & Baltes, 2003). Because of this type of behaviour, pedestrians suffer lower delays compared to the other users of road network, but higher road accident risk (Grayson, 1987).

The analysis of the road crossing behaviour of pedestrians in urban areas is the subject of several existing researches. These include traffic gap acceptance analyses (Hamed, 2001; Das et al., 2005), pedestrian level of service analyses (Sarkar, 1995; Chanters & Chu, 2002), pedestrian choice utility analyses (Chu et al., 2003; Yannis, Golias, & Papadimitriou, 2007), and before-and-after evaluations of measures and interventions (Van Houten & Malenfant, 1992; Keegan & O'Mahony, 2003; Hakkert, Gitelman, & Ben-Shabat, 2002).

These researches have contributed considerably to the identification and the quantification of several parameters affecting the road crossing behaviour of pedestrians. However, most related researches concern a local level behaviour (i.e. isolated junctions or mid-block locations), while the behaviour of pedestrians as regards road crossing has not been examined at trip level. Also, emphasis is usually given in a specific category of parameters, while the combined influence of characteristics of the pedestrian, the road infrastructure and the traffic conditions is seldom examined (Papadimitriou et al., 2009).

Based on the above, the objective of the present research is the analysis of the behaviour of pedestrians along entire trips in urban road networks, with emphasis on their interaction with the traffic and the road environment when crossing roads. For this purpose, a field research for recording pedestrian road crossing behaviour is carried out, along entire trips in real conditions, in the centre of Athens, Greece. Based on the results of this survey, an analysis of pedestrians road crossing' behaviour is carried out, in relation to characteristics of the trips, the pedestrians, the road network and the traffic conditions.

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