

Improving child safety on the road network

A challenge based on ITS?

Lars Leden, Per Gårder, Charlotta Johansson and
Anna Schirokoff

INTRODUCTION

This paper presents the results of two expert questionnaires focusing on the potential safety and mobility benefits to child pedestrians of different types of ITS services targeted to children. Based on the experts' responses to the first questionnaire, fifteen areas of interest (problem areas) were defined. In the second questionnaire the experts ranked these areas with respect to potential for developing effective ITS services. For each problem area, examples of related ITS services were given. The answers were analysed, and are summarized below in order of importance for the nine most important ones.

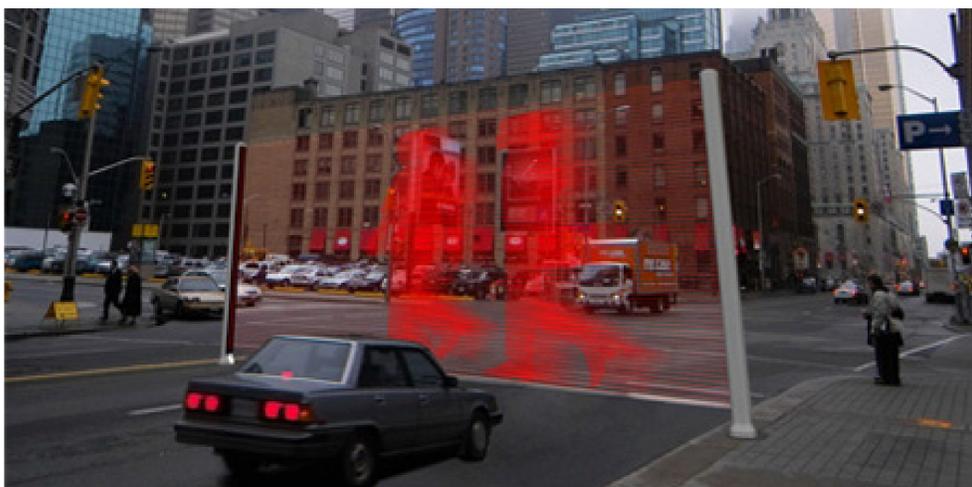
1. Driver travelling too fast where children are crossing.

A child 7 to 12 should not cross streets at locations where vehicle speeds exceed 15-20 km/h (Johansson and Leden, 2010). Such speeds are used in the context of "shared space" and area marked by road sign "Residential area." Older children should not cross at locations where motor vehicle speeds exceed 30 km/h.

Examples of devices that aim to reduce speeds are speed-measuring systems with feedback to the driver on roadside displays, in-car systems that remind the driver of local (legal or advised) speed limits, and in-car systems that intervene to reduce the speed when someone tries to exceed the legal speed limit.

2. Driver not yielding to child or other pedestrian in uncontrolled crosswalk.

Leden, Gårder and Johansson (2006) concluded that 90-percentile speeds at crosswalks should not exceed 30 km/h on any approach or safety will deteriorate. However apart from measures mentioned under Problem Area 1, as a "first aid," various types of in-pavement marker (IPM) systems are emerging. A more futuristic example of ITS aid is the Virtual Wall idea designed by Lee Han Young to 'protect' pedestrians in crosswalks (HanYoung, 2008; Murph, 2008). "The Virtual Wall provides a barrier made up of plasma laser beams depicting pedestrians doing what they do best and any car that crosses that barrier suffers the consequences."



Crosswalk protected by a virtual wall

3. Driver not seeing child pedestrian because of sight obstructions, such as stopped or parked vehicle.

Besides back-up detection systems (see problem area 8), there are other systems that help a driver to perceive pedestrians and possibly intervene in the driving task to avoid collisions. It increases the braking power for an emergency brake (Brake Assist) or even autonomously activates the brakes in case of imminent risk. Volvo (2010) has developed such a system referred to

as "Pedestrian Detection with Full Auto Brake".

4. Driver distracted by advanced ITS-equipment or mobile phone.

A review of several hundred publications reveals that this topic is very complex. Even though a large number of controlled studies show that using a mobile telephone while driving has a negative impact on driving performance, this is not reflected in a strong increase in crash rates in real traffic (Kircher et al., 2011).

5. Driver operating under the influence of alcohol or drugs.

22 experts suggested an alco-lock to be installed in the cars of habitual offenders or in every new car, with almost half going with the latter suggestion. This seems like a very cost-effective solution, especially in jurisdictions where drivers do not pass roadblocks with a regular frequency.

6. Driver not seeing child or other pedestrian at night.

A large portion of accidents with pedestrians happen in darkness: around 46% for the EU18 in 2005 (Eisses, 2011). In the United States, 70% of all pedestrian fatalities in 2010 occurred in darkness. There is a great possibility that safety would improve significantly if we could get more people to use reflectors. Another efficient countermeasure could be to develop ITS night time systems, such as those described in Problem Area 7, following here.

7. Child pedestrian not supervised and running into street without looking for cars.

There were nine experts who suggested that streets be equipped with video cameras that process images of objects and people in a street, and if a child is detected, an in-vehicle alarm is triggered. Seven experts suggested that children carry emitting devices which broadcast a signal that is picked up by a detector in the vehicle and an alarm is triggered whenever a child is within X meters from the vehicle, or when the child is within the roadway as determined by GPS.

8. Driver not seeing child pedestrian when reversing their car or truck.

A back-up camera combined with a sound alarm was the most commonly suggested solution.

9. Child pedestrian or other slow moving pedestrian not given enough time to cross a street at a signalized intersection.

A traffic signal control system that uses sensors to detect the presence of pedestrians and adjust the traffic signals accordingly is an 'intelligent' ITS solution. The duration of the walk signal may be adjusted to accommodate slow-moving pedestrians. Pedestrian detection systems have been shown to significantly decrease the number of pedestrians who violate "don't walk" signals in the US (MacCubbin, et al., 2005).

FINAL CONCLUSIONS

There is not a straightforward reaction to the question asked in the heading of this paper, but there is a clear warning that maybe we should not rely too much on ITS-based services. However, we should not be afraid of embracing the ones that clearly have positive safety effects. ITS solutions developed for children might be needed to reach the target for EU set by the European Transport Safety Council, ETSC (2009), that the EU should see a 60% reduction in children fatalities in traffic between 2010 and 2020. For other age groups, the goal is a 40% reduction. Such an improvement of safety for children, would lead to increased mobility and a more sustainable way of living.