

ROAD SAFETY IN URBAN AREAS FOR SUSTAINABLE TRANSPORT MODES

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Of the total 1.25 million people dying in road traffic crashes annually, at least 30% are in urban areas (WHO 2015).

Almost half of all deaths on the world's roads are among those with the least protection—motorcyclists (23%), pedestrians (22%) and cyclists (4%). Therefore urban traffic safety requires special focus on making the urban environment safer for pedestrians, bicyclists and motorcycle users.

Most public transport users are also pedestrians, because access and egress trips of a public transport system are walking trips. Our research activity will focus on some important principles for making urban traffic safer for pedestrians, bicyclists, Powered Two Wheelers and public transport users.

Bicycle users differ in their use of the road from other vehicles and they have different needs; predictable road geometry, good visibility, high quality road surface, while important for all road users, are essential for cyclists.

From this statement, the first aim of this research project is the validation, for Italian roads, of a technical evaluation of paths, according to the concept of Road Safety Review (RSR) and Road Safety Audit (RSA). This tool allows revealing anomalies with respect to the regulatory standards and guidelines for the design of cycling paths.

The next step of this research concerns the investigation of users' visual behavior while cycling (fig.1 and 2). Eye movements have been recorded by using ASL Mobile Eye-XG system, which consists in two digital high-resolution cameras mounted on lightweight glasses and a portable wireless Data Transmit Unit (DTU). One camera records the pupil position of participant's right eye and the other camera records the environment scene seen by the cyclist. In addition, the bike was equipped with a GPS recorder to obtain kinematic data of the tests.

Another similar research aimed to assess situation particularly risky for bicycle safety is connected to the driving analysis for heavy good vehicles, buses or coaches. Because of the size and shape of the cab, the driver cannot see some multiple areas around the vehicle: they are the so called 'blind spots', the areas that cannot be seen in a driver's

forward vision or rear and side-view mirrors. The cyclist, who perhaps approaches the bigger vehicle at a junction just when it is turning, does not know that the driver does not see him. This may easily turn into serious injury to the cyclist (fig.3). We have already carried out a first awareness campaign in Bologna. It has revealed even if low-cost and easy to be implemented, and it can therefore be very effective to increase road safety.



Fig. 1. Exploring the role of gaze behavior and object detection (heat map) in bicycle path understanding and design.



Fig. 2. Bicycle user equipped with Mobile Eye Detector and GPS recorder during in-situ test



Fig. 3. Bicycles and Heavy Vehicles interaction in urban roads: Pay attention to Blind Spots!

We conducted also some studies to assess bicyclist conspicuity enhancement at night by the application of reflective tape (ECE/ONU 104) to the bicycle rear frame and to pedal cranks.

Previous studies have tested the benefits of reflective markings applied to bicyclist clothing. Reflective jackets however needs to be available and worn while reflective markings enhance conspicuity without any active behavior by the bicyclist.

Detection distance was compared in different conditions: control, rear red reflector, high visibility jacket, and reflective tape. In a second study, the same conditions were studied with night public street light on and off. In a third study detection and recognition distances were evaluated in rainy conditions.

MAIN PUBLICATIONS

Bichicchi, A., Vignali, V., Simone, A., Lantieri, C., Amadori, M., (2016). From data to practice: a cycling path review to assess the impact of urban mobility measures on cyclists, *under review* Proceedings of the International Cycling Safety Conference 2016, 3-4 November 2016, Bologna, Italy

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RESEARCH PROJECTS

Research agreement between DICAM and Bologna Metropolitan Area for the analysis and study of road user – environment interaction through the mobile-eye detector.

Agreement between DICAM and LEPSIS - Laboratoire exploitation, perception, simulateurs et simulations-Siège IFSTTAR a Marne-la-Vallée, Paris, France.

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