Advanced measures to reduce cyclists' fatalities and increase comfort in the interaction with motorised vehicles

Result in Brief

Project information

XCYCLE

Grant agreement ID: 635975

Project website

Funded under: H2020-EU.3.4.

Overall budget: € 5 009 332,50

EU contribution € 5 009 330

Coordinated by: ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA

Systems for safer cycling

Cyclists are vulnerable, and must hope that drivers see them. Now riders can be sure.

Cycling is fun and healthy, but also potentially dangerous. Around 2 000 European cyclists were killed in crashes each year between 2010 and 2016. In most cases, incidents involving motor vehicles were the cause.

Few cycling safety systems currently exist, and those that do are limited. For example, infrastructure solutions, which use cameras to detect cyclists, are unreliable. Furthermore, available on-bike and in-vehicle systems neither interact nor share information with other systems.
The EU-funded XCYCLE project catalogued the shortcomings of bicycle safety systems and developed replacements. The new devices function separately but also integrate to provide a highly accurate safety system.

“We started with reviewing and technically evaluating all currently available cycling safety technologies,” says Professor Luca Pietrantoni, project leader. “We also analysed crash statistics from 10 EU countries, to identify the most dangerous scenarios for bicycle-motor vehicle interaction.” Foremost among those is where drivers turn when bicycles are in their blind spots – a situation that accounts for 35% of cyclist fatalities.

New safety systems

The XCYCLE team developed and tested three separate sets of safety systems: sensor-based detection systems, warning systems and traffic management algorithms.

The first set uses sensors and cameras to detect the presence of cyclists. The innovation includes a stereo vision system to detect movement at intersections, plus an ultra-wideband communication system that pinpoints cyclists' positions. Together, the two technologies provide a complete dynamic picture of an intersection, giving the ability to locate and track cyclists. Researchers also developed an in-vehicle system that warns of cyclists riding in a vehicle's blind spot. This detector is especially relevant to large trucks turning at intersections.

A second set of systems uses data gathered from sensors to predict trajectories and assess risk. Using wireless communication systems, the information is shared among vehicles, nearby infrastructure and cyclists.

The final development is a patented algorithm module for the Green Wave system, called ImFlow. Green Wave detects cyclists and calculates their rate of approach to an intersection. The system then manages traffic lights so that cyclists need not stop; instead, cyclists ride a wave of green lights over a series of intersections. ImFlow improved the time-to-green prediction, and showed an 11% traffic efficiency gain compared to other algorithms. The innovation did not negatively affect other traffic, but it did reduce cyclist waiting times and increase the number of cyclists able to pass through an intersection each cycle.

System integration and the future

“One important achievement of XCYCLE,” adds Prof. Pietrantoni, “is the fusion of different safety systems.” In-vehicle and on-bike radio devices exchange information among different road users. “Together, the linked technologies overcome the weaknesses of any one system acting alone.” The system also helps avoid false alarms, and to reduce the workload of road users via effective warnings.

The XCYCLE project had no commercial goals. Although the initiative wound up in November 2018, the European Road Safety Observatory will continue using the project’s knowledge and tools to work towards
the European Commission’s ‘Vision Zero’ goals.

The new systems may eventually become standard, thereby helping all road users identify and avoid dangers affecting cyclists. This will mean safer and more efficient biking.

**Keywords**

XCYCLE, safety system, intersection, cycling, road user, motor vehicle, blind spot, Green Wave, ImFlow, bicycle safety, traffic management

Discover other articles in the same domain of application

**Smart city and wise city**

**When car sharing goes beyond green mobility**

**Bike, bus, metro, foot: going intermodal**

Share this page

Last update: 30 April 2019

Record number: 286124