New traffic light system automatically recognizes pedestrians' intent to cross the road

May 27 2019

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In Vienna there are some 200 push-button pedestrian lights (signalized pedestrian crossings). They allow pedestrians to cross the road safely.

But only after a waiting time, which is annoying for many people. This often results in pedestrians not waiting for the green phase, but instead walking in a different direction or crossing the street when the lights are red. For some people, push-button lights are an invitation to trigger off the green phase as they go past—just for fun. Something that annoys car drivers, who have to stop at the crossing even though nobody is crossing the road.

More convenience—less waiting time

In a project commissioned by Municipal Department 33 of the City of Vienna—responsible for urban lighting, traffic lights, clocks and public WiFi nodes—researchers at TU Graz's Institute of Computer Graphics and Vision have developed a new pedestrian traffic light system in the last three years which is more convenient and meant to replace the push-button system. The innovative camera-based system recognizes the intention of pedestrians to cross the road and switches to green automatically. What's more, it optimizes the traffic flow further, as Horst Possegger from the Institute of Computer Graphics and Vision explains by way of two examples: "The green phase can be extended in the case of large groups of persons, who require more time to cross the road. And if persons leave the waiting area before the lights have turned to green, this is also passed on to the lights. The traffic lights subsequently don't switch to green and there are no unnecessary waiting times for motorized traffic."

Camera tracking as basis

The main feature is a camera mounted on each pedestrian traffic light. Whereas standard industrial solutions only cover a visual field of two by three metres, this system perceives persons within a field of eight by five metres. It recognises whoever wants to cross the street in seconds. "It

requires one second to estimate the intention—after two seconds the estimation becomes reliable," explains Possegger. Subsequently, the system signals the wish to cross the road on behalf of one or more persons to the pedestrian light controller. The latter decides when the lights should change—just like a traditional push-button system. "Using the current configurations, our system signals that wish to cross three to four seconds before the button is pushed," says Possegger.

Horst Possegger knows that this all sounds very simple, but "two years of intensive research were necessary due to the complexity of requirements." The hardware had to be big enough for a powerful local computer, but at the same time small enough to fit into the switch box of the traffic lights. Exactness and efficiency was a primary goal of the software. Moreover, the traffic light was also equipped with a monitoring system which can report faults immediately. "This is a double safeguard. The system was developed in such a way that it can work round-the-clock even in a harsh environment and can also deal with voltage fluctuations," explains Possegger.

Using global movement models and recorded data, the research team developed learning algorithms which recognize pedestrians' intention to cross the street.

Possegger dispels any worries about data protection. Although the image data are absolutely necessary to detect pedestrians—including children and persons with umbrellas or buggies, the images are only analyzed locally and do not leave the camera. The pedestrian traffic light system works exclusively with geometric information from which it derives a possible wish to cross.

Implementation by the end of 2020

The knowledge transfer is currently being carried out from the

researchers to Günther Pichler GmbH. The company is responsible for the installation in the Vienna city area and will replace push-button lights with the new camera system at selected locations by the end of 2020 for evaluation purposes.

Provided by Graz University of Technology