International Co-operation on Theories and
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# Can we improve pedestrian safety by installing smart crossings? A before-after study including spill-over effects

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## Introduction

Traffic accidents involving pedestrians and pedestrian fatalities represent a significant public health concern globally. Between 2010 and 2021 alone, over 52,100 pedestrians lost their lives on European roads, accounting for almost a third of all road fatalities. In the EU27 countries there is an average of 9.7 pedestrian fatalities per million inhabitants, in Hungary this is as high as 14.3. Notably, 40% of all designated crosswalk accidents in Hungary occur under poor visibility conditions.

Visible pedestrian crossings emerge as a promising response to the safety concerns of pedestrian crossings. These designated areas aim to increase a driver's upstream visibility of the crosswalk and raise awareness of potential pedestrians through well-defined markings and signage. Research has shown that increased visibility of crosswalks can lead to a significant reduction in pedestrian-vehicle collisions.

One such innovative countermeasure is SafeXone developed by Visible Crossing, a company based in Hungary. This system utilizes four bollards at each crossing corner to enhance both pedestrian safety and driver awareness. Upon detecting a pedestrian, the system activates bright yellow flashing lights on the bollards, visible from 150 meters. For enhanced safety during low-light conditions, a unique laser plane system comes into play. Lasers within the bollards project a plane of light across the roadway, illuminating pedestrians and highlighting their presence on the crosswalk, providing an extra layer of protection for vulnerable road users.

Over the past few years SafeXone has been installed at almost 80 locations, however, their safety effect has not been scientifically evaluated yet. The objective of this study is to fill this gap by assessing the safety impact of this system using a before-after study including spill-over effects.

## Research Methodology

A road stretch with two adjacent pedestrian crossings 170 meters apart in the city of Székesfehérvár, Hungary was chosen. In this research a before-after study was designed using video recordings and speed measuring radar devices at both locations. The SafeXone device was installed at one of the pedestrian crossings in March 2024, the other one was kept as is to evaluate the spill-over effects.

Video recordings were collected for 5 days in the before period as well as in the after period at both locations. Roughly 8 hours per day covering the morning (from 6.00 am to 10.00 am) and afternoon peaks (from 2.00 pm to 6.00 pm) were recorded using two GoPro cameras (altogether 40×2×2=160 hours). These video recordings are analyzed by TrafxSAFE, a product of Transoft Solutions.

TrafxSAFE provides automated video analytics using computer vision and machine learning algorithms. The technology uses machine learning to detect, track and analyze interactions between any two road users visible in the video frame. The tool performs the automated analysis in the following order:

1. Detecting and categorizing road users
2. Tracking road users' movements and calculating their speeds
3. Performing road safety analytics, by automatically flagging near-miss conflicts

It reports data on road user classification, turning movement directions, traffic volumes, speed and conflict events using surrogate measures of safety such as speed, time-to-collision (TTC), and Post-Encroachment Time (PET). Using the calculated metrics, TrafxSAFE is then able to aggregate and display the computed data and metrics in the form of charts and heatmaps, visualizing the change spatially or in time.

Radars were used to measure the speed of vehicles approaching the pedestrian crossings. Six stations at each location were set up 10 meters apart from each other (covering altogether 50 meters upstream of the pedestrian crossing). Speeds were measured for one day both in the before and after periods. The radar output files can be merged and using time stamps the speed profile of individual vehicles can be constructed.

**Expected results**

Since videos and radar outputs are being analyzed at the time of writing, we cannot report on results, yet. Once all the data is available, we plan to do the following:

1. Surrogate measures of safety will be analyzed and compared. This comparison will be done between the before and after periods, as well as between the installation and control sites (to see whether there is any spill-over effect).
2. Conflicts will be clustered based on their severity levels for both periods and locations.
3. Speed measurements will be analyzed and compared. Aggregated speed profiles using the data from the six radar stations will be constructed for both the before and after periods, as well as for the installation and control sites.
4. Speed distributions per radar stations will be analyzed, investigating speed changes for both before and after periods and for both the installation and control sites (to see whether there is any spill-over effect).