Studies addressing Vulnerable Road Users, particularly pedestrians, are relevant to increase safety in view of the tragic safety statistics and the increasing focus on accommodation of non-motorized road users in our transportation systems. In the EU, 21% of all traffic fatalities are pedestrians. The largest share of these are 65 or over and occur in urban environment. Therefore, questions about pedestrian safety, the interaction of pedestrians and motorized traffic, as well as their operational effects, need to be explored. A thorough understanding of pedestrian behaviours in urban environments and the risks faced by them, especially at unsignalized street crossings is lacking. The analysis methods of the pedestrians’ behaviour pass through sophisticated simulation methods, due to their ability to replicate variability, to consider system effects, and to allow the analysis of extremely dangerous scenarios. However, the consideration of pedestrian behaviour in simulation is currently limited and is recognized as one of top ten key research needs in traffic simulation.

This research is a part of the project AnPeB - Analysis of pedestrians’ behaviour based on simulated urban environments and its incorporation in risk modelling and aims at comparing the pedestrians’ behaviour on simulated urban environments with field observations.

Therefore, two intersection crosswalks with different traffic and pedestrian flows were selected for describing pedestrians’ behaviour and traffic characteristics in real environments. This information was used to parameterize the inputs of two simulated environments, to replicate the real ones. Preliminary experiments with real pedestrians were run and their results were compared with real data for their own validation.

To characterize the pedestrians’ behaviour and vehicles’ operational conditions the software Traffic Intelligence, developed in the scope of an European project, was adapted and used. This software uses video images to identifies pedestrians and vehicles through the automated analysis of video recordings and registers their trajectory in time allowing the calculation of speed, acceleration and also several surrogate safety indicators which relate vehicles with pedestrians, such as Time-to-Collision (TTC).

The behaviour of the drivers when a pedestrian approaches a crosswalk was categorized by stopping, slowing down and continuing. For each category, speed-time models were developed to be implemented in the virtual environments. The pedestrians’ behaviour was characterized by their speed and acceleration before, during and after crossing the street. Finally, the TTC was calculated at several pedestrians-conflicting vehicle positions.

Meanwhile, the urban environments were constructed to replicate with reliability the two selected intersection crossings and their surroundings. BlenderTM 2.79 was used to construct the virtual scenarios, while BlenderTM 2.69 was used alongside with BlenderTM VR to project the scenarios on
the CAVE system. This system is composed by 3 chip DLP projectors Christie Mirage S+4K with resolution up to 1400*1050 pixels, with frame rates locked at 96 Hz and stereo projection using active shutter 3D glasses. Additionally, the experiment stimuli were constructed to replicate the behaviour of the drivers.

Ten pedestrians participated in the experiment, five females and five males, all voluntary participants, recruited via academic institutions. The experiment was composed by two parts: one static and another dynamic. Therefore, for the same stimuli, pedestrians were asked to indicate when they would start crossing by pushing a trigger and, afterwards, they were asked to actually cross the simulated street and their movements were recorded with Vicon® motion capture system.

From this experiment it is expected to be able to replicate the pedestrians’ behaviour by comparing crossing speeds and TTC. If not, suggestions will be made to improve testing protocols. With this tool validated, further experiments will be carried out to identify with reliability pedestrians risk factors when crossing a street.