The total number of accidents of a certain type in a certain location is a product of the accident risk and the exposure. The exposure is often defined in terms of AADT, which is known for having non-linear relation to accidents (safety-in-numbers phenomenon). Some researchers argue that the simultaneous presence in a certain location of two conflicting road users, has much stronger theoretical grounds for being a unit of exposure compared to single passages. An encounter can be seen a statistical “trial” that either results or not in a collision with a certain probability. That probability represents a characteristic value for that specific site and can be used for comparison between sites with different schemas and layouts or even for similar sites in different Countries. Moreover, since the process of encounter generation is relatively complex, it might be able to explain at least some part of the safety-in-numbers effect.

Obtaining the encounter data requires much efforts as, unlike the flow counts, it is not collected on a regular basis and thus must involve either manual counts or use of sophisticated tools like automated video processing. In this study, the use of microsimulation was tested as virtual environment for getting encounters. As a starting point, data on flow and encounters between motor vehicles and bicyclists collected manually within the Horizon 2020 project InDeV (2015-2018) are used. The same intersection is then modelled in VISSIM software and various operational definitions of an encounter are tested and compared to the field data.

The trajectories obtained by microsimulation are then analyzed with the Surrogate Safety Assessment Module (SSAM) and compared with observed encounters. The input traffic volumes of the simulation are measured in the real world and in the same time frame of the observed encounters. The variability of the flows, and as a consequence the encounter frequency, is taken into account considering the hourly variation of the daily observed volumes. This condition implicit considers the non-linear relationship between flows and encounters frequency which resembles the shape of the non-linear relation between the flow and crashes. The comparison between the observed and simulated encounters is carried out considering, for the simulated one, different range of Time To Collision (TTC) and Post Encroachment Time (PET). For this, the use of SSAM offer the advantage of estimating different surrogate safety measures for each interaction in the trajectories of two road users. The shape of the distribution of the simulated encounters allows to assess which range of TTC or PET values is the more appropriate to estimate the expected encounters in a simulated environment just considering, as dynamic parameter, the hourly distribution of daily traffic flows. After this first validation step with observed data, a testing phase is performed by changing the drivers behavior or the intersection layout to estimate the value of the threshold of PET and TTC, in estimating encounter frequency obtained by SSAM and counted manually from simulation by using the encounter definition. The results allow to extend the traditional use of microsimulation and SSAM for the estimation of conflicts, which under certain restriction represent a surrogate safety measure, to a measure of exposure to the risk, such as the encounters. The result also indicates a maximum threshold for the tested indicators since they at that threshold can be reliably used to estimate exposure and are therefore not suitable to estimate risk and to be used for safety analysis.