Proposed topic for Master's thesis

Automatically evaluating road safety of cyclists using semantic 3D city models

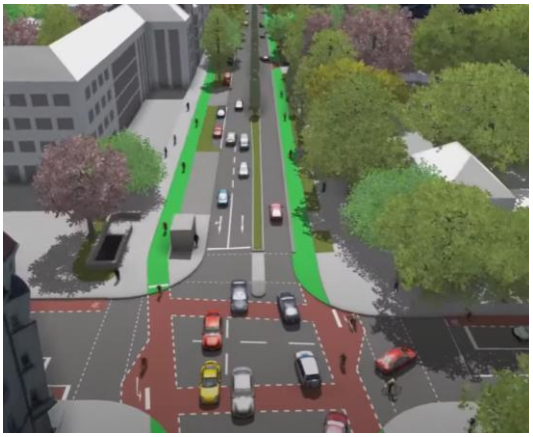

Figure 1: Semantic 3D city model including bicycle infrastructure.

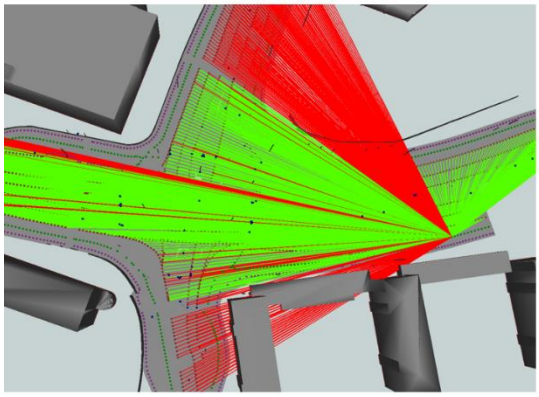

Figure 2: Line-of-sight visibility analysis evaluating the field of view of cyclists at a certain position.

In the context of urban digital twins, a number of cities are gathering detailed information on roads and the streetspace including 3D representations of bicycle infrastructure and their surroundings. Different methods are available in order to evaluate the service quality of bicycle paths and safety related aspects for cyclists.

In this thesis, concepts and methods for assessing visibility related safety aspects of cyclists shall be investigated and developed. Information provided by digital representations of the streetspace as part of semantic city models should be used to automatically conduct different analysis, focusing on visibility aspects. Questions like: What part of an intersection can a cyclist see from a certain location? Or: Can cyclists be seen by car drivers? Should be answered automatically on the basis of available semantic and geometric information within 3D city models.

This can be achieved by conducting line-of-sight and viewshed analysis within the virtual environment. In order to created realistic scenarios, concepts for simulating obstacles such as parked or moving cars potentially blocking the field of view need to be developed and implemented. This needs to be done for static scenarios (e.g. the field of view at a certain location in a specific direction) and dynamic scenarios (e.g. changing view of a cyclist along a bicycle path or changing obstacles of moving cars). A detailed 3D city and streetspace model including bicycle infrastructure, traffic lanes, sidewalks, city furniture, vegetation and buildings is available for cities such as Munich or Ingolstadt. Additionally, traffic simulation results conducted using the open-source traffic simulation tool SUMO are available and can be used to determine the location and orientation of traffic members at different points in time.

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