

A Study of Pedestrian Crossing Behavior Using Video Sensors

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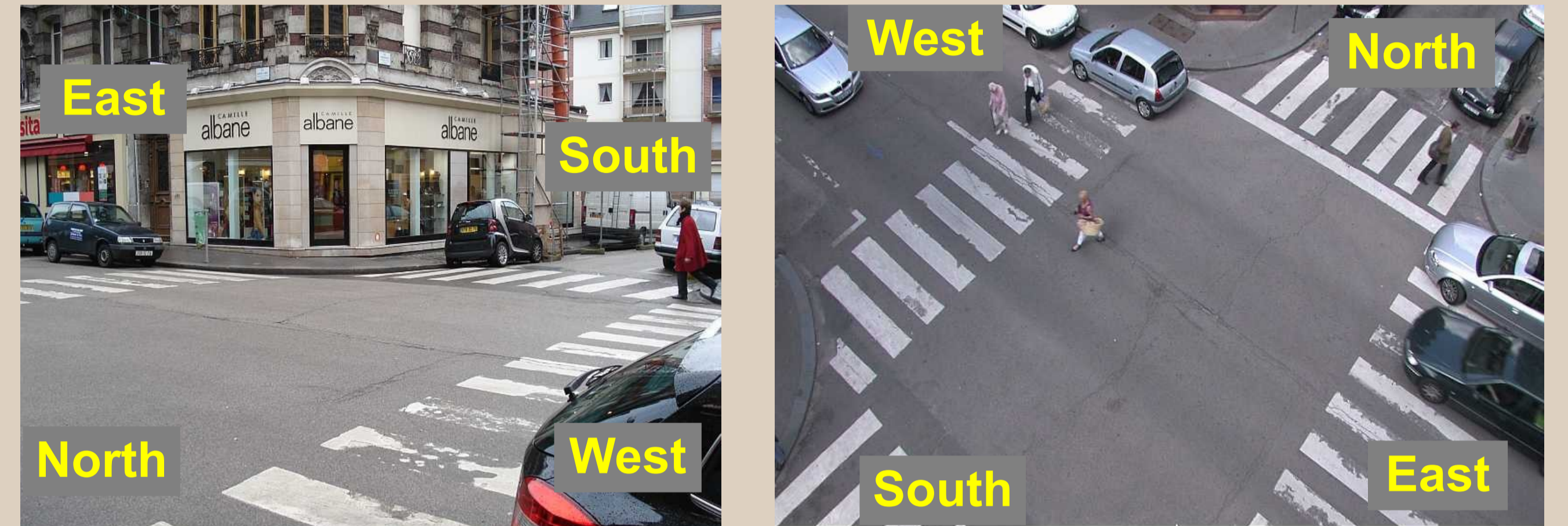
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Context

Accident analysis highlights that most accidents involving pedestrians take place at crosswalk, shared space where potential conflicts between pedestrians and drivers may occur. One of the goals of these works aims to contribute to the pedestrian modeling in crosswalk situations and more generally in urban areas. One of the difficulties to set up microscopic traffic simulation tools is the lack of traffic data on pedestrians and their interactions with the drivers. In this contribution, we aim to achieve a method in order to collect traffic data sets involving pedestrian and vehicles.

Video data set and observed site

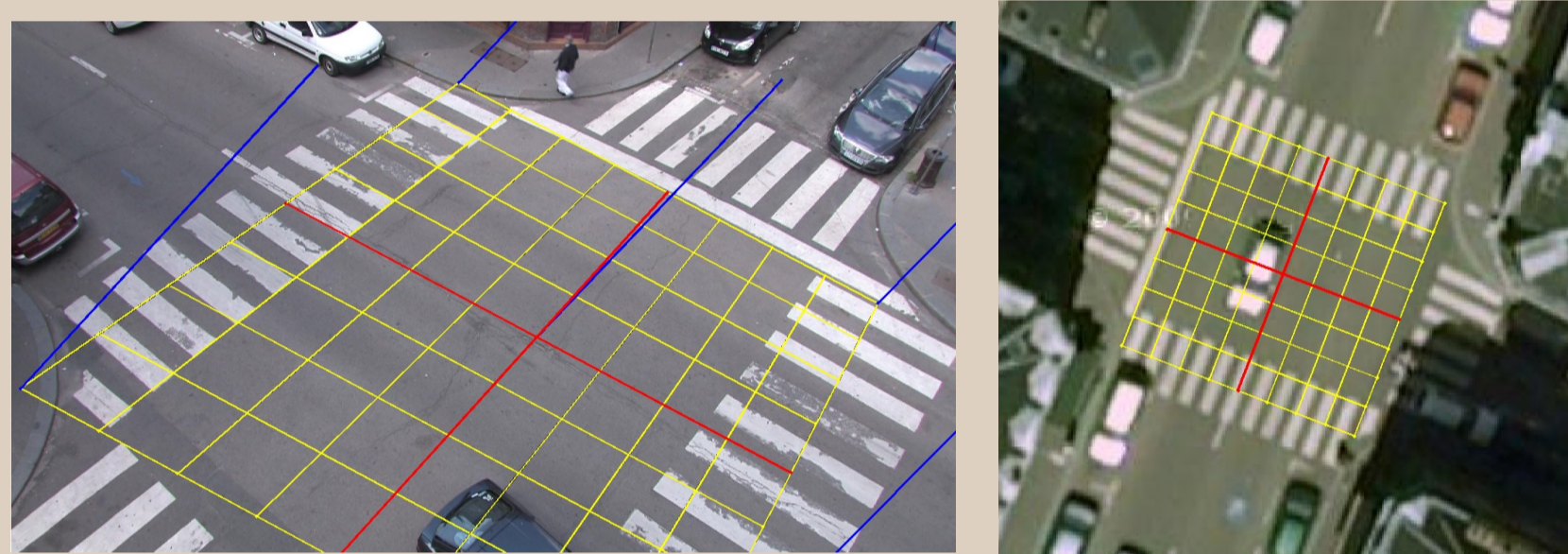
The chosen observed site is located in Rouen (France). Both pedestrian and motorized traffic flows are sufficient to test our method. We did not observe congestion peaks. For this work, the video data was collected around noon. The video data collection was performed by David Doucet from the CETE-NC. The video duration is 50 minutes.



An unsignalized intersection in Rouen (France).
View from a pedestrian and global view of the intersection

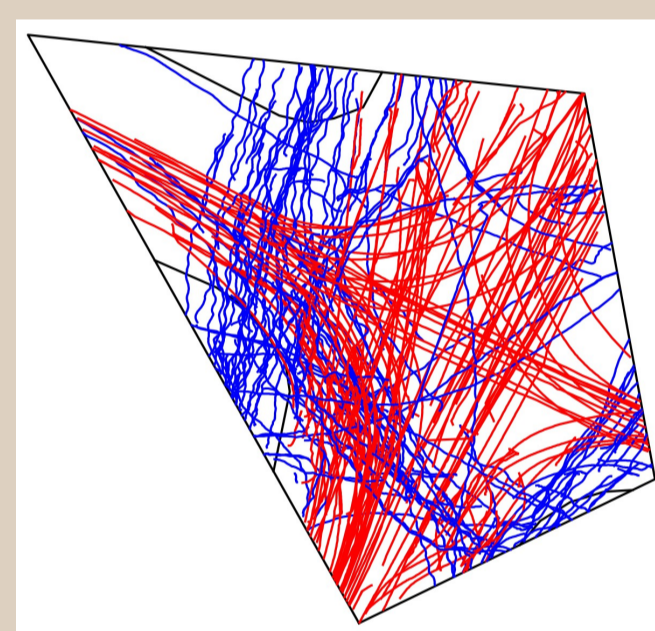
Trajectory extraction

Pre-processing step: camera calibration



Project object in the image space to the « real world » space (ground level)

Homography matrix



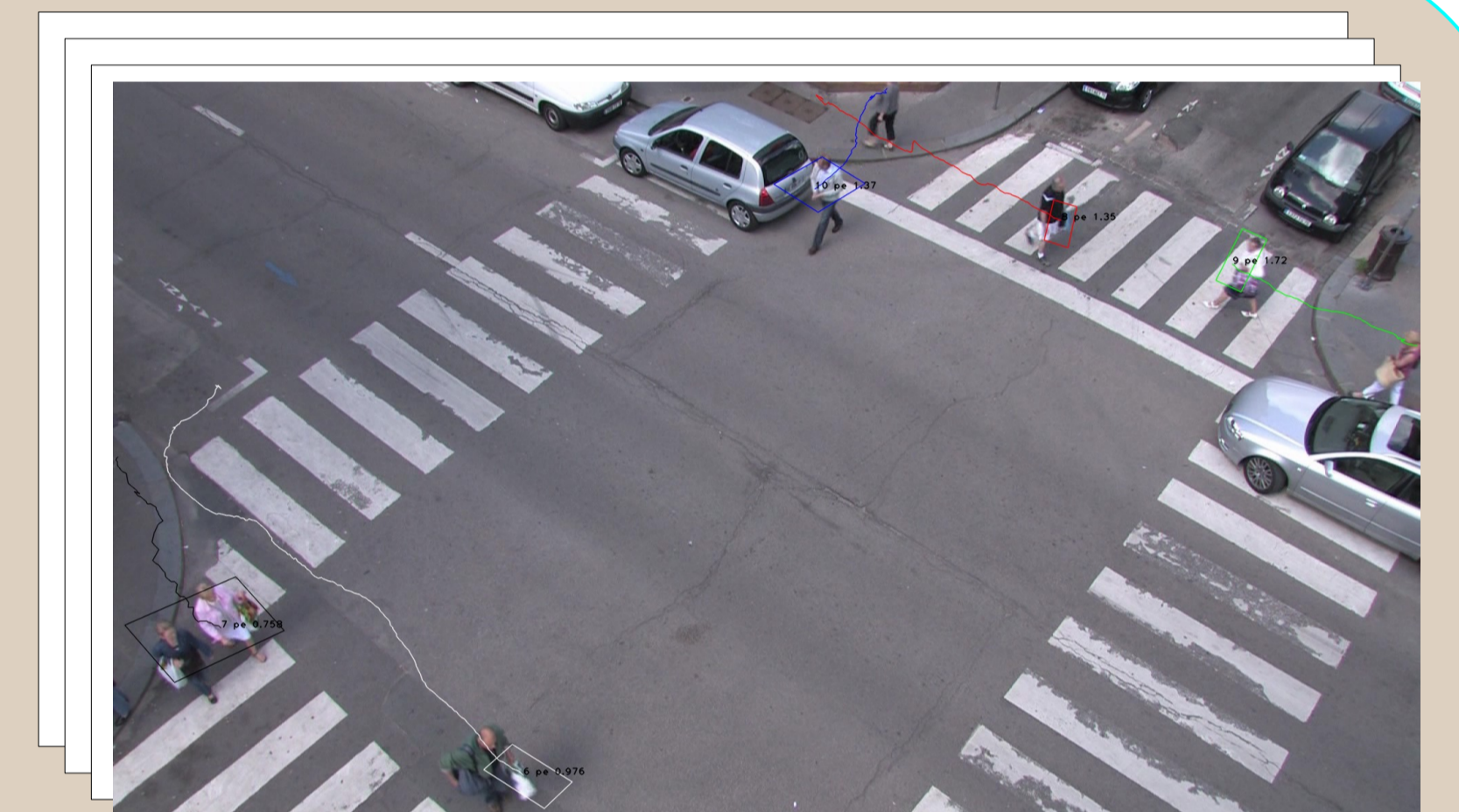
Trajectory prototypes for classification

■ vehicles
■ pedestrians

Feature-based tracking



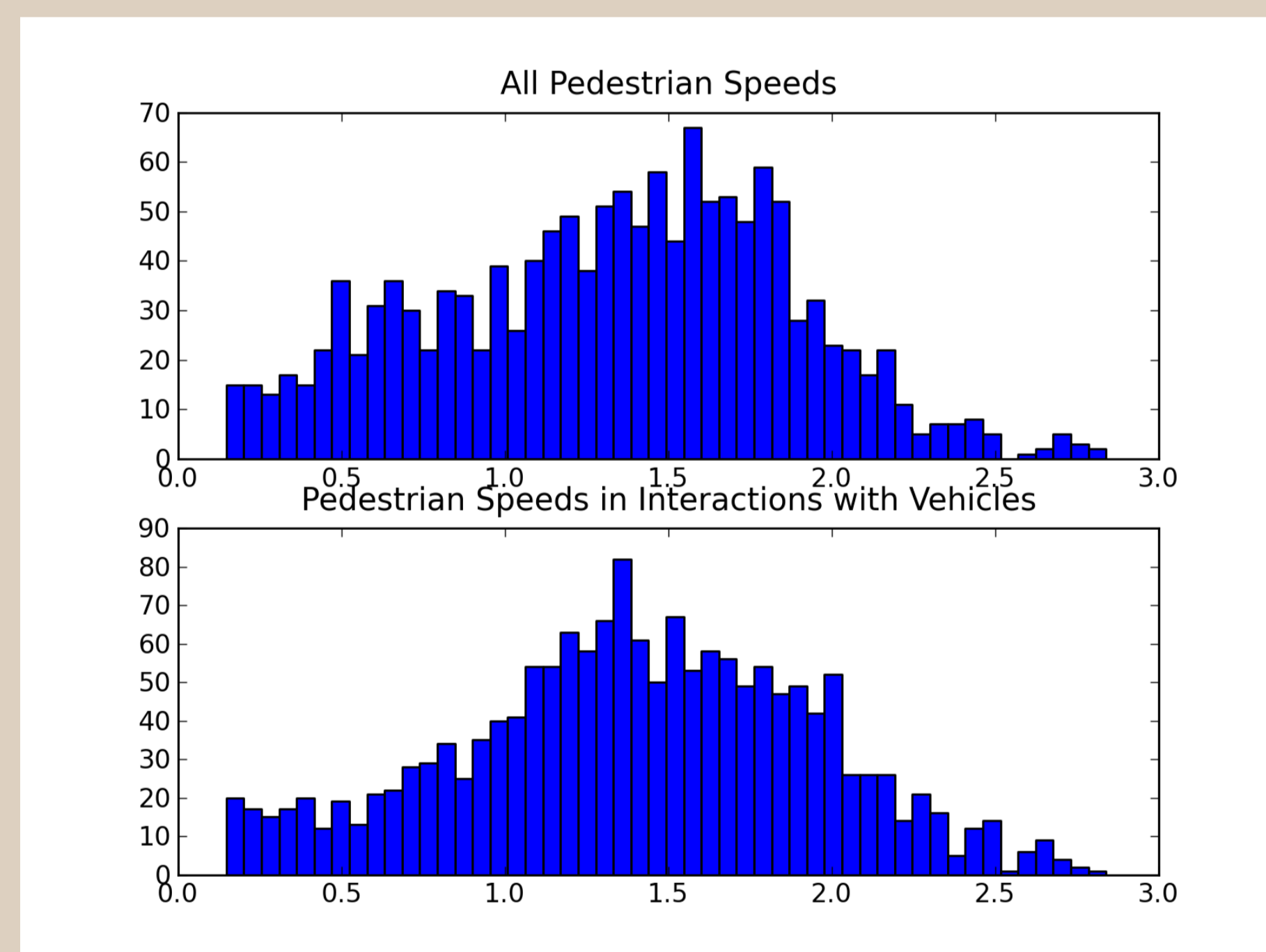
Features on pedestrians



Road user trajectories (pedestrian and vehicles)

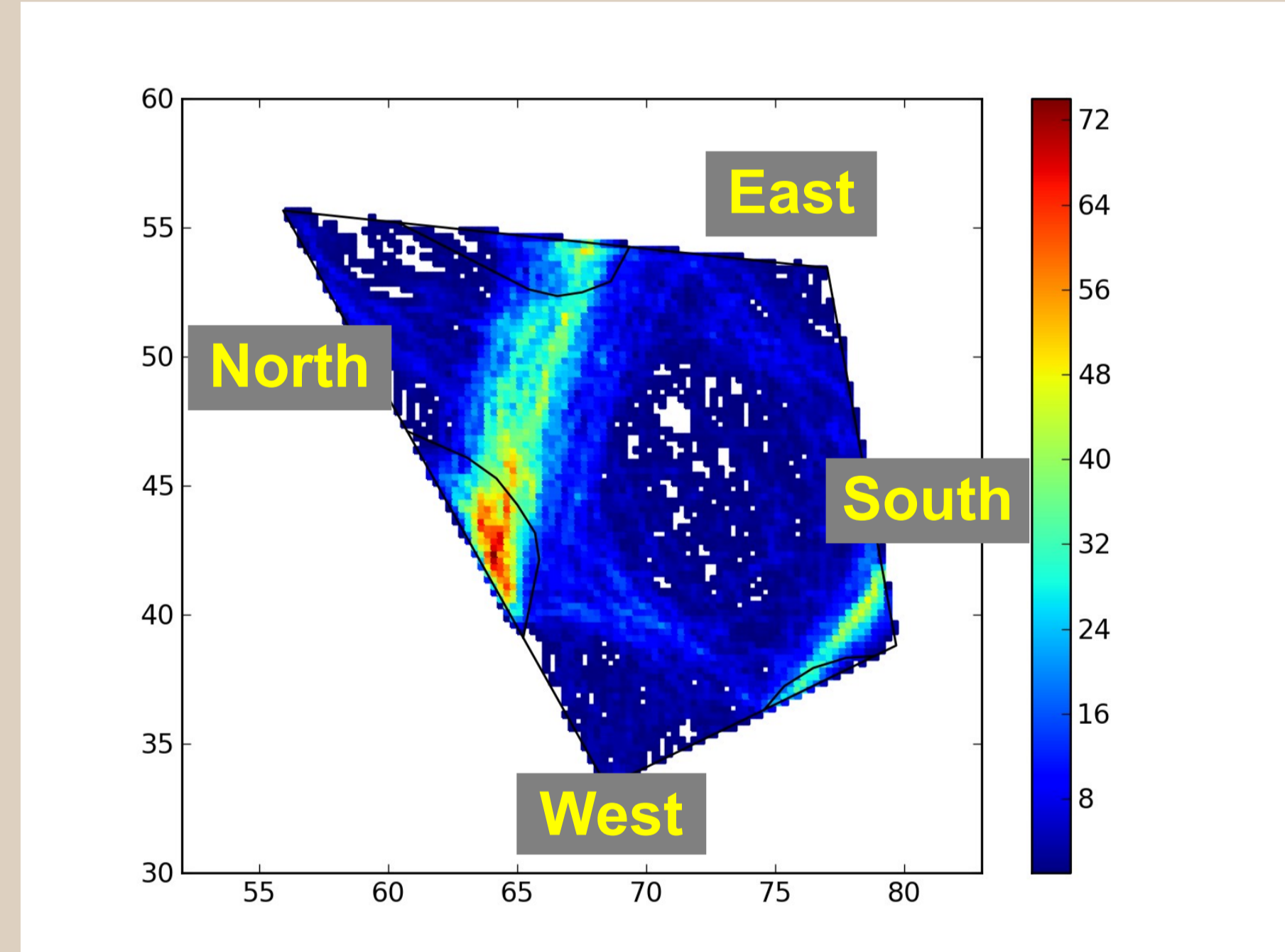
Saunier, N. & Sayed, T. A feature-based tracking algorithm for vehicles in intersections. Third Canadian Conference on Computer and Robot Vision, IEEE, 2006

First results



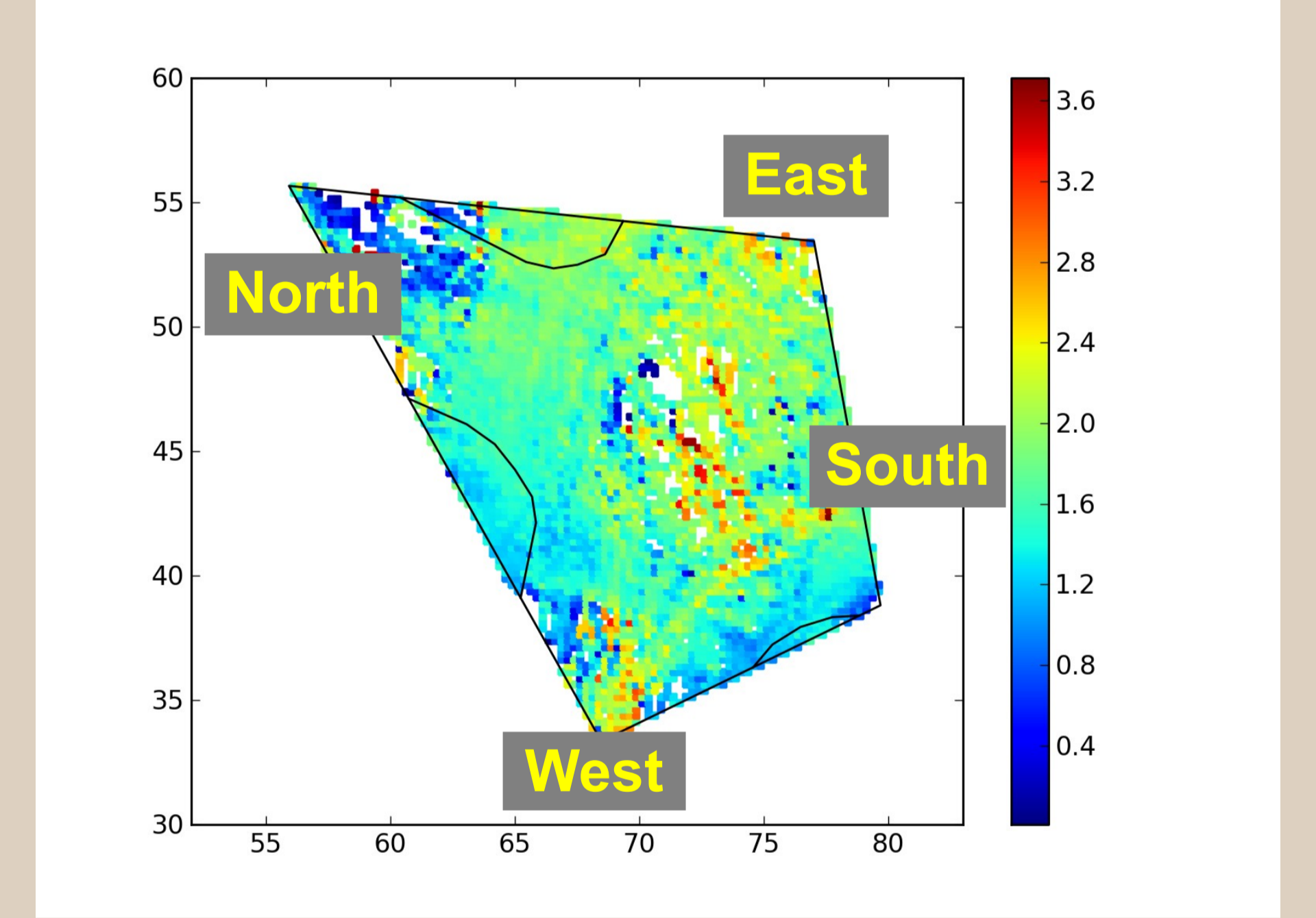
Pedestrian average speed distribution

The speed of the pedestrians is slightly higher when the presence of vehicles is detected in the field of view. This is a significant effect (Kolmogorov-Smirnov test with $p < 0.0032$). This could be interpreted as the pedestrians feeling a lack of safety in presence of motorized vehicles combined with the absence of the traffic lights.



Pedestrians' density

The expected distribution of pedestrians along the crosswalks is observed. There are also longer diagonal crossings that are harder to identify in this distribution (see the prototype trajectories above).



Spatial distribution of pedestrians' speeds

The speed of the pedestrians are higher in the centre of the intersection, and more generally on the street. This could be interpreted by the willingness of the pedestrian to minimize the duration in the centre of the intersection and potential interactions with vehicles.

Discussion and perspectives

The method and results presented here are the first step of a more ambitious work, that aims to be able to provide traffic data sets for microscopic traffic simulation. One of the limit of our approach is the limited information available on each approach to the intersection. Indeed, in the context of the interaction between pedestrians and drivers, each of them can perceive the other and could anticipate the other's behavior (to brake or not for the driver, and to cross or not for the pedestrian). Thus, the next step could be to use more than one camera and to track pedestrians and drivers over larger areas.

Acknowledgement

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