Understanding Pedestrian Behavior in Complex Trafﬁc Scenes

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This piece of research aimed to identify, analyze and present the pedestrian behaviour in traffic from a moving car perspective. Its purpose was to evaluate the crossing patterns, how pedestrians communicate their intention and to find other factors which may influence the pedestrians decisions.

Consequently, they create a new dataset composed of short clips presenting possible events of crossing in different conditions. The data was annotated in two manners: bounding boxes representative for pedestrian detection and textual associated with behavioural data about the pedestrians and drivers actions and contextual information such as demographics, ambient conditions and environmental factors. Multiple labelers were used in order to minimize the subjective bias while assessing the data and some actions were removed from the dataset since there wasn’t a consensus between the labelers.

The study evaluated many perspectives and found out some interesting remarks:

- the context in which pedestrians are observed plays an important role along their position and head orientation, indicator of crossing intention;

- there are often used explicit means of communications to resolve conflicts in traffic scenes (e.g. handwaves, driver using the led lights)

- various elements in a scene such as width of the street, the presence of a zebra crossing or a traffic signal can greatly influence the pedestrian confidence of crossing, representing a valuable way to predict his further actions

- the driver’s dynamic state with respect to the pedestrians influence their behaviour, Time-To-Collision being used as a representative factor

The study seems to suggest that there’s also an interrelationship between various contextual elements which influence the pedestrian behaviour as a whole. There are more factors which can be furtherly

studied such as environmental conditions (weather, light), social conditions and demographic conditions. Moreover, studies based on surveys should be conducted in order to fully eliminate subjectivity bias in determining and labeling pedestrians’ intentions and actions.

Abstract

Designing autonomous vehicles for the diverse urban traffic remains an unresolved problem due to its large number of events both expected and unexpected requiring various actions in a very short amount of time. Object detection represents a major topic in the goal of addressing the issue of autonomous vehicles and more specifically pedestrian detection is a complex due to its high variety of factors and challenges such as various height, weight, clothing, frequent occlusion between pedestrians and so on.

Basic functionalities of the application

The application should offer at least the core functionality of pedestrian detection: correctly identifying and separating the position of each pedestrian in a frame. The frame evaluation should take a relatively small amount of time in order to be applicable to a live camera system installed on a car. Further classification may be researched in order to classify the pedestrian as a “danger” for the traffic (its intention to cross in the close future) or neutral to the traffic.

Plastic and formal description of the problem

Pedestrian detection is a special case problem of object detection which is further a classification problem. The problem consists in identifying whether a frame contains or not pedestrians.