Using Environmental Context in Pedestrian Trajectory Prediction

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Forecasting pedestrian movement is an integral part of both fully autonomous vehicles and advanced driver assistance systems (ADAS) as, when traveling at high speeds, a response often needs to made in fractions of a second to avoid collision. In recent years, ADAS has become more and more prevalent for a wide variety of cars, from the complex autonomous-like system in Tesla Autopilot to Ford announcing that most cars will roll out with ADAS by 2020. However, most ADAS systems are restricted by the lack of available data as it is often not feasible to implement complex sensor arrays in most consumer cars, so prediction algorithms for this purpose are thus restricted to front-facing monocular footage or vehicle odometry readings. In addition, ideas from this project can be naturally implemented in a fully autonomous car system that has more complex data with minimal changes. The goal of this project is to develop a better model for systems like these to predict the future trajectory of pedestrians. Previous work has proposed the use of traditional and deep learning methods for pedestrian path prediction, but most consider only pedestrians in their algorithm. Environmental context, though, plays an important role in pedestrian behavior. A zebra crossing for example, may introduce a higher likelihood of a pedestrian crossing the road. This project proposes 1) a novel LSTM encoder-decoder model for pedestrian trajectory prediction that takes into account not only the past location-scale data of pedestrians and vehicle odometry data, but also the environment around the vehicle and pedestrian, and 2) an analysis of different forms of environmental context in terms of their ability to model pedestrian behavior.

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