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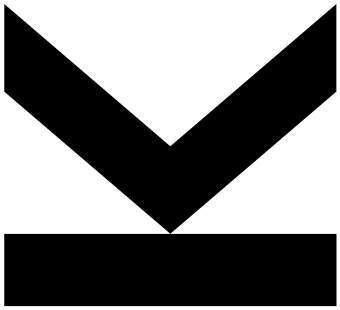
ROBUST DRIVE-BY ROAD SIDE PARKING DETECTION ON MULTI-LANE STREETS USING AN OPTICAL DISTANCE SENSOR



Thesis Outline

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1 Initial Situation and Motivation

Currently the road side parking situation in most cities is rather untransparent. Except from parking garages and the like information about the availability of parking spaces is rarely available. However, such information can help to reduce traffic by a tremendous amount. Studies have shown that in urban areas about 30% of traffic congestion is created by drivers looking for free parking spaces [3] and that in 2007 a loss of about $78 billion U.S. dollars was created by the use of about 2.9 billion gallons of gasoline alone in the USA [1]. Furthermore, about 4.9 billion hours were wasted by drivers while looking for parking spaces during that year.

2 Problem Definition

Detection of road side parking spaces and their states is a challenging task. Of course an obvious approach to the problem would be to put sensors to every parking space in the city, which check, if the corresponding parking space is occupied or vacant. This, however, has the drawback to be very expensive as, for big cities, thousands of sensors would have to be bought, installed and maintained. Furthermore, because the parking situation does not change often, the high frequency of sensing with such a system would be rather inefficient.

Another approach to sensing a city's parking situation is the use of mobile sensors instead of static ones. For instance, vehicles which drive through the cities could sense parking spaces while they drive by. There already exists some work on this subject. Mathur et al. [2] developed their system "ParkNet" which can sense parking spaces using an ultrasonic range finder. While the car is driving through the city, the sensor continuously measures the distance to the nearest obstacle on the right side of the road (in many cases a parking car). Using this information and GPS measurements the parking space counts and the parking occupancy rates could be derived by an accuracy of over 90%.

However, such mobile sensing systems currently only work on single lane roads. To work in real world scenarios, lane detection has to be incorporated.

3 Goals and Detailed Approach

4 Milestones

Table 1 shows the planned milestones of this project.

References

[1] Texas Transportation Institute. Urban mobility report. 2007.

Date	*Milestone*
07.04.2017	Hardware is available
28.04.2017	Hardware parts work together and sensor data can be retrieved.
	Tests regarding the accuracy and range of the optical distance sensor are taken.
12.05.2017	The sensors are mounted on the car.
19.05.2017	Test data has been collected on a single lane road.
31.06.2017	Single lange parking detection is implemented and has been evaluated.
15.07.2016	Test data has been collected on multi lane roads in different scenarios.
01.09.2016	Lane detection algorithm has been implemented and evaluated.
31.10.2017	Parking detection on multi lane road has been implemented and evaluated
01.12.2017	Submission of the thesis

Table 1: Milestones

[2] Suhas Mathur, Tong Jin, Nikhil Kasturirangan, Janani Chandrasekaran, Wenzhi Xue, Marco Gruteser, and Wade Trappe. Parknet: Drive-by sensing of road-side parking statistics. In *Proceedings of the 8th International Conference on Mobile Systems, Applications, and Services*, MobiSys '10, pages 123–136, New York, NY, USA, 2010. ACM.

[3] Sarfraz Nawaz, Christos Efstratiou, and Cecilia Mascolo. Parksense: A smartphone based sensing system for on-street parking. In *Proceedings of the 19th Annual International Conference on Mobile Computing & Networking*, MobiCom '13, pages 75–86, New York, NY, USA, 2013. ACM.