Visual analysis of traffic congestion based on Shanghai FCD

Master's Thesis

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In this work visual analysis methods for Floating Car Data (FCD) are investigated. The data set is given in the Floating Car Data (FCD) format, which is based on the acquisition of the positioning of about 8000 taxis in Shanghai. The main task in the visual analysis of this data is the possible detection of congestion within the urban traffic infrastructure. Therefore some basic concepts of traffic flow and traffic congestion have to be examined by the use of commonly used quantities and by considering already established digital traffic forecast systems. Since FCD has its own specific properties, the processing of the data in this format was inspected in general by the use of the methods, which are described in certain scientific publications. In this field the term map matching plays an important role and delivers the main ideas for the way how information is derived out of the raw FCD set. Additionally the already established visualization possibilities of movement and traffic in particular are considered in detail. In this field some groups of movement and traffic visualization were introduced and described. After the description of the given FCD set by the listing of the used attributes and the possibilities for processing of the raw data and additional derived attribute values, some of the described movement visualization methods were adopted for the FCD set of Shanghai. After the generation of suitable visualizations, which can show some characteristic movement patterns, the used methods were compared by their limitations and possibilities for the detection of congestion events. Since the visualization of congestion appears in an abstract way, the manner of providing the information for an end user of some individual map displays is contemplated in detail. For that purpose the variations of the different map displays are compared to each other based on specific criteria. In addition to this, the way how the raw FCD is processed for certain visualizations is compared with the use of a similar listing of certain criteria as mentioned before.

The proposed visualization techniques for the FCD set of Shanghai, which are the base for the maps describing the appearance of congestion, are shown in the following figure by some examples.