Spatial model-aided indoor tracking

Reflection of P5

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This thesis proposes a tracking algorithm integrating magnetometer, grid model, and grid to improve the location measured by WiFi positioning system. To test the algorithm's performance, a tracking system is built and several experiments are carried out in a live environment. The experiment results show that the algorithm can significantly reduce tracking errors of the WiFi positioning system and correctly derive the moving trend of the person.

The topic of the thesis is strongly related to the Geomatics program that allows applying the knowledge learned from the courses such as location based service, spatial database and indoor modeling. The thesis also motivates the author to learn new knowledge, e.g., java and mobile application development. Through the thesis, the research skills of the author have been improved. Most objectives of the thesis are archived successfully and the experiment results show the effectiveness of the proposed algorithm.

In addition, this thesis is sponsored by the company CGI group, which provides technical supports and an experiment environment for the research. Through carrying out the thesis research in a company, the author is able to get working experience and know the specific market's requirements of the tracking technology.

The main contribution of this thesis in scientific field is that it proposes a tracking algorithm that exploits geometry, topology and semantics of the spatial model. The literature shows that most commonly used tracking methods are dead reckoning, Bayesian filters and map matching. These approaches employ very limited or none spatial information. Moreover, it is difficult to find researches on how to integrate geometrical, topological and semantic information of indoor environment for tracking. Thus, this thesis first constructs a suitable spatial model for tracking, then develops a tracking algorithm based on the chosen spatial model, finally implements and tests the algorithm in a live environment. We consider this thesis could contribute to the joint research of spatial model and indoor tracking.

The output of this thesis can also contribute to the indoor location market. The growth of indoor location market is very impressive these years. The report of "MarketsandMarkets" estimates indoor location market will grow from $448.6 million in 2013 to $2.6 billion in 2018 and there are at least 170 companies today working on indoor location, indoor maps, in-building tracking, and way finding (navigation) inside buildings. Tracking service is an important aspect of location-based service (e.g., tracking children, elderly, friends, customers, etc.) and is the basis of other location-based services (e.g., navigation, evaluation, mobile advertising, etc.). However, to continuously provide precise location inside building is

challenging. The improvement of current tracking systems are expected by the market. With the boom in WiFi network, the WiFi based positioning technology gains great popularity now. The output of this research can improve the tracking performance of WiFi positioning system so that it could be more widely used.