Vehicle Navigation Model and Algorithm based on WiFi in Complex Terrain Environment

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GPS is a very successful outdoor positioning system, but in complex environments such as tunnels, viaducts and overpasses, GPS positioning still has problems [1]. A vehicle navigation model based on knowledge graph and WiFi positioning is proposed in this paper. Combining physical space and information space, a project is developed to verify the model.

The system architecture of vehicle navigation model is shown in Figure1. It is consisted of data acquisition layer, cloud computing layer and data visualization layer. The process for model construction is as follows. Firstly, the software Sketch Up is used to model Xiaocaiyuan overpass of Kunming China and its surrounding physical facilities, and the information space is created; Secondly, assuming that 100 wireless access points (APs) are deployed on the overpass, the corresponding WiFi signal propagation field strength is obtained through simulation, and the radio map based on knowledge graph $G = (L, E, W)$ is constructed. Here, L represents the set of road nodes of the overpass; E is a set of directed edges, representing the connectivity between coordinate nodes and wireless AP nodes; W is the set of all wireless AP nodes on the overpass. Thirdly, a WiFi location project based on knowledge graph is developed, and the two-step location algorithm based on similarity calculation and received field strength is verified. The results show that the accuracy is 1.69m, which shows that the proposed model is expected to solve the navigation problem in complex environment. Next, we will try to deploy wireless APs in physical space and implement WiFi data collection, transmission, cloud processing and visual display to further verify the engineering value of this model.

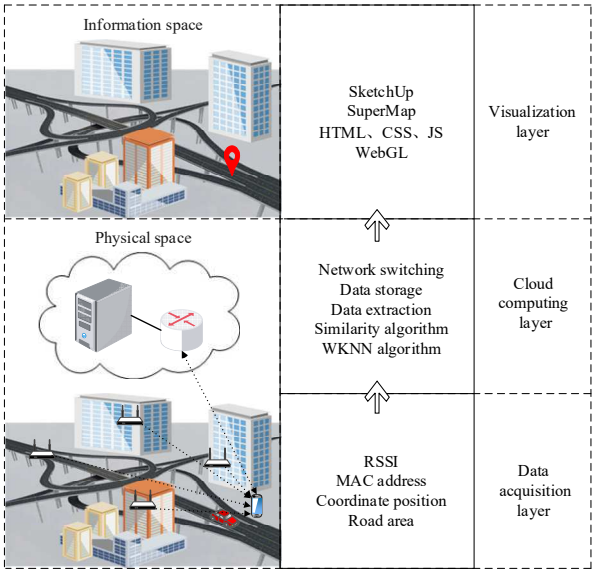

Figure 1. The system architecture of vehicle navigation model based on WiFi

1. F. Liu, H. Han, X. Cheng, and B. Li, "Performance of Tightly Coupled Integration of GPS/BDS/MEMS-INS/Odometer for Real-Time High-Precision Vehicle Positioning in Urban Degraded and Denied Environment," Journal of Sensors, **2020**, 4, April 2020, pp. 1-15, doi:10.1155/2020/8670262.