主　論　文　要　旨

論文題名

Indoor Positioning Algorithms Based on Statistical Models

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主論文要旨

The present thesis proposes indoor positioning algorithms based on statistical models.

First, the trend of indoor positioning in recent years and the required accuracy in indoor positioning are described. Also the various characteristics of the indoor positioning methods are shown. Then, a brief review of the positioning methods by applying the Global Positioning System (GPS) is presented. For the underground circumstance, the GPS does not work for positioning so that the Indoor MEssaging System (IMES) is considered and is analyzed from several perspectives.

Second, the best modeling techniques for the errors included in the autonomous sensors (gyro sensor and acceleration sensor) that are used in Inertial Navigation System (INS) are introduced. The sensor errors are modeled as the autoregressive models and the high-order vector autoregressive (VAR) models. Additionally, the sensor errors models are applied the GPS/INS hybrid systems. In the experiment, the results of identifying the AR models and the VAR models with the different orders are shown.

Finally, in the positioning method using the wireless communication, the algorithms to estimate the position of the terminal by the Received Signal Strength Indicator (RSSI) are introduced. The positioning algorithms are based on the maximum likelihood (ML) method by using the probability density functions (PDF) of the signal powers models. The models of RSSI of radio signal propagation applying the Rice distribution, and in the special occasions, including the Rayleigh and Gamma distributions are derived. The accuracies of the estimated model parameters and positioning are also examined by the wireless sensor network data based on the IEEE Std. 802.15.4.