論文 / 著書情報
Article / Book Information

題目(和文)	市街地における未知電波発信源の指紋法を用いた位置推定
Title(English)	Fingerprint-based Localization of Unknown Radio Emitters in Outdoor Urban Environments
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出典(和文)	学位:博士(工学), 学位授与機関:東京工業大学, 報告番号:甲第10159号, 授与年月日:2016年3月26日, 学位の種別:課程博士, 審査員:高田 潤一,山下 幸彦,花岡 伸也,高木 泰士,阪口 啓
Citation(English)	Degree:Doctor (Engineering), Conferring organization: Tokyo Institute of Technology, Report number:甲第10159号, Conferred date:2016/3/26, Degree Type:Course doctor, Examiner:,,,,
学位種別(和文)	博士論文
Category(English)	Doctoral Thesis
種別(和文)	要約
Type(English)	Outline

Thesis Outline

Fingerprint-based Localization of Unknown Radio Emitters in Outdoor Urban Environments

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Localization of unknown emitters is crucial to avoid interference to other radio systems. Conventional techniques face difficulties when dealing with unknown emitters due to lack of prior knowledge regarding its signal parameters. Furthermore, they also have low accuracy in urban scenarios due to obstruction of the line-of-sight path and many multipaths arriving at the receiver.

This thesis presents several novel fingerprint-based localization techniques which can support the harsh conditions of localizing unknown emitters in urban scenarios. Several fingerprint types are proposed, which include the cross-correlation of the channel impulse responses between several receiver (Rx) sensors, and also the phase-difference between elements of an antenna array. In order to support a wide range of possible unknown emitter parameters, methods to interpolate these fingerprints in multiple domains are presented. Then, a hybrid localization algorithm incorporating the proposed techniques is also proposed, based on joint likelihood.

Performance of the proposed techniques is evaluated through Monte Carlo simulations, and ray-tracing is used to simulate the propagation channel in a dense urban scenario modeled after the area surrounding Shinjuku station, Tokyo. Simulations are performed using a wide variety of parameters, and results indicate the effectiveness of the proposed techniques compared to conventional techniques. Results also showed the advantages of employing the hybrid algorithm, which can maximize the strengths of each individual technique.

Finally, considering the possibility that the unknown emitter might be moving, a dynamic tracking algorithm based on the particle filter was adapted and applied to the proposed localization techniques. Results indicated that a reduction in computational load can be achieved when utilizing the proposed implementation of the particle filter, and this would make real-time applications of the localization system more realizable.