Indoor High Precision Three-Dimensional Positioning System Based on Visible Light Communication Using Particle Swarm Optimization

作者: Cai, Y (Cai, Ye)[1]; Guan, WP (Guan, Weipeng)[1]; Wu, YX (Wu, Yuxiang)[1]; Xie, CY (Xie, Canyu)[2]; Chen, YR (Chen, Yirong)[2]; Fang, LT (Fang, Liangtao)[3]

查看 ResearcherID 和 ORCID

IEEE PHOTONICS JOURNAL
卷: 9 **期:** 6
文献号: 7908120
DOI: 10.1109/JPHOT.2017.2771828
出版年: DEC 2017
文献类型: Article
查看期刊影响力

摘要

Recently, visible light communication (VLC) has gradually become a research hotspot in indoor environments because its advantages of illumination and relative high positioning accuracy. But unfortunately, in the matter of algorithm complexity and positioning accuracy, most existing VLC-based systems fail to deliver satisfactory performance. Moreover, the majority of visible light positioning algorithm in them are based on two-dimensional (2-D) plane. In addition, some of the systems realize 3-D positioning on the base of various sensors or hybrid complex algorithm. These methods greatly reduce the robustness of VLC system. To solve these problems, a novel VLC positioning system based on modified particle swarm optimization (PSO) algorithm is put forward in this article. PSO is a powerful population-based stochastic approach to solve the global optimization problems, such as VLC-based indoor positioning, which can be transformed into a global optimization problem. Our simulation shows that the average distance error is 3.9 mm within 20 iterations in an indoor environment of 3m x 3m x 4m. And the positioning results prove that this system can prove high localization accuracy and significantly lower the algorithm complexity. Moreover, in the experiment, we come up with a solution that using Kalman filter to deal with the unstable received signals. Our experiment result proves the mentioned system satisfies the requirement of cm-level indoor positioning. Therefore, this scheme may be considered as one of the competitive indoor positioning candidates in the future.

关键词

作者关键词: Visible light communication (VLC); indoor positioning systems (IPS); particle swarm optimization (PSO); positioning accuracy; simulated annealing (SA)

作者信息

通讯作者地址: Guan, WP (通讯作者)

+ South China Univ Technol, Sch Automat Sci & Engn, Guangzhou 510640, Guangdong, Peoples R China

地址:

+ [1] South China Univ Technol, Sch Automat Sci & Engn, Guangzhou 510640, Guangdong, Peoples R China
+ [2] South China Univ Technol, Sch Mat Sci & Engn, Guangzhou 510640, Guangdong, Peoples R China
+ [3] South China Univ Technol, Sch Elect & Informat Engn, Guangzhou 510640, Guangdong, Peoples R China

电子邮件地址: gwpscut@163.com

基金资助致谢

基金资助机构	授权号
National Undergraduate Innovative and Entrepreneurial Training Program	201510561003 201610561065 201610561068 201710561006 201710561054 201710561057 201710561058 201710561199 201710561202
Special Funds for the Cultivation of Guangdong College Students' Scientific and Technological Innovation ("Climbing Program" Special Funds)	pdjh2017b0040

查看基金资助信息

出版商

IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 445 HOES LANE, PISCATAWAY, NJ 08855-4141 USA

期刊信息

Impact Factor (影响因子): Journal Citation Reports

类别 / 分类

研究方向: Engineering; Optics; Physics
Web of Science 类别: Engineering, Electrical & Electronic; Optics; Physics, Applied

查看更多数据字段

第 1 条，共 1 条

引用的参考文献: 24

显示 24 / 24 在 "引用的参考文献" 页面中查看全部结果

(来自 Web of Science 核心合集)

1. An in-Depth Survey of Visible Light Communication Based Positioning Systems — Times Cited: 17