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Editorial

Architecture, Technologies, and Applications of Location-Based Services

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Several location-based service (LBS) applications (e.g., navigation [1], location tracking [2], intelligent transportation systems (ITS) [3–6], location-based mobile commerce [7], location-based emergency services [8], and location-based event recommendation [9]) have been designed and implemented based on advanced positioning techniques and mobile/cellular communication techniques. For obtaining the LBS applications, mobile devices (MDs) and LBS servers are designed in the architecture of LBS. The LBS servers can receive and analyze the location information of MDs which can be estimated by advanced positioning techniques (e.g., satellite positioning, and mobile positioning) for providing LBS applications. For improving the accuracy of location information, the network signals including angle of arrival [10], time differences [11–14], and received signal strength indication (RSSI) [15] from satellites networks [16], mobile/cellular networks [17], and wireless networks [18] could be collected and analyzed to obtain more precise location information. Moreover, in recent years, artificial intelligence (AI) techniques including expert systems, rule-based systems, machine learning (ML) methods [19], and deep learning (DL) methods [20] have been adopted for the development of LBS applications. A variety of LBS applications in companies, organizations, and governments have been designed and implemented for obtaining location-based information and LBS to their MDs. This special issue covers LBS architectures [21], satellite positioning techniques [22], mobile positioning techniques [23], positioning techniques based on ML methods [24], communication techniques [25], and ITS [26–28]. This special issue has collected papers on the principles of LBS and LBS technologies including the advanced satellites positioning techniques, advanced mobile/cellular positioning techniques, advanced indoor/outdoor positioning techniques, advanced ITS, advanced positioning techniques based on ML methods, advanced positioning techniques based on DL methods, advanced positioning techniques based on information security and network security techniques, advanced positioning techniques based on parallel computing and distributed computing techniques, and the implementation of LBS applications for smartphones [29–33]. The LBS applications in ITS, indoor/outdoor navigation systems, LBS for industry applications, LBS for education applications, LBS for art applications, and LBS for sport applications have also been mentioned. Topics covered in this special issue are categorized into the following eight themes: (1) mobile positioning methods, (2) navigation applications, (3) logistic applications, (4) core techniques, (5) LBS for industry, (6) LBS for education, (7) LBS for art, and (8) LBS for sports. A total of 32 accepted papers have been published; these papers are categorized into the aforementioned eight themes that are briefly introduced in this paper.

1. Mobile Positioning Methods

This special issue includes five papers on mobile positioning methods which are listed as follows. The RSSIs from mobile/cellular networks, wireless networks, wireless sensor networks, and heterogeneous network were collected and analyzed for indoor positioning [34–37]. Furthermore, the signals from satellites networks were collected and analyzed for outdoor positioning [38]. Detailed information of each article could be found in [34–38].

2. Navigation Applications

This special issue includes four papers on navigation applications which are listed as follows. The navigation applications based on LSB were developed for cleaning robots [39] and smart home service robots [40]. Moreover, the LBS and virtual reality techniques were implemented for tourism applications [41, 42]. Detailed information of each article could be found in [39–42].

3. Logistic Applications

This special issue includes three papers on logistic applications which are listed as follows. ML methods [43], game theory [44], and internet of things (IoT) [45] were developed for logistic applications based on LBS. Detailed information of each article regarding logistic applications could be found in [43–45].

4. Core Techniques

This special issue includes five papers on core techniques which are listed as follows. For improving optimization techniques, advanced particle swarm optimization (PSO) [46] and advanced Multiobjective Optimization (MO) [47, 48] were proposed to obtain LBS applications. For improving security and networking techniques, advanced network security technology [49] and advanced satellite channel allocation schemes were proposed to obtain LBS applications. Detailed information of each article on core techniques could be found in [46–50].

5. LBS for Industry

This special issue includes five papers on LBS for industry which are listed as follows. LSB techniques were applied on enterprise management systems [51], improved LSTM models for industry system [52], human-machine interfaces [53], e-commerce services [54], and public safety evaluation system [55] for providing industry applications. Detailed information of each article related to LBS for industry could be found in [51–55].

6. LBS for Education

This special issue includes five papers on LBS for education which are listed as follows. LSB techniques were applied on vertical search methods [56], cloud classrooms [57], speech recognition [58], data stream classification [59], and online learning support service system based on LBS for providing education applications. Detailed information of each article on LBS for education could be found in [56–60].

7. LBS for Art

This special issue includes two papers on LBS for art which are listed as follows. The art applications based on LSB were developed for AI-based computer-aided arts [61] and visual communication art [62]. Detailed information of each article with respect to LBS for art could be found in [61, 62].

8. LBS for Sports

This special issue includes three papers on LBS for sport which are listed as follows. LSB techniques were applied on Athletes' abnormal training [63], sport performance prediction [64], and biomechanical simulation and simulation [65]. Detailed information of each article on LBS for sports could be found in [63–65].

Conflicts of Interest

The authors declare no conflicts of interest.

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