Parking Management System Using Wireless Sensor Network

Anil Rane, Roshan Sathyanarayan, Amol Avhad, Sourabh Choudhari

Abstract

Wireless Sensor Networks (WSNs) provide a new paradigm for sensing and disseminating information from various environments, with the potential to serve many and diverse applications. Current WSNs typically communicate directly with a centralized controller or satellite. On the other hand, a smart WSN consists of a number of sensors spread across a geographical area; each sensor has wireless communication capability and sufficient intelligence for signal processing and networking of the data. The structure of WSNs is tightly application-dependent, and many services are also dependent on application semantics (e.g., application-specific data processing combined with data routing). Thus, there is no single typical WSN application, and dependency on applications is higher than in traditional distributed applications.

There is a dire need for a secure, intelligent, efficient and reliable system which can be used for searching the unoccupied parking facility, guidance towards the parking facility, negotiation of the parking fee, along with the proper management of the parking facility. Intelligent Parking Service is a part of Intelligent Transportation Systems (ITS). This paper reviews different Intelligent Parking Services used for parking guidance, parking facility management and gives an insight into the Parking Management System possible in the near future.

Introduction

Parking system on wireless sensor network was utilizing parking system. It can help to minimize the car parking space solution. In the modern world, where parking-space has become a very big problem and in the area of miniaturization, it become very crucial to avoid the wastage of time
and space shopping mall, big companies and apartments etc. In places where more than 100 cars need to be parked, this system proves to be useful in reducing wastage of space and time.

This Parking System enables the parking of cars without much manual intervention, which results in reduction of manpower & providing an enjoyable parking experience. Also, this system drastically reduces time spent by customers to locate free spaces & retrieve the car from a large number of cars. This system provides efficient parking of cars, floor after floor and thus reducing the space used. Here any number of cars can be parked according to the requirement. This makes the system organized and makes maximum utilization of the space. This idea is developed using wireless sensor infrared and magnetic, 8951 microcontroller, MAX232. In this system, the car is allotted a parking space using the shortest path. Whereas, compared to the traditional system, the driver has to look for a slot manually.

Various techniques proposed to an intelligent car parking system

Some of the most relevant techniques for realizing an effective Intelligent Parking System are summarized in the figure below.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Different Technologies</th>
<th>Features</th>
<th>Services Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Agent Based</td>
<td>Dynamic Distribution and Complex Traffic Environments</td>
<td>Bargaining, parking guidance and route negotiation etc.</td>
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<tr>
<td>2.</td>
<td>Fuzzy Based</td>
<td>Human-like intelligence and expertise</td>
<td>Intelligent parking methods e.g. parallel parking and perpendicular parking etc.</td>
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<tr>
<td>3.</td>
<td>Wireless Sensor Based</td>
<td>Low cost implementation with lower power consumption</td>
<td>Detection and monitoring of the parking facility etc.</td>
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<tr>
<td>4.</td>
<td>GPS Based</td>
<td>Real time location based information and guidance towards destination</td>
<td>Provides information about the locality and availability of parking facility</td>
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<td>5.</td>
<td>Vehicular Communication</td>
<td>Provision of parking information distribution service for mobile vehicles</td>
<td>Antitheft protection, real time parking navigation service etc.</td>
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<td>6.</td>
<td>Vision Based</td>
<td>Good for car searching in large parking lots</td>
<td>Lot occupancy detection, parking space recognition, parking charges collection etc.</td>
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</table>

Table 1. Summary of relevant techniques for intelligent parking systems
Project overview

The above figure depicts the flow of information in this particular project. The information about the location and availability of a parking space near the destination is provided to the drivers by the current GPS-based vehicle navigation system. The information of the current state of the parking facility is provided. That’s why they can’t guarantee a parking lot when the driver reaches the facility. A scientific solution based on utilization of the past and current status of the parking lot is proposed in. Poisson process is used for modelling the availability of a parking lot.
An intelligent algorithm which helps the driver in choosing the slot with maximum probability of being vacant is presented in as well. Various methods and different cities were used for demonstrating these issues. It also highlighted different challenges of on-street parking such as peer-to-peer exchange and storage of parking information.

The Server is responsible for storing all the information related to sensor values that is, parking vacancy. When the vehicle arrives at the checkpoint, the Radio Frequency Identification (RFID) will be used to check the authentication of the car to make sure that the vehicle has been registered previously on the system. The RFID is swapped and simultaneously, the in-time is noted on the server and a notification is sent to the user regarding his entry to the car park. The user is also allocated a parking slot depending upon the amount of time the user needs to park his car. This type of car allotment is done using an intelligent algorithm which takes input as the amount of time the driver needs to park his car and the closest parking slot, calculates it and send a specific parking slot according to the driver’s needs.

This kind of parking management system is very effective as it avoids chaos at the car park, the amount of labour required is much less and the parking system is well managed and maintained.

Conclusion

In this paper, various systems that provide intelligent parking services are briefly discussed. These systems can counter the parking problems that arise due to the unavailability of a reliable, efficient and modern Parking system. The use of different modern techniques such as Expert Systems, wireless sensor based, fuzzy based, GPS based, Vehicular communication based and Vision based can reduce the parking related issues. Such system can help the economic, social and safety based aspects of the society. It also helps in preserving the environment, fuel and time. The intelligent algorithm provides a much user friendly approach of handling the parking management system. Future work should be done for integrating different technologies together in order to achieve a system which is the most efficient, reliable, secure and inexpensive. The
economic analysis should be done both quantitatively and qualitatively. After the economic analysis is done, then the project can be finalized.

Parking management could arguably be one of the neglected problem the world is facing at the moment and to tackle this problem, we need to make it a priority and complement it with technologies used elsewhere. An integrated test for the autonomous parking planner with the trajectory tracking controller to verify effectiveness and applicability of our proposed approach will be appeared in the near future.

Acknowledgment

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References

