Smart Parking System Based on Vehicle Identification and Internet of Things

Degree programme: Master of Science in Engineering | Specialisation: Informations- und Kommunikationstechnologien
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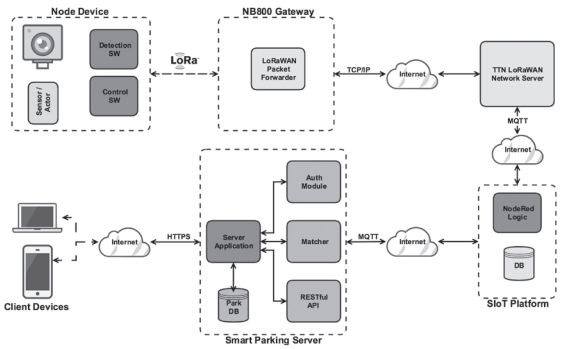
Parking spots equipped with sensors together with a network, a cloud application and a mobile app are used to facilitate an optimised parking experience. The identification of vehicles using license plate recognition and the online broadcasting of parking spot occupancy enable a reservation based parking system. The extended amount of information exchange not only contributes to reducing emissions but also allows for balancing an overloaded parking situation.

Introduction

The traditional way of parking a vehicle is inefficient. Due to a lack of information, motorists spend a considerable amount of time driving in search of an opportunity to park their vehicle. This results in unnecessary emissions of greenhouse gases, particulate matter and noise and contributes to overcrowded roadways. In addition, the overall parking experience is rather inconvenient and causes stressed situations and even aggression in traffic. A number of different approaches try to fill some of that information deficit, mainly by focusing on the availability of parking spots. Guidance systems such as display panels and coloured lights give a broad overview of parking garage capacity. Others focus on renting out unused parking spots. However, the current approaches do not provide a holistic solution to improve the situation in all the aspects. For example, they do not exclude race conditions since motorists may receive the same information and are therefore heading for the same parking spot simultaneously. The different concepts of information broadcasting, sharing economy and scheduling should be unified to improve the situation as a whole.

Approach

By equipping the parking sites with a small device consisting of a single-board computer, a camera and a wireless communication module, they provide sufficient ability for a reservation based parking system. By means of a graphical user interface (GUI), motorists can inform themselves about the ongoing situation and look up available parking spots. Moreover, they can register their car with the license plate and reserve the parking spots for their exclusive usage. Therefore the information presented is not limited to the current state, but the future condition as well. When a user makes a request through the GUI, the system applies a matching algorithm and returns the closest parking spots suiting the desired properties. The user can then book a reservation and is guided to the parking spot at the time of reservation.



System overview

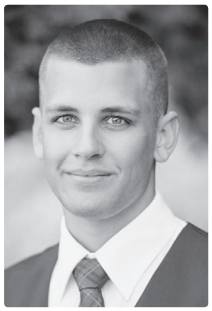
Results

The result is a working prototype of a system that facilitates the described approach including the following integral parts:

- A node device with the ability to recognise and transmit license plates.
- A network to transport the data from the node to the server using LoRaWAN, The Things Network and the SIoT platform while ensuring thorough encryption.
- A server application including a matching algorithm and a REST API in order for the user to interact with the system.
- A client application implemented as a cross platform mobile app, which allows the users to perform searches, make reservations on parking spots and view the status of their ongoing reservations.

Conclusion

Since this system is based on reservations, services such recharging the battery can be booked on top of the bare parking. Unutilised parking spots can be offered to the community to increase the supply. The guaranteed parking spot, the integrated payment and the better informing reduces stress and eliminates cumbersome seeking and therefore unnecessary traffic and emissions. From an operator point of view, the dynamic pricing and the extended services open up a variety of new business models.



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