WIRELESS PARKING SPACE CONTROL SYSTEM FOR PEOPLE WITH REDUCED MOBILITY

TECNOLOGÍA PATENTADA

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RESUMEN

T h e **Engineering Design and Technological Development (DIDET)** group from the ArtefactosLAB laboratory of the University of Alicante has developed a system to control and manage the use of parking spaces reserved for people with reduced mobility (PRM).

This **low-cost, wireless** system is designed to be used on public roads and installed underground. In this way, the user can check the status and location of parking spaces reserved for people with reduced mobility. In addition, it would allow the local police to know whether the driver who has parked in these spaces is authorised or not.

The group is looking for companies or institutions interested in acquiring this technology for commercial exploitation or to collaborate in the design and manufacture of other new devices that improve the quality of life of people with reduced mobility.



INTRODUCCIÓN

In all municipalities it is common to find parking spaces reserved for people with reduced mobility occupied by other vehicles that are not authorised to use them, which makes parking difficult or impossible.

Nowadays, there are different systems to detect the status -free or occupied - of a parking space. The problem with these systems is their high cost, the necessary infrastructure and the need for a connection to the electricity grid.

The different systems for vehicle detection are as follows:

1) By installing cameras and using **artificial vision** to acquire, process and analyse real-world images to detect the status of parking spaces and recognise number plates or user cards to identify whether or not they have authorisation.

This system requires a large infrastructure and investment in the development of software to recognise the images effectively. Currently, in Spain, its implementation would be limited due to the Data Protection Law.

2) The use of **ultrasonic sensors** is also a common practice for vehicle detection. Their use is mainly limited to indoor spaces or covered car parks, as they need to be installed at high points for greater performance. This system, normally applied in shopping centres, consists of the installation of an ultrasonic sensor at the top of the car park which is activated when an item is detected underneath. This makes it possible to identify whether there is a vehicle in the space where the sensor has been installed, to recognise its status and, by means of a light element, to inform whether it is occupied or free.

3) Another technique that can be used, and is the one used in this system, is the **detection of magnetic field variations** to detect vehicles. Currently, magnetic loops are still used for automatic opening of parking gates, lifting of barriers or even for the detection and activation of traffic lights on roads with little traffic. However, they have the disadvantage of a high price

and the need for a connection to the mains.

Therefore, all current systems have the technical problem that they require a high level of complexity in terms of the necessary infrastructure and the need for connection to the electricity grid. In addition, there is no known solution to manage and monitor the problem of unauthorised occupation of reserved parking spaces for persons with reduced mobility and, on the other hand, the possibility of finding the closest free parking space to the user's destination.

All these technical problems are solved with the present invention, based on the development of a system formed by a network of electronic beacons connected to a computer application from which the problem of unauthorised occupation of reserved spaces and finding free spaces can be satisfactorily managed. All of this without the need for the different beacons to be connected to the electricity grid, which is an advantage compared to any other technology known to date.

DESCRIPCIÓN TÉCNICA

This system arises from the hitherto unresolved technical problem that people with reduced mobility and their families regularly find when parking spaces reserved for them are occupied by other vehicles that are not authorised to use them, which makes parking difficult or impossible.

The system consists of 3 parts (*see Figure 1*):

1) **Network of electronic beacons**, installed buried in the ground under a 1 cm layer of concrete or asphalt. The ideal location is in the centre of the square, although they can be installed anywhere as long as the vehicle is parked on top of them.

Each beacon consists of an electronic board of free and low-cost hardware, a magnetic sensor and a long-life battery, all inside a watertight cylindrical container, to facilitate installation using a circular crown, and resistant to humidity.

The function of the beacon network is to detect vehicles parked on them and listen if their mobile phone with the application installed and an authorised user is issuing a parking authorisation. It also informs the database that its status has changed from free to occupied and the user who is parked on it if known.

2) **Application for mobile devices**, it has different functions, location of parking spaces for users with reduced mobility, automatic system of registration of spaces occupied by authorised persons, suggestion of new spaces and evaluation of old ones.

It is important to point out that the system not only offers parking spaces that have a beacon installed, but also offers spaces without a beacon. In the case of these spaces, we will not be able to know their occupancy status, but we will be able to know where we have parking spaces.

It will be necessary to register the user and enter the card number and the authentication photograph so that the authorisation administrator can check that the data is correct and mark the user as an authorised person.

3) **Database in the cloud**, it allows us to store in real time both the information of the beacons and the users. It also supports sending messages to the devices of registered users.

It is a database compatible with IOS, Android and web, so that it can be used from any platform, both mobile devices and web browsers.

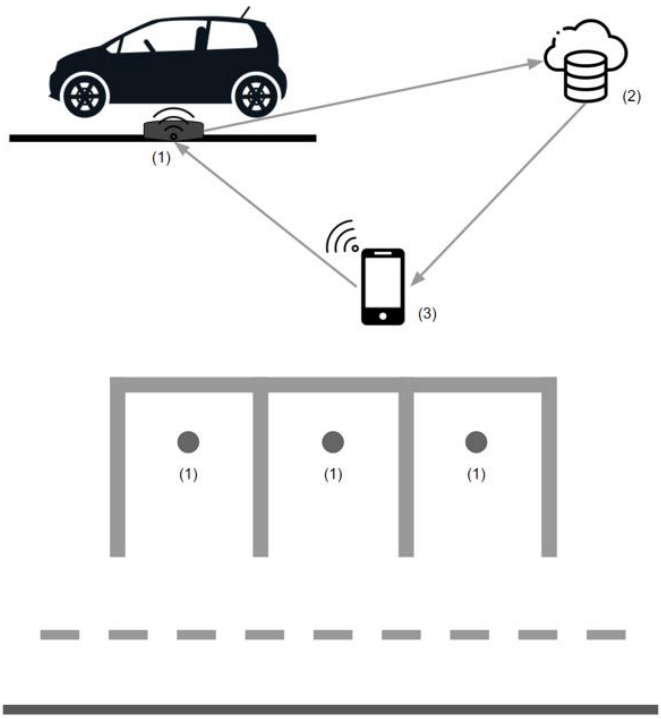


Figure 1: Parts of the system: Electronic beacon network (1), Mobile application (2) and Cloud database (3).

VENTAJAS Y ASPECTOS INNOVADORES

MAIN ADVANTAGES OF THE TECHNOLOGY

- Easier and faster search for free spaces for people with reduced mobility.
- It solves the problem of finding parking spaces in unknown municipalities and areas.
- It makes it possible to control whether users have authorisation to park in them, therefore, greater efficiency in the management of these spaces by local councils.
- The beacons are installed underground so that they are protected and, as they do not require conventional electrical installation, they are isolated and autonomous.
- Through the mobile application, users can also provide ratings on the state of conservation or operation of the parking spaces.

INNOVATIVE ASPECTS

- Use of electronic boards based on low-cost free hardware. These boards have much lower costs than systems with customised circuits, created and designed for a specific device.
- As it is a wireless system, it does not require conventional electrical installation or any other type of infrastructure.
- Its great autonomy is achieved by means of a rechargeable battery (autonomy of more than one year). To optimise energy consumption, the beacon goes to sleep every time a check is carried out and the status of the square has not changed.

ESTADO ACTUAL

A **prototype** has been developed based on the collaboration of computer experts together with people with functional diversity and technicians from the local administration who have tested and adjusted it for its correct operation. Therefore, a device that perfectly meets the objectives sought has been achieved.

APLICACIONES DE LA OFERTA

It is mainly aimed at the **Smart Cities** sector, more specifically, companies that manufacture telecommunications devices.

COLABORACIÓN BUSCADA

The group is looking for companies or institutions interested in acquiring this technology for **commercial exploitation** through patent licensing agreements or to **collaborate** in the design and manufacture of other new devices that improve the quality of life of people with reduced mobility.

DERECHOS DE PROPIEDAD INTELECTUAL

This technology is protected by **patent application**:

- *Patent title: "Sistema y método de gestión de plazas de aparcamiento de personas con movilidad reducida".*

- *Application number: P202230909*
- *Application date: 21/10/2022*

SECTORES DE APLICACIÓN (3)

Construction and Architecture
Computer Science, Language and Communication
Transport and Automotive

IMÁGENES TÉCNICAS (1)

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