SIEMENS

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Intelligent search for parking space:
Worldwide first projects in Berlin

Siemens and its partners have developed a radar sensor system that offers drivers a quick, hassle-free way to find vacant parking spaces in the urban jungle.

A first pilot project was installed at the Berliner Bundesallee in September 2015 for test and demonstration purposes. The pilot installation is part of the federally funded City2e 2.0 project in which Siemens is exploring the potential of sensor-controlled management systems for roadside parking and electric recharging points in cooperation with the Senate Department for Urban Development and the Environment in Berlin (SenStadtUm), the VMZ Berlin Betreibergesellschaft mbH, the Institute for Climate Protection, Energy and Mobility (IKEM) and the Robotics Innovation Center of the German Research Center for Artificial Intelligence (DFKI).

Within the framework of a second project, Siemens is equipping three charging stations in the Berliner Lindenstrasse with radar-assisted detectors. Customers using a charging station can thus view on the BerlinMobil App (http://www.vmzberlin.com/aktuelles) not only the relevant information about the location and availability of the quick charger, but for the first time also information about the availability of the three associated parking spaces. The Gewobag provides parking spaces for the charging stations and cooperates with the carsharing provider DriveNow and the charging station infrastructure expert Allego.

Intelligent search for parking spaces in Berlin – how does it work?

- It works on a straightforward principle. The sensor circuits, which are about the size of an adult's fist, send microwaves towards a predefined surface; any obstacles in their path reflect the waves back to the sensor. Thus the sensor can use a sophisticated algorithm to calculate if and in what position an object is parked in the space, and how big it is.

- The sensor comprises an antenna, analog electronics, an analog-to-digital converter and a signal processing component. The sensor is small, which means it can be built in to the lamp fixture on a street light; this also ensures it can be supplied with electricity. Alternatively, the sensors can be fitted to the lamp post or the wall of a building. They can survey from above a cone-shaped area of around 30 by 9 meters: that's equivalent to between five and seven cars parked in a line.

- But how can drivers anxious to find an empty parking space access the information gathered by these sensors? Mobile radio signals are used to transmit the measurement data to Berlin's traffic management control center. The center processes data and prepares it in an accessible format, calculating which parking spaces are full, in real time. Drivers can then use their smartphone or navigation device to enter a destination and receive information on whether and where parking spaces are available nearby.

- The key aspect here is that the software works with adaptive systems. It recognizes identical recurring cycles in the parking situation – for example if it comes under particular pressure, or much less pressure, at certain times of day or on certain days of the week. The software then predicts for particular road users what the parking situation is likely to be when they reach their destination.

Information regarding the research project City2e 2.0:

The City2.e 2.0 project funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) is designed to provide a practical demonstration of integrating parking spaces with recharging points into an intelligent parking space management system. It aims to create a 'virtual car park' so it can investigate the relevant requirements. A wide variety of data will be linked together in order to predict and control, with a degree of certainty, traffic looking for a place to park. This includes data from parking space sensors in public or semi-public areas, information on the occupancy of recharging points, and weather information. The project focuses on coordinating and controlling the traffic so vehicles can travel directly to a vacant parking space or recharging point.

- **Siemens AG** is overall project coordinator, and as such is responsible for developing sensor technology to monitor on-street parking spaces, along with the relevant system architecture.

- This will be based on an analysis of available parking spaces and lighting infrastructure performed by the **Senate Department for Urban Development and the Environment in Berlin (SenStadtUm)**.

- The **VMZ Berlin Betreibergesellschaft mbH (VMZ)** will evaluate and operate the demonstration model, and provide the underlying system platform.

- The **Institute for Climate Protection, Energy and Mobility (IKEM)** is responsible for the legal and economic research to accompany the project. IKEM will analyze the legal and economic conditions relating to a 'virtual car park' system solution. It will identify both any necessary changes to legislation and the criteria for sustainable business and finance models, then translate these into concrete proposals for implementation.

- The **Robotics Innovation Center of the German Research Center for Artificial Intelligence (DFKI)** is tasked with developing and implementing a prediction module for the project, to generate forecasts of future parking space occupancy. Intelligent algorithms will learn, from the sensor data gathered, patterns which allow the module to predict the likelihood of finding a parking space in a particular street at a particular time. This will take into account large events, building work and other special circumstances.

Facts and figures regarding City2e 2.0:

- The section of road in the pilot is **250 meters** long, between Walther Schreiber Platz and Friedrich Wilhelm Platz in the Friedenau district

- **Ten street lights** are fitted with built-in detection sensors

- Each sensor in the network scans from above like a flashlight beam, covering an area of up to **30 meters** (**six to eight cars**).

- The project as a whole covers **50-70 parking spaces**

- The data from the sensors is transmitted to the City of Berlin's traffic information center, so drivers can always find empty parking spaces simply by using their **smartphone, a navigation device or the parking guidance signs**.

- The project is funded by the **German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)**.

- The results of the test will be available in **2016**, and are expected to demonstrate that the system is viable.

More information and press pictures are available at:
www.siemens.com/press/smart-parking

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