



## Researchers use mobile phone signals to track patterns of movement in the population

20/07/2020

Research news

**The study, coordinated by the University of Granada and published by the Institute of Electrical and Electronics Engineers, aims to help prevent future problems related to the movement of pedestrians or vehicles in urban areas**

Researchers from the Universities of Granada and Cádiz have conducted a study to validate a new methodology that uses mobile phone signals (or those of other smart devices) in urban areas to track and analyse behavior in terms of inhabitants' movement around the city. The study aims to prevent possible future incidents linked to the movement of pedestrians or vehicles.



Over the last two years, this team of experts has analysed the density and movement of pedestrians in the City of Granada by tracking the Bluetooth and Wi-Fi signals given off by their smart devices. The process is managed anonymously and is intended to detect patterns and anomalies and that will help design optimal strategies for more efficient mobility and safety. This work "is part of a study that deals with the data provided by a smart city and that seeks to facilitate the lives of its inhabitants," the authors explain.

The study, published recently in the scientific journal Institute of Electrical and Electronics Engineers Access (IEEE Access), proposes a methodology based on several phases. First, data from mobile devices are acquired through the wireless signal inadvertently emitted via smart devices to establish connection with other nearby devices (such as the home router or the hands-free driving function), and

these are stored and encrypted to ensure anonymity. Once the data are acquired, their source is verified and known mobility anomalies are detected. Finally, information and knowledge are extracted on the habitual movement patterns of pedestrians and vehicles to study the mobility anomalies that have occurred and thereby establish models that can predict them in future and detect the factors that cause them. It is important to emphasise that at no time does the system store users' personal data.

"If this methodology were widely applied in cities, the authorities could better manage their mobility and transport resources," asserts the main author of the work, **Pablo García Sánchez** of the Department of Software Engineering of the UGR. In this sense, "the possibility of detecting anomalies in the density and movement of pedestrians and vehicles within the area of urban mobility is of vital importance for the effective planning and administration of a city." This approach is in line with the objective of creating a smart city capable of optimizing resources for citizens and facilitating their movement, "something that could be achieved by "adjusting the programming of traffic lights, the urban transport, or the optimal pedestrian crossing design," as explained in the scientific journal article. Furthermore, the detection of incidents using this method can help identify possible flaws in current urban planning and even prevent or anticipate similar behavior patterns in the future.

### **Management of a smart city**

The use of technology to track the density and movement of the inhabitants of a certain area is now an option to consider in the management of a smart city. In fact, this study has served as a starting point for applying this methodology in other places and future scenarios, and for creating a complex network of movements that can be better analysed, thus optimizing the available resources.

Furthermore, this methodology successfully simplifies the use of the tracking technologies used to date, as these required higher expenditure on installation and maintenance—such as the use of video cameras, which also raised complex privacy issues. "The use of wireless signal monitoring and tracking systems has proven to be an effective, low-cost solution to the challenge of obtaining information on people's mobility."

The co-authors of the work, along with Pablo García Sánchez of the UGR's Department of Software Engineering, are Antonio J. Fernández-Ares, Maribel García Arenas, Antonio M. Mora García and Pedro A. Castillo Valdivieso.

### **Bibliography:**

Fernandez Ares, A; García Sánchez, P; Arenas, M.G; Mora, A.M; Castillo Valdivieso,

Pedro A. (2020). 'Detection and analysis of anomalies in people density and mobility through wireless smartphone tracking'. IEEE Access. DOI: 10.1109/ACCESS.2020.2979367.

### Image captions:



The researchers who participated in this study.



A traffic light.



One of the devices used in the study to monitor movements.

### Media enquiries:

**Pablo García Sánchez**

Department of Software Engineering, University of Granada

School of Computer and Telecommunication Engineering

Email: pablogarcia@ugr.es

<http://www.ugr.es/>