

Studying individualised transit indicators in the metropolitan area of Granada using a new low-cost information system

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Resumen Given the benefits of an information system about the traffic intensity and about the usage of vehicles, a new low-cost information system to monitor the traffic in real-time is proposed.

Current information systems used for data collection and to generate information on the state of the roads have two drawbacks: the first is that they have no ability to identify and target the vehicles detected. The second is their high cost, which makes them expensive to cover the secondary road network, so they are usually located just on main routes. In this paper we propose a system based on scanning bluetooth devices that are near the detection node. This is an unique identifier that allows to know the manufacturer and even distinguish what type of device it is (PC, mobile phone, handsfree, etc).

We intend to collect large amounts of data from passes of bluetooth devices by different nodes (movements or displacements). Thus we could determine the frequency of appearance, calculate speeds between nodes, or calculate the number of devices that pass certain site each day (on both working or non-working days).

Statistics will be obtained and thus several indicators relating to the use of vehicles by the population of the monitored area will be studied.

Keywords: traffic, exposure indicators, new technologies, bluetooth, monitoring

1. Introduction

Having a system of information on traffic conditions and the use of roads by vehicles seems key in the current context. With a population increasingly informed, provided with communication devices ubiquitous commonly used about 90 % of the population, obtaining information about the traffic in any of the nearly 20,000 kilometers of roads, would mean to optimally manage a communications network vital for a high percentage of users.

The application of this proposal in the transportation system will involve having an information system on the traffic status.

Our ultimate goal is to have information about traffic flows that occur in a certain area, allowing to optimally manage motion decisions by citizens.

Therefore, various needs from the viewpoint of the transport management have been found:

- A versatile and autonomous data collection and monitoring device is needed.
- It is also necessary to collect traffic data in real time.
- Once the data has been collected, it has to be processed properly.
- And finally, a system that allows sharing data and information with those who make decisions about mobility is needed, both from the institutional and personal points of view.

In this work, a system based on bluetooth (BT) device discovery is proposed. Specifically, it will catch waves emitted by different technological components incorporated on vehicles (handsfree, gps), accessories that the users incorporate to their vehicles, as well as their mobile phones. The main data that is collected is the MAC address of the device BT card. This is an unique identifier for each device, allowing us to identify passing vehicles. From the point of view of data privacy, it is noteworthy that the data collected will not be associated to any user because there is no information that enables the identification of the information we collect with a specific person. Encryption technology unidirectional with nonstandard characters that preclude identifying the MAC of the wireless device is used. Thus, intrusiveness is minimal. A large amount of data related to passing BT devices will be collected, to calculate statistics and to study several indicators about the use of vehicles by the monitored area population.

2. Current technologies

Current technologies used in traffic monitoring include pneumatic tubes, loop detectors, floating vehicles or automatic recognition systems, among others.

The main disadvantage of these systems is that they are unable to identify vehicles detected, in order to obtain origin/destination matrixes. Just the number of vehicles and their type can be calculated, but does not allow to obtain moves flow, nor to determine whether a certain vehicle passes repeatedly. In addition, its high cost makes it unprofitable covering secondary roads with them, so they are often located on major roads.

Finally, technologies based on video image detection are very costly compared to the previous and can be sensitive to meteorological conditions.

3. Objectives and expected results

The main objective is building a low-cost system, with a fast implantation and highly reliable. It will provide real-time information about the traffic status, not only to the official organisms and agencies in charge of the traffic controlling, but also to any person who requests it (available as web services).

Several features have been developed:

- *Data collection component*: it includes several sensors to continuously scanning and identify BT devices. It uses a 3G connection to send data the storage server.
- It is enclosed in hermetic boxes, with a power line (220volt).
- *Data processing component*: it stores the obtained data, and offers some tools to serve them (through web services).
- *Information service*: it provides the users the requested information related to the traffic status.

4. Conclusions and future work

The information systems currently used for collecting data about the road conditions are not able to uniquely identify detected vehicles, and if they do, these information systems have a high cost.

This work presents a new low-cost information system to monitor traffic on different road types and in real time.

The main goal was getting exposure indicators using a new system based on the BT devices detection using several collecting nodes.

Thus, we are able to monitor the traffic density and car journeys, identifying the vehicles when they move from one nodo to another inside the monitored zone.

Our purpose is to develop in the future a prediction system that helps to make decisions, and able to apply knowledge in applications related to mobility. It is expected that the development and deployment of these systems will offer a set of information services with added value that are not achieved with current technologies.