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Simultaneous assessments of innovative traffic data collection technologies for travel times calculation on the East ring road of Lyon

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Abstract

In recent years, many innovative technologies for the travel times calculation evolved, but have never been evaluated and compared to each other at the same time. These technologies depend on the kind of implemented sensor for the traffic data collection. The purpose of this paper is to introduce an original experimentation, which will compare several recent technologies of data collection allowing travel times calculation from Bluetooth sensors, magnetometers, Floating Car Data from GPS embedded devices and even inductive loops stations for speeds interpolation. For this assessment, number plate readers (ANPR) were chosen to provide the reference travel times according to their high traffic's identification rate (near to 90%), which is much greater than the whole of assessed systems, and also allows to reach an optimal representativeness of the traffic flow. This trial takes place in a 12 kilometres long segment of the Lyon East ring road, which DIR-CE is the road operator. The daily traffic flow is about 90,000 vehicles with around 10% of trucks. The East ring road of Lyon usually presents any kind of traffic density : free-flow, heavy traffic, regular 1 to 2 kilometres long end of day congestion. So, it will be interesting to test the swiftness of each of these new technologies for all of the various traffic conditions, especially during the fast transition phases of the traffic flow or even while the traffic is jammed and therefore when the travel times are high. There are five measurements test points along this itinerary and so four elementary segments. The installation of all the field sensors ended at the beginning of March and when all the systems will be in a nominal operating mode (actually, they are at present in a testing and settling phase), it is planned to collect data during at least three months, which will allow to build a large travel times database. Among these four road segments, one of them has neither entry nor exit, thus the penetration rate and the overall performances of each of these technologies will be able to be estimated with no disruption in travel time measurements.

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1. Introduction

1.1. Background

DIR-CE, a road operator in the Centre East of France, deployed several years ago a traffic data collection station fleet, with inductive loops to manage its road network through different traffic control centres named “Coralie”, “Hyronnelle”, “Gentiane”, “Osiris” and “Moulins”.

Today, the urban freeways travel times are implemented from these inductive loops stations by speed measurements interpolation. However, on some itineraries and for several periods of the day, these travel times present important gaps compared to the real ones.

So, it has been decided to improve the reliability and the quality of the travel time information system broadcasted to the road network users. Numerous solutions exist today, based on various technologies, but few elements allow doing a sensible choice both from the expected performances and involved costs.

1.2. Goals of the experimentation

In this context, DIR-CE wishes to estimate various technical solutions allowing to enhance reliability of the travel time calculation, on one hand as for the technology of traffic data collection, and on the other hand, as for the calculation estimation methodologies and real travel times forecasting. Next, the broadcasting to the users will be done from the websites and the road network VMS (variable messages sign). In that aim, it is planned to appraise in real and known situation, various ways of evolving methods of travel times from several innovative technologies.

The objective is to estimate the metrological and functional performances of various systems and services based on these new technologies of traffic data collection, by comparison of travel times implemented by each of them according to those provided from the reference devices which are license plate readers (ANPR), and those developed from the existing inductive loops stations (cf. Figure 1).

This large-scale project deals with three main axes :

- Research for optimal algorithms of travel time development from the spatial aggregation of punctual data that are traffic flows, speeds and occupancy rate supplied by each station ;
- Assessment of devices and services based on innovative technologies of traffic data collection by exit travel time measurements analysis ;
- Research for improving algorithms of predictive travel times reliability with the aim of their broadcasting to the users and to the road network operators for traffic management.

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