Available online at www.sciencedirect.com

ScienceDirect

Transportation Research Procedia 6 (2015) 28 – 49

Transportation Research Procedia

www.elsevier.com/locate/procedia

4th International Symposium of Transport Simulation-ISTS'14, 1-4 June 2014, Corsica, France

A realistic case study for comparison of data fusion and assimilation on an urban network – The Archipel Platform

M. Canaud [a] * A.Nabavi [a], C.Bécarie [a], D.Villegas [a] and N-E El Faouzi [a,b]

[a] *Université de Lyon, F-69000, Lyon, France*
IFSTTAR, LICIT, F-69500, Bron
ENTPE, LICIT, F-69518, Vaulx en Velin

[b] *Smart Transport Research Centre*
Faculty of Build Environment and Engineering
Queensland University of Technology
2 George St GPO Box 2434, Brisbane QLD 4001, Australia

Abstract

Achievements from conducted research as part of the team of the Laboratory of Traffic Engineering Transportation (LICIT) of IFSTTAR are integrated in platforms in order to develop and test new modules directly on real data. The ARCHIPEL platform focuses on data assimilation and fusion from multiple sources. The objective of ARCHIPEL is therefore to provide tools to process real-time data from different sources. This platform allows one to test and compare different approaches of assimilation and data fusion: loops, GPS, Bluetooth. Besides it offers to view details of traffic conditions in the form of space-time diagram on accurate and successive areas or larger areas by traficolor representation. In the context of ISpace&Time project, the city of Paris has been finely modelled in a traffic simulator developed by the LICIT, called SymuVia. This permits to have access to a case study in which we know all vehicle positions. In order to explore which fusion method is the most suitable depending on the context e.g. penetration rate and data noises, this realistic data has been put in the platform database and is utilized to give a complete overview of the more relevant methodology to apply. In this work, we propose some fusion scenarios and present the comparison results with respect to different conditions. The final aim is to give a roadmap of the more accurate solutions, since the ground truth is exactly known.

Selection and/or peer-review under responsibility of the Organizing Committee of ISTS'14

Keywords: ISpace&Time; Archipel; Symuvia; Data fusion; traffic state estimation; urban network

* Corresponding name: Matthieu Canaud Tel.: +33-472-142542
E-mail address: matthieu.canaud@ifsttar.fr

Selection and/or peer-review under responsibility of the Organizing Committee of ISTS'14
doi:10.1016/j.trpro.2015.03.004

1. Introduction

Achievements from conducted research as part of the team of the Laboratory of Traffic Engineering Transportation (LICIT) of IFSTTAR are integrated in platforms in order to develop and test new modules directly on real data. The ARCHIPEL platform focuses on data assimilation and fusion from multiple sources.

The objective of the ARCHIPEL platform is therefore to provide tools to process real-time data from different sources. In this context, the LICIT has developed methods of data fusion using data from sensors, supplemented by information from probe vehicles. More specifically, it is a tool for data fusion to produce traffic state and travel time estimations on a given area. This tool allows one to test and compare different approaches of assimilation and data fusion: loops, GPS, Bluetooth. As one of interesting outputs, this platform offers to view traffic conditions in the form of space-time diagram on accurate and successive areas or larger areas by traficolor representation.

In the context of ISpace&Time project, see ISpace&Time project (2013), the city of Paris was finely modelled in a traffic simulator software developed by the LICIT, called SymuVia. This permits to have access to a case study in which we know all vehicle positions. Obviously, to make simulated data as real data, noise process is used in order to reflect what occurs in reality. Moreover, different situation were investigated i.e. the penetration rate of GPS. Hence, each of them is based on the same situation but with different data characteristics.

In order to compare methods and find out the most suitable one depending on the context e.g. penetration rate and noises, this realistic data was put in the database of the platform and is used to give a complete overview of the more relevant methodology to apply. What we propose in this work is different fusion scenarios and comparison results with respect to different conditions aiming to give a roadmap of the more accurate solution, since we exactly know the ground truth.

1.1. Objectives

The purpose of the ISpace&Time project is to develop of a 4D demonstrator of a geographic information system on the web resulting from the convergence of different technologies provided by consumers as well as professionals. This portal will integrate new knowledge technologies, sensor networks, immersive visualization, animation, and simulation. It will meet a set of needs that range from simple 4D visualization of the city to support tools development (intersections, sidewalks, etc.) through participatory updating of map databases and participatory constitution database oriented disability.

Among the different issues of the project, the data treatments and qualifications are the key points. More specifically, this issue is concerned with the process and fusion of heterogeneous data from fixed or mobile sensors providing information on partial flow and at different scales in order to obtain more robust and more accurate sample of flow information e.g. the network heterogeneous could be merged to estimate the flow in an urban area for pedestrians, cars, and other moving objects willing to study the impact of a development on the traffic flow, by simulation. In this work, only car traffic is investigated.

This objective is divided in two estimation sub-topics: (i) real-time traffic condition and (ii) traffic flow. The first one is devoted to traffic state estimation and the second one to OD matrix estimation.

In this article, only the first sub-topic is introduced. In the literature, different solutions are available. In the aim of implementing the more relevant solution in the sense the closer to reality, it is necessary to compare these different algorithms in different conditions. This is the purpose of this work, to present visual results i.e. traficolor of the urban network and also some metrics of estimation quality.