e-mission, a personal mobility tracking software common

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This paper is a DRAFT proposal to be submitted to https://heart2020.sciencesconf.org/ by
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The paper will be largely completed and updated this summer.

1. Introduction

La Fabrique des Mobilités is a French not for profit association with the goal of developing, "commons", in particular open source software, in the mobility domain. In 2019, la FabMob decided to engage in developing a mobility tracking app, and to set up a demo so as to initiate a user community on open source solutions for collecting sharing and analysing personal mobility smartphone tracking data.

The project comes with questions such as :

- can an open source application such as e-mission meet the requirements of an end-user who wants to know better his/her personal mobility?
- can this application preserve privacy?
- can this application also meet the mobility analysis requirements of organisations such as cities and urban planning agencies, when the collected aggregating personal data ?
- what are the key components of such a mobility analysis software toolbox?
- which components exist as open source software?
- is there a motivated community motivated for reusing the software and contribute to it?

Considering the limited budget (70k€ in 2019), the approach has been to use and possibly adapt an existing software. We discovered such a software was currently under development by Shankari K. at Berkeley U : e-mission. The e-mission software has been described elsewhere, in particular in her PhD thesis, and is documented and available on github with a BSD license.

More than a software application or a research tool, e-mission is a framework designed to be reused by other projects, one of the key goals for the software being to be maintained and adapted. And indeed, the e-mission has been reused and adapted or extended by several research projects in the USA and other countries since 2017.

Another important feature of the project is the evaluation methodology with respect to power consumption, accuracy and data analysis designed and implemented as open source tools by K. Shankari during her PhD research. This evaluation methodology is based on pre-defined, ground truthed, artificial trips and is still being improved. The collected data has been published a public data set alng with reusing analysis tools (see https://github.com/e-mission/e-mission-eval-public-data-docs).

2. Achievements in 2019

The PhD thesis has been completed in, with significant results

The application works on iOS and Android and is relatively straightforward to install. A small project team was set up by FabMob for deploying the app, with minimal adaptations, and let it test by interested users ; our e-mission version, "traceur de mobilités", has been tested by more than 60 users between June and October, and the evaluations have been reported in the project web site.

A test has been set up at the End of May until September, with 20 or 30 users initially contacted, who had already expressed their interest for the app, and finally more than 60 users have installed and tested the app (from the Paris Region, Marseilles, la Rochelle, Nantes or the French Riviera, but also from Monteal, Berlin and Rome); they have been invited to give technical and usability feedback on the software. The test results have been reported in the delivrables (in French).

During our tests, we contributed to a few improvements, the most notable being the internationalisation and translation to French and Italian.

Another team in Berlin at DFKI OSlab developed lated on a German version and a new UI.

Meanwhile, the core e-mission project has been completed with respect to data analysis and evaluation, and is still reused by other academic projects in other universities, e.g. with respect to privacy preservation, integration with travel survey tools, or with an internet of things framework.

3. Perspectives in 2020

2020 will be a pivotal year for the future of e-mission, as the software now has proven its relevance for research and on-field use cases and now the goal is to set up an organisation and funding for software governance and maintenance, and to consolidate the software architecture and documentation, with a priority merge with Itinerum, an open source mobility developed by Concordia University in Montreal.

In Europe, several use cases are considered in 2020 : Nantes, la Rochelle, Berlin, Heidelberg, Abidjan...

The goal of this Heart 2020 presentation will to be update this section with the most recent developments and discuss with the European Transport Research community over the issues we currently face :

- which organisation is best suited for this kind of software, taking into account the research goals and the more operational goals of transport authorities, and of mobility operators or private companies ?

- how to set up a user and contributor community broader than North America, in particular, including Europe ?

References.

e-mission: an open source, extensible platform for human mobility systems, K. Shankari, Ph Thesis, EECS Department, University of California, Berkeley, Technical Report No. UCB/EECS-2019-180, December 20, 2019, https://www2.eecs.berkeley.edu/Pubs/TechRpts/2019/EECS-2019-180.html

e-mission documentation and code available from https://e-mission.readthedocs.io/

Fabrique des Mobilités : http://lafabriquedesmobilites.fr/en/home/

Traceur FabMob project documented at https://oultim.frama.site/livrables , mostly in French.