

From Data to Sensing Users by exploiting Km4City Services

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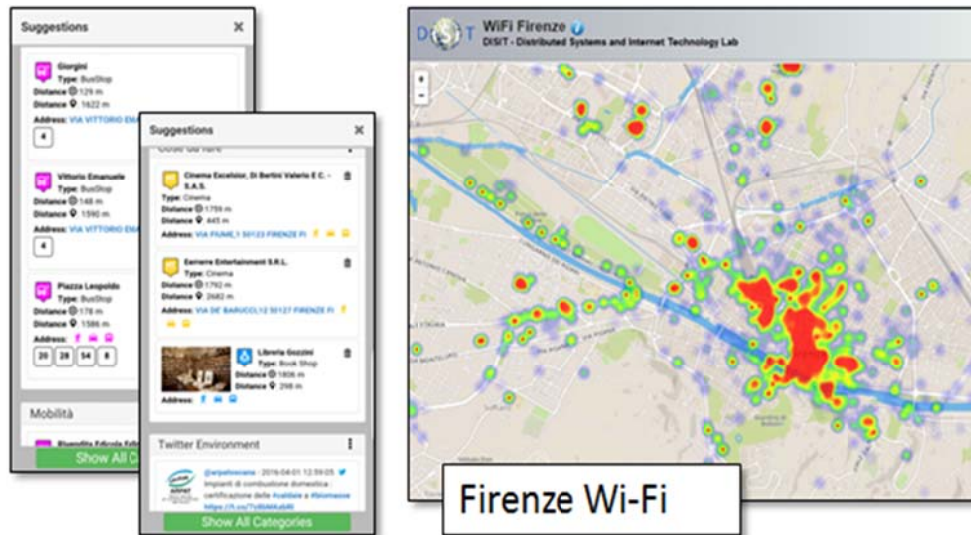
Extended abstract of the presentation

Many smart city solutions are providing access to city users at geolocalized services. These services can be related to static and/or real time data of the city including: information, point of interests, mobility and transport, energy, environment, health, tourism and culture, wine and food, etc. Km4City aggregated a large number of data and is providing services to final users via Smart City API and from these to mobile Apps. Km4City ontological model and data aggregation has been recently augmented with results of the Sii-Mobility project on mobility and transport. In Tuscany, Italy, more than 100,000 services are provided from Firenze, Pisa, Prato, Pistoia, Arezzo, Empoli cities. With a particular focus to the Metropolitan Area of Firenze, and data coming from the Tuscany Region, LAMMA, observatory Transportation and traffic manager MIIC, City of Florence for a total of more than 180 data sets. The identification of the most relevant data sets was performed to activate the data aggregation process by integrating information for the city users about services and mobility/transport. Geographic data have been integrated from MIIC (Mobility Integration Information Center of the Tuscany Region), many open data from Florence Municipality, sensors, weather forecast from LAMMA agency, several information about commercial activities from the web, and social media. The data which are present on Km4City for Florence and Tuscany are presently covering the whole Tuscany region with all districts and more dense data on Florence Metropolitan Area for a total of more than 120 millions of elements including

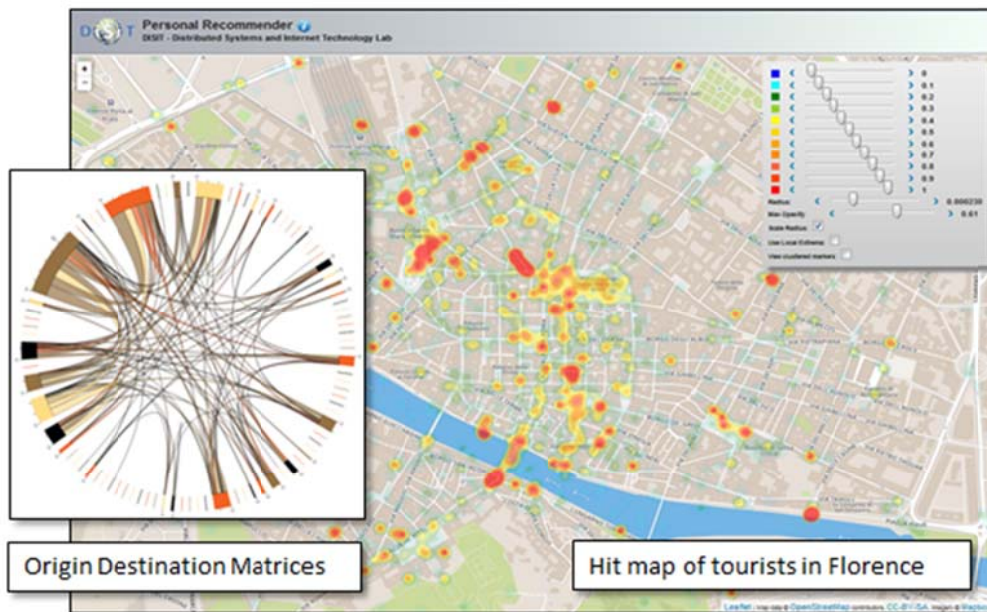
- **Elements:** Road Graph (Tuscany region) as 132,923 Roads, 389711 Road Elements, 318,160 Road Nodes, 1.508.207 Street Civic Numbers; 110374 Services (20 main categories, 512 subcategories); 2326 Bus stops & 86 bus lines (up to now only in Florence); 210 Parking areas in Tuscany; 424 Traffic Sensors in many cities; information on elements that are located on GPS points, paths, areas, etc.;
- **hundred thousands of measures per day about:** position of busses, parking status, traffic sensors, weather forecast, new events, power measures about Wi-Fi and iBeacon, restricted traffic zones, etc.

A web application on these data can be accessed via <http://www.km4city.org>, and for developers <http://servicemap.disit.org>. Thus, Km4City enables the development and deploy of personal assistant services, for example to implement Mobile Apps for city users with multi-domain information, and at the same time collects data from the users about their preferences and behavior. Km4City can be easily extended and applied to different smart cities.

Km4City Mobile App (available on all stores and collecting some thousands of users) is a sensor and front end desk for the city in the hands of the city users. All data are collected in a completely anonymous manner, while servers of the city inform and map collective behaviour of city users. The Mobile App exploits the Km4City Smart City API. Km4City Mobile App provides suggestions based on the user profile selected (citizen, commuter, tourist, student, and all) and on past anonymous action; measures the power of Wi-Fi and iBeacon. The user can deactivate suggestions totally or selecting categories. These are classified as suggestions of: events, weather forecast, mobility and transportation, interesting issue to be done, utilities, accommodations, restaurants, twitter informative channels, etc. The Km4City suggestion engine is at the disposal of the city and of city operators. It learns from the city users and avoids pressing them with multiple identical suggestions and respecting their preferences when suggestions are banned/rejected by the users.



The collective profiles can be exploited by the city for tuning services, extract what, when, which, where, and how they use the city services; and thus for producing Origin Destination matrices, trajectories, the most frequent city areas, all information suitable and relevant for city operators. Thus exploiting Km4City Smart City API and solution, other Mobile Apps can be realized by City Operators, and commercial operators. Enabling a wide range of commercial and business applications, some of them are presently under development.



- [1] P. Bellini, M. Benigni, R. Billero, P. Nesi and N. Rauch, "Km4City Ontology Bulding vs Data Harvesting and Cleaning for Smart-city Services", International Journal of Visual Language and Computing, Elsevier, <http://dx.doi.org/10.1016/j.jvlc.2014.10.023>
- [2] C. Badii, P. Bellini, D. Cenni, G. Martelli, P. Nesi, M. Paolucci, "Km4City Smart City API: an integrated support for mobility services", [2nd IEEE International Conference on Smart Computing \(SMARTCOMP 2016, St. Louis, Missouri, USA, 18-20 May 2016\)](#).