Chapter 5

Enriching Geographic Maps with Accessible Paths Derived from Implicit Mobile Device Data Collection

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ABSTRACT

The increasing use of technologies like smart phones and mobile apps enables people to be actively involved in collecting data that can be the base of useful services to the whole citizenship. In the realm of volunteer data collection, this chapter addresses the problem of mobility and accessibility limitations for vulnerable citizens in today’s cities. The MEP (Maps for Easy Paths) project proposes a set of tools and mobile apps for the enrichment of geographical maps with information about accessibility of urban pedestrian pathways, targeted at people with mobility problems. Different issues are considered and discussed in this chapter, including: the problem of collecting data of a user’s route and of reconstructing it with novel sensor fusion techniques; the problem of correcting the positions obtained from low-cost GNSS receivers of mobile devices; the need of usable and accessible applications for the fruition of the collected data suitable for the target users.

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INTRODUCTION

Emerging technologies, such as wireless sensor networks and internet-based mobile applications, have been reshaping our urban environments, turning them into smart and connected cities. Nevertheless, social, environmental, technological and economical evolutions, have put cities under a constant change, and they have provided citizens with challenges that need modern smart and creative service solutions. Indeed, citizens are the fundamental element of the cities, and smart cities cannot be without smart citizens; from them we are witnessing innovative solutions for their smart cities that do not emerge as top down plans, but rather as bottom up initiatives. Collaboration platforms, open data, open platforms, crowd sourced platforms and the alike, create innovative solutions for city issues through the creativity and collaboration of citizens (Shaffers et al., 2011).

Among the facilitators of this type of social innovations there is the increasing use of smartphones and mobile apps. These technologies have enhanced the connectivity among the population and have enabled people to be actively involved in collecting and exchanging data that can be useful for other citizens and for the city itself. In the realm of volunteer data collection and sharing, this chapter addresses the issue of collecting and redistributing information about mobility and accessibility of city paths to vulnerable citizens in today’s cities, and it shows how a collaborative mobile platform can create valuable data to make cities more accessible.

City accessibility is considered a priority in several countries having in mind all people with motor impairments, ranging from users with manual or electric wheelchair to the elderly with/without mechanical support, but embracing also people with temporary reduced mobility such as parents with strollers or people with a temporary injury or illness (e.g., a broken bone).

The number of wheelchair users is difficult to determine; US census estimated 3.6M wheelchair users (1.5% of the population) in 2010 (Brault, 2012; USCensus, 2014); estimates in Europe are very similar (“Wheelchair Statistics”, 2016). Besides wheelchair users, a large percentage of the population uses mobility aids or has difficulties in traveling due to old age, disability or reduced mobility. (“Wheelchair Statistics”, 2016) reports data from different studies conducted all over the world; data show disability prevalence among elderly people aged 65 and over: the latter represent over 40% of the disabled people. Numbers are expected to grow as well as the age of population; indeed, by 2020, a quarter of Europeans will be over 60. New easy to use tools and services are therefore needed to help achieving an improved accessibility of cities.

Satisfactory solutions for smart city accessibility are still lacking, but the need is clearly increasing more and more as witnessed by the growth of aids to cope with it. Indeed, several collaborative projects have been proposed to improve cities accessibility, through Web or, more recently, smartphones/tablets applications (Bruyninx et al, 2012). However, most of the available applications focus on the accessibility of points of interest (e.g., museums, restaurants, etc.) and they do not offer the information about accessible paths to reach a given, possibly accessible, destination; this is a complementary need for target users. Maps for Easy Paths (MEP in the following) (MEP Project, 2016) is a project funded by Politecnico di Milano under the Polisocial program, which aims at developing a set of tools and mobile apps for the enrichment of geographical maps with information about the accessibility of urban pedestrian pathways for people with mobility restrictions. The project aims at filling the gap between the available information about points of interest accessibility and the unknown accessible paths connecting them by advancing current state of the art in cooperative/social mapping. This is done through implicit data collection.