Large scale movement analysis from WiFi based location data

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ABSTRACT

The study and understanding of the human motion is very important in numerous activities: it can be used to plan cities, to plan new roads based on the traffic, and to predict the spread of virus and diseases, just to name a few applications. To understand the human motion in large scale spaces, several studies were conducted based on data collected using GPS receivers or data from GSM networks usage. Studying the mobility of people in big buildings is also very important and raises new challenges on how to observe the motion: how to collect the users' location inside buildings, how to observe numerous users and how to do it in the entire building.

There are numerous technologies being used to locate people and objects inside buildings, with different degrees of accuracy. However some of the technologies cannot easily be deployed in large facilities or be used by a large number of users.

In this paper we present the result of a large scale work conducted to study the human mobility in a University's campi. The study was conducted along several months, using data collected from thousands of users that freely moved inside the numerous buildings existent in two University campi and a few other buildings in the city centre.

A Wi-Fi infrastructure of around 400 access points provides Internet access to the campus. We tracked the user movements by logging the devices connected to each access point. Based on that data, an analysis process that highlights the relationships between space features and human movement has been developed. In particular, we propose the concepts of "place connectivity" and "flow across a boundary" to model these relationships

Results show the mobility patterns detected, which are the attraction places along the day, and what places are more strongly connected. It includes also an analysis of the short and long term movements between places.

Our study allowed gaining an understanding of the life in campus - to fell the campus pulse.

KEYWORDS: Human motion, WiFi networks, tracking, movement patterns.