Implementing Context Aware Scenarios to Enable Smart Health in Complex Urban Environments

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Abstract—The availability of context aware scenarios is a compulsory requirement in order achieve efficient Smart Health services. In this work, the deployment large scale wireless sensor networks to enable interactive scenarios in order to provide Health services will be analyzed by means of deterministic 3D ray launching techniques in order to consider topo-morphological impact in services to be provided in a complex dense urban environment.

Keywords—Context-Aware Scenarios, Ambient Assisted Living, Wireless Communication Systems, 3D Ray Launching.

I. INTRODUCTION

One of the greatest challenges in healthcare is to increase quality of life of patients and users, while reducing overall costs. Within this aim, the paradigm of Ambient Assisted Living (AAL) is playing a key role in order to provide the necessary interaction with the users in order to allow for them to develop their everyday life within their usual environment. To achieve this, a wide range of technologies based on retrieving biomedical and behavioral parameters from different types of sensors, which can be interconnected to several communication networks. The great acceptance that smart phones have obtained from the general public and the steady improvement of broadband access networks are the key drivers to implement a truly interactive environment.

The adoption of interactive e-Health systems, which interact not only with medical data but also with other systems, such as transportation or environmental networks, will lead to the broader concept of Smart Health, in close alignment with the advent of Smart Cities. This new scenario will be characterized by a strong degree of interaction from the user with the surrounding environment, in order to enable a truly user-centric system conception. In order to achieve this goal, the use of communication networks in general and multiple wireless systems in particular is required. In this regard the use of Wireless Personal Area Networks (WPAN) based on IEEE 802.15 standard as bluetooth or ZigBee combined with wider area wireless technologies like Wi-Fi or GPRS are essential [1]. Therefore and considering that the autonomy of this kind of systems should be low, healthcare monitoring systems often use Smartphones as interface and WPAN for the communication with the terminal. Some health monitoring system have been developed using these technologies, like the ECG monitoring device Holtin[2], the U-healthcare System[3], Smart-Clothing belt[4] or ANT[5] and considering the expansion and the high connectivity possibilities of Smartphones they could be easily integrated in the smart cities environment.

To guarantee correct operation of this Smart Health environment, which will co-exist with multiple wireless systems (mobile communication systems, wireless sensor networks, personal and body area networks, radiolinks, among others), adequate radioplanning tasks must be performed within the scenario under analysis. Wireless communication systems have experimented a constant evolution in terms of capacity and mobility, mainly given by the use of Adaptive Coding and Modulation schemes, spectrally efficient access schemes such as OFDMA and the existence of new spectral allocations. However, due to the dynamic nature of the communication requirements by users as well as by the adaptive nature of transceivers, coverage/capacity relations are the key performance metric to consider. In this situation, system limitation is mainly given by available power restrictions as well as by overall interference levels.

In this work, the performance of a heterogeneous wireless system operating within a dense urban environment will be explored. By means of deterministic 3D ray launching simulation techniques developed in-house, a section of a dense urban environment...
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