Chapter 13

An Internet of Things Governance Architecture with Applications in Healthcare

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ABSTRACT

The astonishing expansion of Internet of Things has opened a lot of opportunities for related domains to employ strategies that were successfully used for the “things” governance. Furthermore, because of the technology blending in the most common household devices and wearable items, it becomes very easy for the computers to sense the surrounding environment and to collect information about the inhabitants, therefore transforming the intelligent house in a Home Care System (HCS). For medical conditions like dementia and its associated diseases, it is very convenient to monitor the patients in their living space because the patient will benefit from their home comfort. In addition, the costs for in hospital monitoring will decrease. This chapter proposes an Internet of Things Governance Architecture that can be used to sustain and monitor a complex e-health system, with application especially for patients with dementia and its associated diseases.

1. INTRODUCTION AND MOTIVATION

The increased standard of living in many countries around the world has led to a high level of life expectancy, the demographic profile being significantly changed. Together with the benefits resulting from a better quality of life, the level of elderly population has increased, people live longer with all the implications related to specific potential diseases, often multiple and complicated. At the same time, the number and complexity of issues the health system has to face have increased, being confronted with problems related to the way in which those people benefit from the caring

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system, how to maintain a high quality level of care and how to maximize the independence of the cared people (Patel et al., 2012).

The advances in computer technology have led to great promises in what concerns the health system, making it possible to change our lifestyle by producing wireless sensors, wearable or implantable in the human body, acting to detect biochemical and psychological phenomenon but also targeted to motion sensing. Their applications reside in a wide range of fields (Cooper & James, 2009; World Alzheimer Report, 2013), one of the most important being the health care: medical monitoring, communication in case of emergency, medical data access and much more.

Providing a continuous monitoring of the patients by using implanted or wearable sensors can offer an early detection of risky situations for people suffering of cognitive and physical disabilities. Psychological sensors help in diagnosis and monitoring of various neurological or cardiovascular diseases. It is usual to have sensors related to physical parameters like fall detection, location tracking or posture detection, contributing to enhance the independence level of the elder people, but there are also a wide range of sensors related to biological and environmental parameters able to give information related to the patient’s health.

Dementia is one of those conditions associated with aging and having symptoms ranging from memory loss to decreased reasoning and communication skills (Graham & Warner 2009). According to Kinsella & Phillips (2005), “today, over 35 million people worldwide currently live with the condition and this number is expected to double by 2030 and more than triple by 2050 to 115 million.”

The patients suffering from such a disease are cared for in specialized health centers or even at home by professional staff, but a large part of this task is considered administrative work, about filling various forms with health parameters, writing different statistics related to the patient’s condition, etc. The digital devices like computers, tablets and smartphones could improve this work by reducing the bureaucracy tied with the paperwork, keeping closer touch with hospitals or specialized medical staff.

Considering the number of people that are expected to develop dementia in the next years, one problem that is raising is related to the caring costs in terms of medications and equipment together with the caring personal and, at the same time, the need to provide quality health services. Continuous monitoring of the patients by using implanted or wearable sensors offers early detection of risky situations for the people suffering from cognitive and physical disabilities.

All these technologies help to reduce the medical costs related to dementia, improving the quality of life for the patients by providing a higher safety level and ease the work of the caring personnel, opening the possibility for extending the number of patients whilst maintaining the same medical staff.

2. THE INTERNET OF THINGS

Inspired by the adoption of the computers in more and more areas of activity, Mark Weiser proposed in 1988 the term of ubiquitous computing as “the third wave in computing [...] the age of calm technology, when technology recedes into the background of our lives”. Besides the ubiquitous computing paradigm, other concepts have found their place in current language, like pervasive computing, things that think, physical computing or ambient intelligence. Weiser (1991) enunciate that “the most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it”. According to Satyanarayanan (2001) the environment of the pervasive computing is saturated with computing and communication infrastructure that is so integrated with the users that eventually becomes “technology that disapp-