

Chapter 60

When Wearable Computing Meets Smart Cities: Assistive Technology Empowering Persons With Disabilities

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ABSTRACT

In this chapter, wearables are presented as assistive technology to support persons with disabilities (PwD) to face the urban space in an autonomous and independently way. In the Inclusive Smart City (ISC), everyone has to be able to access visual and audible information that so far are available just for people that can perfectly see and listen. Several concepts and technologies – such as Accessibility and Universal Design, Pervasive Computing, Wearable Computing, Internet of Things, Artificial Intelligence, and Cloud Computing – are associated to achieve this aim. Also, this chapter discusses some examples of use of wearables in the context of Smart Cities, states the importance of these devices to the successful implementation of Inclusive Smart Cities, as well as presenting challenges and future research opportunities in the field of wearables in ISC.

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INTRODUCTION

Cities have been the stage of most economical, societal, political and cultural human activities in the last centuries. Distinctively, almost as separated *silos*, these sectors have been profoundly influenced by the use of information and communication technology (ICT): the way we do business, communicate, interact with each other, the different alternatives we currently have to get informed about politics and politicians and so on. Yet only in the last years the urban space has become a subject of research and technological solutions.

New concepts, such as Urban Informatics and Urban Computing, have risen considering the employment of a wide range of *technologies* to problems that take *place* in the urban space (Foth, Choi, & Satchell, 2011). Due to ubiquitous and pervasive computing (Weiser, 1999), metropolitan areas are receiving more and more attention in order to have their problems addressed. Furthermore, cities can work as sources of information about their own *status* and about the location of their components – people, cars, parks, streets, avenues etc. – as well as what these components are performing.

Mobility is another key concept behind Ubiquitous Computing: everybody should be able to access every-piece of information, everywhere. For this reason, devices have to be reduced to the smallest size, weight and power consumption. This effort led to wearables: body-worn accessories that besides covering, adornment and protecting someone should be able to collect, to compute and to return information - armbands, anklets, bracelets, contact lenses, necklaces, glasses, gloves, jackets, rings, shoes, watches (Genaro Motti, Kohn, & Caine, 2014).

The rise of rapid prototyping boards and cheap yet powerful computational hardware motivated the development of a strong Dot-It-Yourself movement. The way Information and Communication Technology (ICT) solutions are prototyped, built and customized is changing fast and in favor of all people. Small computers built on a chip are now common and available to everyone, so are peripherals such as sensors, displays, actuators and so on. Everyone can be Gyro Gearloose. On the software side, tools to program these computers, libraries to use the peripherals, instructions to use the components and software are freely available to anyone willing to build “something”. Also, people are more prepared and connected to deal with any challenge, providing conditions for fast device and tools development that can be directed towards inclusion of PwD as users or as developers of ICT solutions.

Due to built-in sensors, wearables can offer their users some extra powers - such as automatic face recognition provided by Google Glass – and directly impact the way we feel the reality around us. In fact, those devices have the power of improving the way we interact with our own body. Wearables can change the way we represent ourselves and can affect our cognitive abilities (Dunne & Smyth, 2007). For the purpose of being used in the urban space, wearables can support users to deal with the huge amount of data available in the city and can be seen as an innovative infrastructure to interact with the environment around.

In this chapter, the authors advocate wearables as data input/output interfaces for persons with disabilities (PwD) to benefit from applications available in the urban space. The authors do believe that Smart Citizens and Smart Administration are the pillars of successful Smart City projects. Technology can play a decisive role in leveraging citizens’ smartness, since technology can self-adapt and provide customized interfaces/services to user needs, which implies having the required conditions to efficiently make decisions and to be responsive to feedback (C. Yin et al., 2015). The goals of this chapter are:

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