


## Chapter 13

# Mobile Pedestrian Navigation and Augmented Reality in the Virtualization of the Territory: Cities of Salamanca and Santiago de Chile

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### ABSTRACT

*Establishing the meanings and relationships that exist between the creation of heritage educational content of applications with elements of mobile pedestrian navigation and mobile augmented reality and learning processes through mobile devices is the objective of this research. From this portable and mobile context, a teaching process linked to territorial information on the architectural and historical heritage corresponding to the cities of Salamanca (Spain) and Santiago (Chile) has been developed, proving its educational effectiveness. Methodologically, the research focuses on two areas: the educational design of recourses for learning through augmented reality and mobile pedestrian navigation on heritage contents and the determination of the modes of understanding and educational effectiveness of the app created in relation to other traditional learning tools. In this way, the construction of a patrimonial thematic unit has been developed with the determination of the scope of this tool in the mobile learning processes considering the processes of identity and local culture.*

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## INTRODUCTION

Currently, within what is mobile technology (referred to tablets and smartphones), there have been important advances in functionality and in data processing capacity, highlighting the inclusion of specialized sensors and the ability to obtain information from the medium in which the user is immersed. This information gathering and processing capabilities are reflected in elements such as Geolocation and Augmented Reality, established now in a context of portability and wide availability, achieving the creation of applications and contents in different themes, which have the territory as common denominator.

In this way, teaching and education have been strongly strengthened with the creation of new ways of establishing and understanding learning. New paradigms and lines of action have also been generated that go beyond the existing e-learning, transforming it into m-learning and u-learning, in which different fields of knowledge converge, and generating a complementarity of contents, methods and objectives. From the perspective of m-learning and u-learning, there are technologies that have been strengthened by the technological advances in portability that mobile devices provide: Augmented Reality (AR) and Mobile Pedestrian Navigation Systems (MPNS). These tools have allowed the development of diverse contents in different topics with important consequences in their educational implementation.

The Augmented Reality (AR) technique has been developing over the last 30 years, strongly influenced by the exponential increase in hardware capabilities, both in stationary and mobile devices. It is in this last sense where important new functionalities are appreciated, highlighting mobility and portability, which has made it possible to offer a greater number of activities and contents for AR. The above has been increased with the application of this type of technique in various fields of knowledge, of which education and territorial patrimony stand out, and where important thematic contents have been developed, generating a new way of presenting and disseminating themes present in real space.

The application of the AR offers a great adaptability of contents and methods, which has facilitated the inclusion of diverse disciplines and areas ranging from the visualization of industrial processes to medicine, not forgetting advertising and astronomy. In this way, the end user obtains the digital information in a contextualized way with reality, where the contents are presented with a didactic facility that contributes to the improvement of the experience of understanding the visualized phenomena. The use of AR in education has always been framed in teaching-learning contexts similar to those found in e-learning methodologies, where the student receives complementary information –contents– through the computer screen or through some other device with a particular user interface –GUI– (González Izard et al., 2019, 2020; Xiao et al., 2016). It is in these cases where there is a permanent interaction with the learning content and a real scenario.

In parallel, almost all of the phenomena produced in the territory have been strongly influenced by the context proposed by mobile and portable technologies, ranging from the simple representation or modeling of spatial scenarios (Geographic Information Systems, –GIS–), to the possibility of generating and structuring places from new and complex data structures. This has been propitiated by the development of processing techniques and graphical deployment methodologies (Building Information Modeling, BIM). In particular, digital data has an important characteristic that corresponds to its spatial situation, which can be reduced initially to its euclidean context of these phenomena (its expression in a known X, Y and Z coordinate system). This makes it possible to deliver new perspectives of how we understand these elements from their spatial dimension and from the way they relate to each other in a territorial setting, not only in a three-dimensional way, but also in a multidimensional form, with characteristics, relationships and magnitudes that define the complete system (Joo Nagata et al., 2016).

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