

Learning the History of a Tuscan Village: A Serious Game Using Geolocation Augmented Reality

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Abstract : An important tool for the enhancement of cultural sites is serious games (SG), i.e., games designed for educational purposes; SG is applied in cultural sites through trivia, puzzles, and mini-games for participation in interactive exhibitions, mobile applications, and simulations of past events. The combination of Augmented Reality (AR) and digital cultural content has also produced examples of cultural heritage recovery and revitalization around the world. Through AR, the user perceives the information of the visited place in a more real and interactive way. Another interesting technological development for the revitalization of cultural sites is the combination of AR and Global Positioning System (GPS), which integrated have the ability to enhance the user's perception of reality by providing historical and architectural information linked to specific locations organized on a route. To the author's best knowledge, there are currently no applications that combine GPS AR and SG for cultural heritage revitalization. The present research focused on the development of an SG based on GPS and AR. The study area is the village of Caldana in Tuscany, Italy. Caldana is a fortified Renaissance village; the most important architectures are the walls, the church of San Biagio, the rectory, and the marquis' palace. The historical information is derived from extensive research by the Department of Architecture at the University of Florence. The storyboard of the SG is based on the history of the three characters who built the village: marquis Marcello Agostini, who was commissioned by Cosimo I de' Medici, Grand Duke of Tuscany, to build the village, his son Ippolito and his architect Lorenzo Pomarelli. The three historical characters were modeled in 3D using the freeware MakeHuman and imported into Blender and Mixamo to associate a skeleton and blend shapes to have gestural animations and reproduce lip movement during speech. The Unity Rhubarb Lip Syncer plugin was used for the lip sync animation. The historical costumes were created by Marvelous Designer. The application was developed using the Unity 3D graphics and game engine. The AR+GPS Location plugin was used to position the 3D historical characters based on GPS coordinates. The ARFoundation library was used to display AR content. The SG is available in two versions: for children and adults. the children's version consists of finding a digital treasure consisting of valuable items and historical rarities. Players must find 9 village locations where 3D AR models of historical figures explaining the history of the village provide clues. To stimulate players, there are 3 levels of rewards for every 3 clues discovered. The rewards consist of AR masks for archaeologist, professor, and explorer. At the adult level, the SG consists of finding the 16 historical landmarks in the village, and learning historical and architectural information interactively and engagingly. The application is being tested on a sample of adults and children. Test subjects will be surveyed on a Likert scale to find out their perceptions of using the app and the learning experience between the guided tour and interaction with the app.

Keywords : augmented reality, cultural heritage, GPS, serious game

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