



The Application of Urban AR Technology in Cultural Communication and Innovation

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Abstract. With the development of science and technology, today's society has gradually entered the Internet-led system, and based on the demand for creating a more perfect intelligent experience for users, augmented reality technology has become a hot spot for the development of the modern intelligent industry. AR applications such as AR games, AR smart furniture, AR navigation systems, etc. are constantly emerging. As technology evolves and matures, AR applications are beginning to shift from 2D data information (text or image-based descriptions) to 3D integration objects. The development of technology has provided more ways and possibilities for cultural communication and innovation. City around the globe is ready for the next step for their evolution to augmented cities. This paper aims to design an application of Location-based AR technology for exploring cities and discuss its important role in cultural communication and innovation.

Keywords: Augmented reality · Cultural communication · Cultural innovation

1 Introduction

The research on this project was originally based on the concept of “Italicity”. The word “Italicity” was first proposed by Piero Bassetti, in order to describe a cultural value system that is not limited to the sense of the nationality, but take the way of thinking, the mode of behavior, and the living habits as the core for those people who have a sort of subtle connection with Italy to some extent.

This view breaks the usual understanding of cultural value systems. With the acceleration of globalization, it is clear that a cultural value system divided by the state will not be enough to support such a complex and diversified cultural system. However, despite the closer communication between regions, cultural exchanges are still in a subtle stage and lack of effective tools for cultural communication.

With the rapid development of the Internet and the emerging technologies such as AR (Augmented Reality) and VR (Virtual Reality), it has injected new vitality into the research of the cultural industry. VR technology is used to build past historical experiences, and AR technology is used to restore ancient cultural relics and ancient ruins. The emergence of these cultural innovation industries has greatly enhanced the intensity and depth of cultural dissemination.

At the same time, smart phones also provide users with a variety of information exchange systems. In today's society that 5G networks are beginning to prevail, the use of the Internet in smart phones can better support users to explore augmented reality environments. In an era of information explosion, people are becoming more accustomed to spending less time to obtain information, instant information becoming a way by users to get knowledges. This means that, the way of cultural dissemination from large amounts of textual information in the past must be appropriately adjusted and changed. With the continuous penetration of the Internet into human life, social platforms have gradually become one of the main ways for people to communicate, exchange and obtain information.

In 'the Smart City Expo World Congress 2017', Gregory Curtin pointed out: city around the globe is ready for the next step for their evolution to augmented cities. And by augmented cities, we mean using all of their various data, infrastructure, the connected things that now are coming online in smart cities and new urban design. And in the augmented city, really bring all together to change the city in reaction and engagement with citizens, residents, workers, businesses. It really change the entire city experience. So, an augmented city is using all the information, data, infrastructure cities have available now. It enables all that for augmented reality devices experiences in like. And it definitely will be one of next step in terms of urban design, city design, really creating a whole fabric for a city, for the citizens as users to engaging and navigating to really experience in city.

So, in terms of augmented reality, in using augmented reality is really a fancy term for new technology, is very usable, readily available, most of the young people are already behavior or change their required for augmented reality anyway. Playing games on their handheld, smartphones, navigating cities... younger people use smart phones for just about everything. So already that behavior changing is happening, or using smartphones for voice interaction, or using smartphones for direction. So there's no problem in transform using the smartphone to then moving to the visual. Augmented reality, is very visual navigation, visual interaction.

City image is the manifestation of city culture, and it is an urban form that can stimulate people's ideological and emotional activities. It is a cultural model with urban characteristics, created jointly by citizens in the long-term life process, and is the sum of urban living environment, lifestyle and living customs. It has the characteristics of complexity and diversification. We often visit museums in a certain country or city to learn about the local history, culture and customs. However, the city, as an all-encompassing huge museum, the cultural connotation hidden under the reinforced concrete constitutes the flesh and blood of it.

Public art design, as one of the cultural carriers for constructing today's urban appearance, bears the responsibility of cultural communication in a certain sense, which is mainly manifested in: the spread of historical culture, the spread of aesthetic culture, and regional characteristics. In today's information age, the scope of public art design has covered digital media and interactive application methods. This article discusses the way that uses art and design as media for cultural communication.

Artists and designers are the subject of this project. We will extract the cultural and design elements of artists and designer to build a sample library. Then AR technology is used to combine the virtual model constructed by the artist's design elements with the real city to create a new urban style and bring a new urban experience to users. The real city will become a huge canvas (background) in the future, providing a new way of expression for artist/designer style and ideas. For users, this is also a new cultural experience journey different from visiting a museum.

2 Literature Review

Many research papers have shown that AR technology has played a significant role in promoting cultural exchanges. In AR, one of the display areas with great potential is cultural and historical heritage, also known as virtual heritage. Reconstruct 3D visual representations of monuments, artifacts, buildings and other cultural and historical artifacts by using AR technology. This visual and interactive cultural experience is more realistic and detailed than traditional text or pictures to convey information. It is very useful to help users understand site information and history.

In addition to its role in the study of historical and cultural heritage, AR technology has also played an increasingly important role in the development of contemporary tourism which plays an important role in the cities. Tourists who come to the city are aiming to explore historical and touristic areas, social areas, entertainment and shopping centers. Many navigation systems based on augmented reality technology came into being, and many location-based AR city exploration apps evolved constantly.

Go Find! GoFind! can be used by historians and tourists and provides a virtual view into the past of a city. The system provides location-based querying in historic multimedia collections and adds an augmented reality-based user interface that enables the overlay of historic images and the current view.

Nokia City Lens. Nokia City Lens uses the device's camera to display nearby restaurants, stores, and other notable locations in augmented reality style, along with important information about each location — including reviews, directions, hours of operation, and more. And when you're not in the mood to have your reality augmented, you can also check out the same information through both a list and map view.

AR Urban Canvas App for HKYAF. HKYAF is a City Exploring Mobile App. Users can follow cultural tour routes, explore hidden neighborhood stories in Hong Kong, and view the hidden artworks with Augmented Reality technology.

Near the tail end of the 20th century, pseudonymous author and technologist Ben Russell released *The Headmap Manifesto*—a utopian vision of augmented reality referencing Australian aboriginal songlines and occult tomes, while pulling heavily from cybernetic theory and the Temporary Autonomous Zones of Hakim Bey. At turns both wildly hypothetical and eerily prescient, *Headmap* explores in-depth the implications of “location-aware” augmented reality as a kind of “parasitic architecture” affording ordinary people the chance to annotate and re-interpret their environment.

Around the same time, artist and scholar Teri Rueb began developing her pioneering, site-specific augmented “soundwalks,” some of the earliest and most influential examples of GPS-based art practice. Influenced by land art practitioners such as Robert Smithson and Richard Serra, Rueb’s work identified the critical potential of locative AR as a direct mediator of spatial experience, capable of revealing hidden layers of meaning within landscapes. Beyond land art, a number of early AR practitioners and theorists explicitly identified the Situationist International (and even Archigram) as conceptual touchstones for the kind of digital enhancement, and potential subversion, of space made possible through augmenting reality.

In 2019, Apple introduced Apple [AR]T Walk Project. Augmented Realities Co-Curated with New Museum. These experiential walks take participants through San Francisco, New York, London, Paris, Hong Kong and Tokyo as they encounter works by world-renowned artists, most of whom are working in AR for the first time. Works by Cave, Djurberg and Berg, Cao, Giorno, Höller and Rist connect participants to public spaces such as London’s Trafalgar Square, San Francisco’s Yerba Buena Gardens or New York’s Grand Army Plaza in Central Park. Using AR, the artists have reimaged or invented new ways to express core themes of their art practice. Rist’s “International Liquid Finger Prayer” bounces, taunts and sings as participants race to catch a shimmering form, while Giorno’s “Now at the Dawn of My Life” is a rainbow journey of homespun wisdom, and “Through” by Höller takes viewers through a portal into a world with no perspective.

These studies show that there have been many attempts at location-based AR technology-based art exploration. Combining the inspiration obtained from these cases and the development trends and application areas of AR application software in the era, we have launched a project called City Art Project.

3 System Description

An AR mobile app called City Art through Vuforia using the SDK open source framework will be design in this project.

This is an urban exploration app that combines urban experience with cultural communication. City was chosen as the background for the exploration journey.

A city’s common image is a mixture of many images. American urban research scholar Kevin Lynch, in his book “The Image of The City” proposes the main elements of urban imagery: channels, edges, regions, nodes, landmarks these five aspects. Lynch mentioned that urban imagery is a basic part of our daily life. The city image is valuable, it is like having a map for people to taking directions, and taking action, and the scenery plays a social role. The place where all known causes a common feeling when mentioning about it. This symbolic sign will unite everyone and use it to create a common goal. Therefore, based on the analysis of urban characteristics and urban imagery, the city is divided into five parts: Popularity, Activity, Street view, Modern life, Transportation. These five parts will serve as a background for exploring city.

Milan was selected as a pilot city as a demonstration of the city’s art journey. By decomposing the composition of the city, we identify the exploring objects of the city as the main buildings of the city—famous places of interest (such as Milan Duomo), historic buildings (such as the Monastery of Santa Maria della Grazie), and the Museum with Cultural Significance, etc.

3.1 Concept Interpretation

We have selected some artists and designers to build a sample library, analyze and decompose their works, and extract design elements and color features from them to establish independent material packages. These elements will be randomly combined to form a virtual 3D model cover the real scenery in the city in the app (Fig. 1).

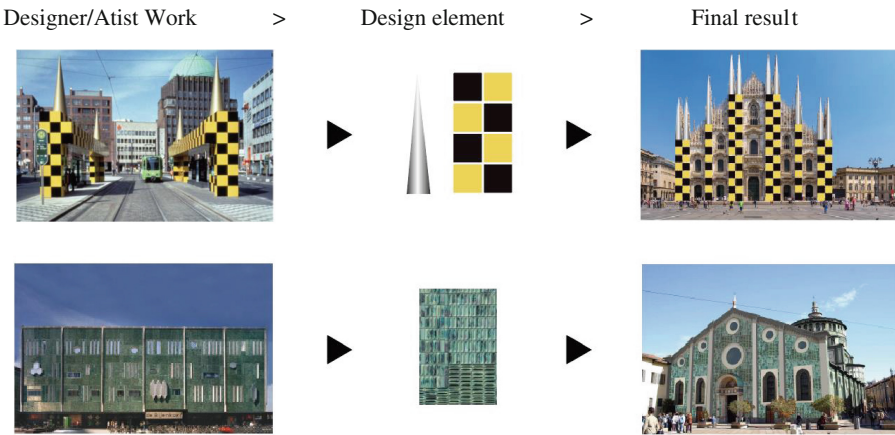


Fig. 1. Transformation process

3.2 System Overview

The application’s system has three main components: User Block, Marker Tracking, and Augmented Reality Environment. The user block contains users and mobile devices. Marker Tracking with geographic recognition will obtain the user’s location through GPS. At the same time, the corresponding 3D rendering model will be loaded in the Augmented Reality Environment. Finally, the output results are visualized to the user (Fig. 2).

After opening the app, users can choose to download their favorite designer material packages, then turn on the AR mode, call up the camera, and the images taken from the camera will be loaded onto the Vuforia SDK and a virtual 3D model with geo-tagging (that is, 3D model stitched by designer material package), and finally displayed to the user through a mobile display device.

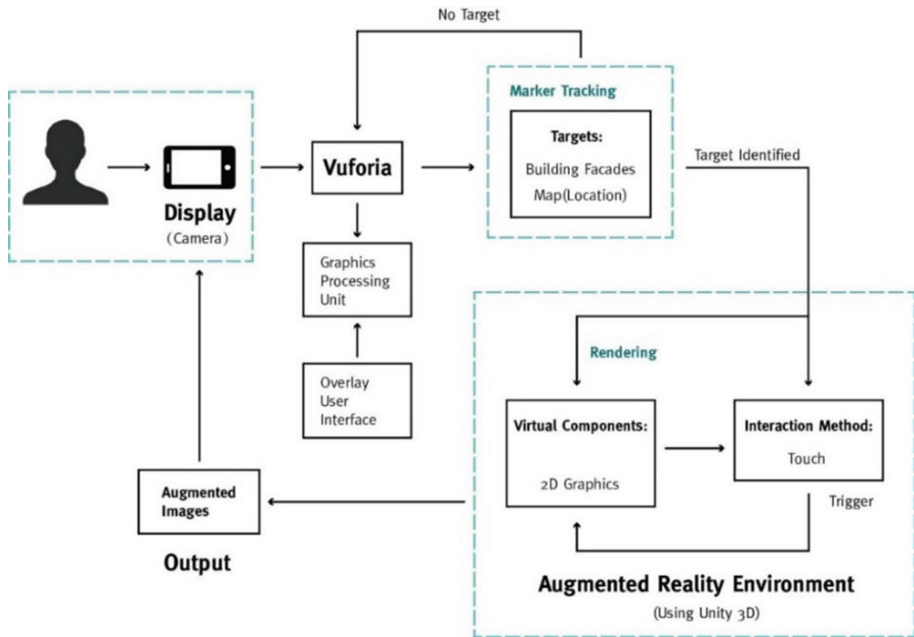


Fig. 2. System architecture

3.3 Application Design and Features

The design of the entire app mainly includes 5 major modules: Home, Map, Community, Favorite, and Me.

Homepage. The homepage is the portal for the user to start the city experience. First, by click the camera button, user will directly enter the download interface, where user can choose to download the artists/designers material pack that they preferred. The next step is to activate the camera to allow the user to experience the city in AR mode, and taking pictures or videos. The pictures and videos will be saving to ‘Me’ as user’s creation. This is the main function of the app, for the display and recording of the combination of urban scenes and virtual 3D model (Fig. 3).

Map. The map plays the role as a guider. Users can find Milan’s main city nodes and landmark buildings on the map. The map will highlight famous places of interest such, historic buildings, and culturally significant museums. Users can explore the city according to the planned routes.

Community. The design of the app includes community attributes. Users can record their city impressions through photos or videos, and share to the community or other social platforms. This constitutes a platform for cultural communication.

Favorite. After sharing to the community, users can look through the works in it, and collect their favorite works save them to Favorite.

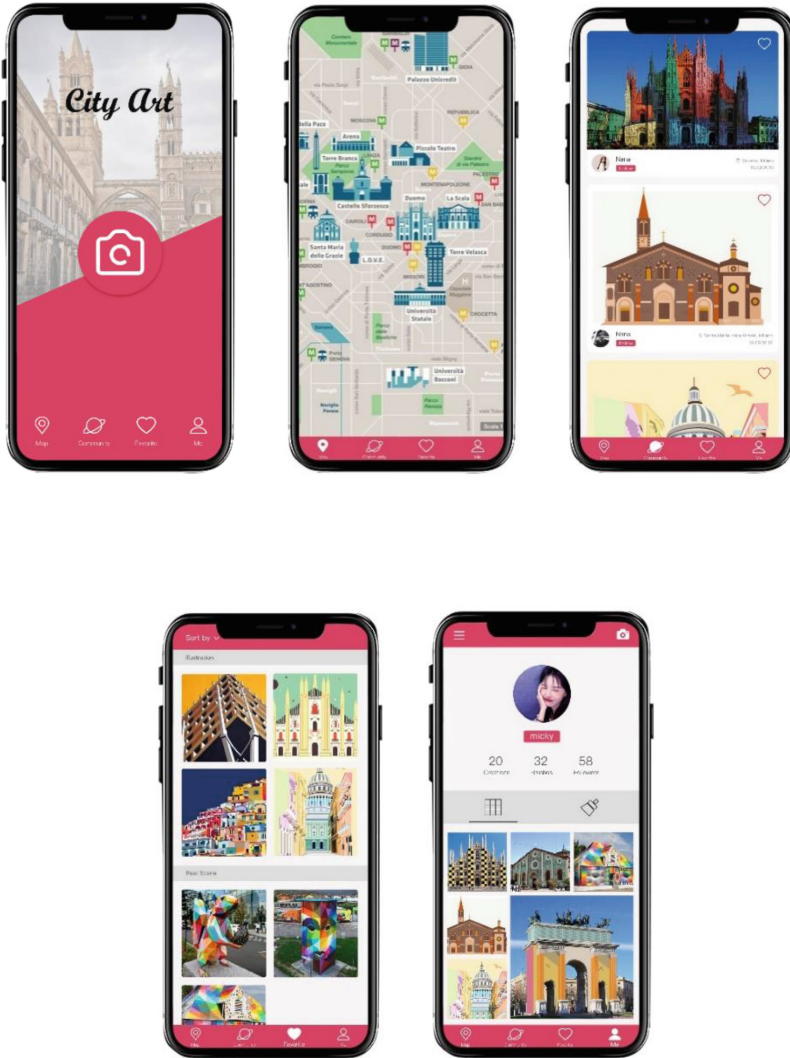


Fig. 3. App interface design

Me. This part used to store user's own picture and video material that record during city tour. All the pictures and videos will automatically save to here.

3.4 Operating Process

After entering the homepage, click on the camera button to start downloading artist/designer material packages. After the authorization is completed, the camera is authorized to enter AR mode, and users can download multiple material packages (no

more than 5). Then, authorize the camera to turn on the AR mode. After entering the AR experience mode, users can switch between different artist/designer roles to experience and observe different style features (Fig. 4).

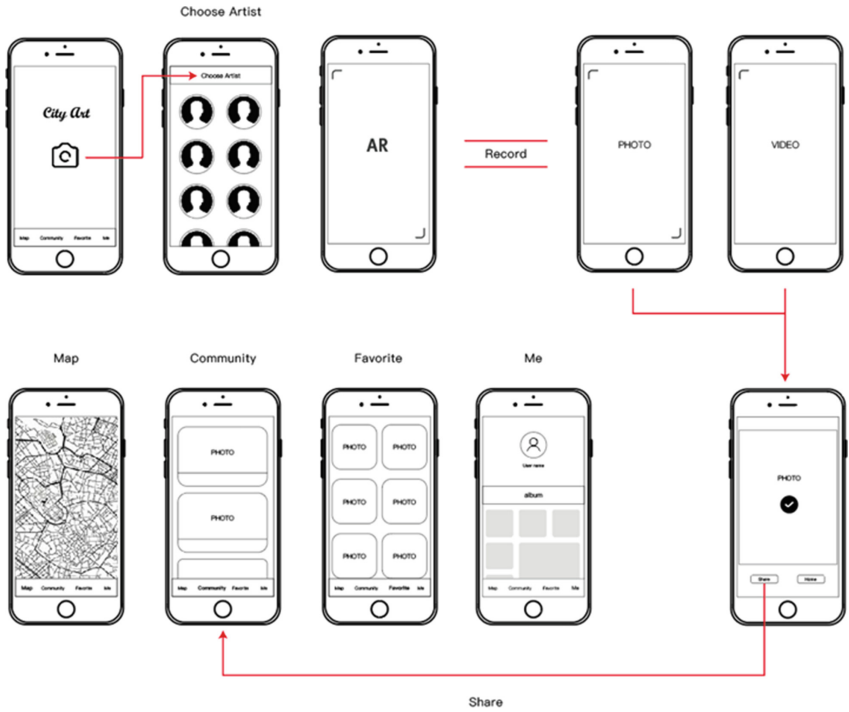


Fig. 4. Operating process

In simple terms, the solid scene covered by the 3D virtual model is like a layer of ‘Filter’. After downloading a certain number of artist/designer material packages, users can switch between different artist/designer roles (such as When facing the Milan Cathedral, the user can choose the perspective of designer Alessandro Mendini or the perspective of Ettore Sottsass, which will produce different visual effects), or switch between different perspectives under the same character (such as MD01, MD02 in the material of Mendini Effects such as different design elements or design styles) (Fig. 5).

Of course, it is ideal first use map to determine the destination. Photographs and videos are all allowed recording. Recording results are automatically saved to ‘Me’ and allowed to be shared to ‘Community’ or other social media. After sharing, users can browse other people’s records in ‘Community’ and add to ‘Favorite’...



Fig. 5. Final effect

4 Discussion

This article actually uses Italian culture and representative city Milan in Italy as examples to explore the role of urban AR technology in cultural exchange and innovation. Italy, as the birthplace of the Renaissance, has deep historical and cultural heritage, especially in the field of art design, and has extremely rich resources and materials. The spiritual culture of Italian art design has been subtly influencing the development of contemporary design. However, this influence has gradually been swallowed up by the cultural products of the great fusion in the torrent of cultural fusion, losing its independence and characteristics. By extracting distinctive element characteristics, that is, sorting out the characteristics of design elements of representative artists and designers, using innovative emerging AR technology and urban architecture, combined with the communication nature of communities and social media, this City Art Interactive urban

AR application, to some extent, is an effective means for quickly acquiring cultural information in accordance with the fast-moving modern society.

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