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Application of Digitizing Methods to Urban Area with an Example-- Zong-Ye Historic District, Tainan City

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Application of Digitizing Methods to Urban Area with an Example-- Zong-Ye Historic District, Tainan City

Hsienhsin Cheng^{*}, Chengche Chen^{**}

Abstract

This article attempts to apply digitizing methods to historic assets in old downtown by map overlaying analysis after map rectifying, and then taking textual method through surveying images. After proving and conform through research, townscape could be connected with real historic traces by reality digitizing approach, and it will make a reality aura of formerly district for visitors. In this way the abundant, definite and impressive content of district can be the valuable materials in region development, and the time and space of this district could continue the history and culture of the city. Consequently, this article aims to set up a feasibility proposal applied to it concretely.

This article puts forward 1.the district analysis through historic map rectifying 2.the reality digital reconstruction of streets digital archives elements 3.the application on AR(Augmented Reality) in historic district, and brings forward an technological approach which could respond to the challenge of losing regional characteristics in redevelopment process with an example of Zong-Ye historic district in traditional Tainan City. Therefore, this proposal which places great emphasis on local history and culture is equipped with applying value for European cities based on plentiful culture in cultural industries and regional development issues.

Keywords: Map Rectifying, Digitizing Methods, Regional Regeneration, Zong-Ye Historic District, Digital Archives Elements of streets, Augmented Reality

1. Introduction

The population worldwide has been concentrated in urban area recently and causes it to change rapidly. At the same time, it comes to the issues on the historic preservation of urban redevelopment. Lately, the townscape of historic district in Taiwan has also changed swiftly. Facing the disappearance of historic landscape and the decline of industries, the urban strategy in Taiwan heads for renewal development. However, during the process of redevelopment, how to put the heritage to good use, take it as distinctive historic assets, and raise the value of urban has become a significant subject.

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This article attempts to apply digitizing methods to historic assets in old downtown by map overlaying analysis after map rectifying, and then taking textual method through surveying images. After proving and conform through research, townscape could be connected with real historic traces by reality digitizing approach, and it will make a reality aura of formerly district for visitors. In this way the abundant, definite and impressive content of district can be the valuable materials in region development, and the time and space of this district could continue the history and culture of the city. Consequently, this article aims to set up a feasibility proposal applied to it concretely.

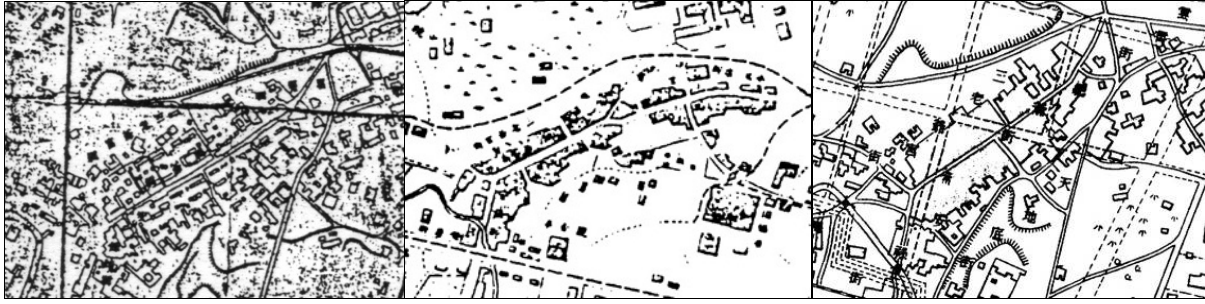
2. Analyzing urban pattern with ancient map

In the past, we usually use manual drawing and rough measurement to record information of urban development on ancient maps. The historical area is easy to be replaced during the renovation period.

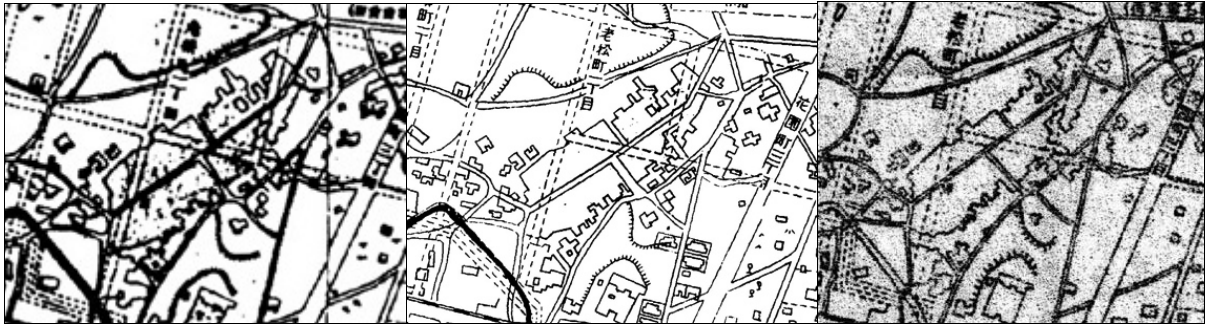
Maps made in Ching dynasty and Japanese colonial period are important historical resource in Taiwan. Although these ancient maps are kept safely in the Academia Sinica, and share with public by on Internet by scanning, it still has little contribution to planning and space design field. Because of the scale is too small, it only contains limited information, which is not enough for the planning.

Our site is Zong-Ye historical district, which locate at north part of Tainan, (Chong-An Street today). Street district contains many cultural assets, which need to be preserved, including old folk arts, traditional arts, historical buildings and traditional urban fabric. However, after City Improvement Plan, introduced during the Japanese colony, changed the atmosphere of the street block, luckily, numbers of old buildings still well preserved today. How to deconstruct of urban fabric with existing traditional building and ancient maps is our researching object.

Different objective leads different surveying and mapping in each period of time. Maps could only shows limited historical information, our research has to extend the collection of Tainan historical maps, then to interpret and classify in order to create the basic map to facilitate our analysis. Our map collection focuses on maps which including, historic building and ancient streets. There are, maps from city improvement plan in 1907, Anping streets map in 1907, Tainan city map 1915, Tainan city map 1918, Tainan city map 1924, Tainan street map 1927. (See Fig.1.)



Maps from City Improvement Plan, 1097/Anping streets map in 1907/ Tainan city map 1915



Tainan city map 1918/ Tainan city map 1924/ Tainan street map 1927

Fig.1. Historical maps which related to our research

About the control points, we could understand developing pattern and building orientation of Zong-Ye Street by Taiwan Chorography in Ching Dynasty and Tainan Chorography. The “Adjustments of Taiwan Chorography” noted down names of two Tu Di Gong temples in different period as follows:

- (1) Ding Tu Di Gong temple : Zhen Shu Yuan Men Bian Tu Di Ch,Zhen Yuan Jing Shang Tu Di Gong.
- (2) Di Tu Di Gong temple : Zong-Ye Jie Fu De Ci, Zong Lu Jing, Xia Tu Di Gong, Shui Lao Gong.

Two temples are well preserved, and the location could be identified in the historical maps. Also, from the fieldworks, we have “ Wu Gong Xue” (the cave of centipede) as the third “control point”. (See Fig.2)



Fig.2. Control point diagram of Historical map data

It has to immerge the result of fieldworks with control point, in order to ameliorate the interpretation quality of the historical maps. By using AutoCAD to draw the on site information, and mapping data in different period with photoshop. The researching process is in fig.3.

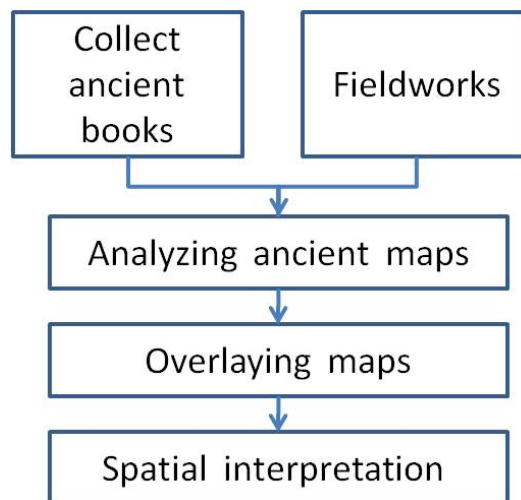


Fig.3. Researching process

- A. Collect ancient books: Collect documents and local chorography in order to study the spatial pattern of the historical district.
- B. Fieldworks: Investigating the historical buildings, redraw elevations and floor plan with AutoCAD.
- C. Analyzing ancient maps: immerge the historical data and fieldworks, using historical building and street pattern as the “control point” of mapping.

- D. Overlaying maps: based on our “control point”, we mapping three types of cadastral, there are, ancient map made in Japanese colony and current city maps.
- E. Spatial interpretation: interpreted the building pattern, which introduced during the Japanese colony after mapping

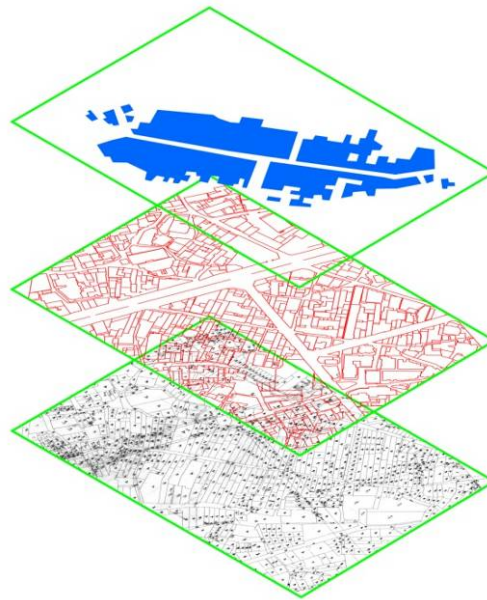


Fig.4. Overlay maps of selected different periods

3. The classifications of street elements in Augmented Reality

The Augmented Reality reconstruction of streets Digital Archives Element, the classify standard are based on “ The Historical Streets Digital Achieves Exhibit Elements”. Our study tries to intergrade the reconstruction of architectural space with digital technique. Therefore, we separate the architecture into several elements.

3.1. Reviews of historical street elements

The value of Cultural Heritage is, “ It is our duty to hand them on in the full richness of their authenticity” - The Venice Charter (1964). The Venice Charter focus on “authenticity”, our study is based on the spirit of Venice Charter, to construct the framework of historical district elements. Our research object is to provide a useful classification in different level of preservation planning. For more details, please see “ The Historical Streets Digital Achieves Exhibit Elements (2009)”.

Table 1. Historical streets element by authenticity

Item	Content	
pattern	Building	Elevation
		Edge
		Prominence
	Facade	Entrance
		Pavement
	Interior	Living space
Materials		Structure
Location and surrounding	Street pattern	Distribution
Traditional technique and management system	Industry	Store
		Ramification
		Industrial technology
Usage and function	Complement	Ground Object
		Commercial Object

3.2. Classification of Augmented Reality elements

The principals of architectural element classification is reducing repeat, we use single building as the height level coding unit, material as the lowest coding unit, and use N, E, W, S, to represent the orientation.

3.2.1 Layer classification in AutoCAD

- A. Structure : wall (cement), column, beam
- B. Gate : door, doorframe, window, window frame
- C. Pavement : lining, display
- D. Roof

3.2.2 Elements classification (building 3D model)

- A. Door and window
- B. Roof (tile, roof structure)
- C. Ground (lining)
- D. Structure (wall, column, beam)

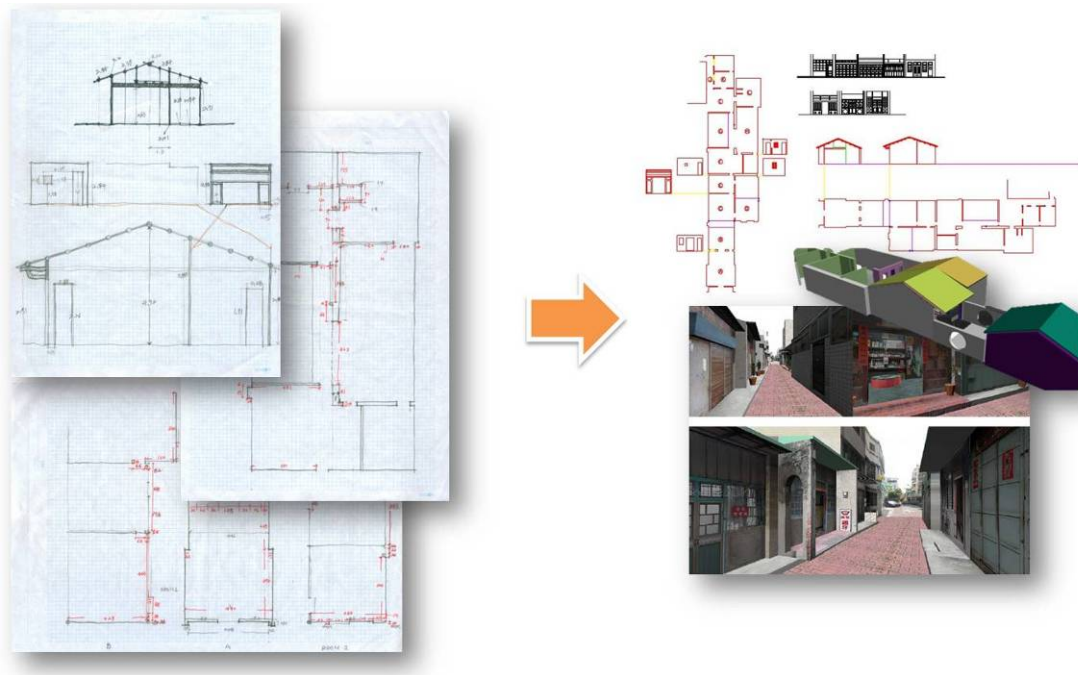


Fig.5. Process of Digital Archives architecture model

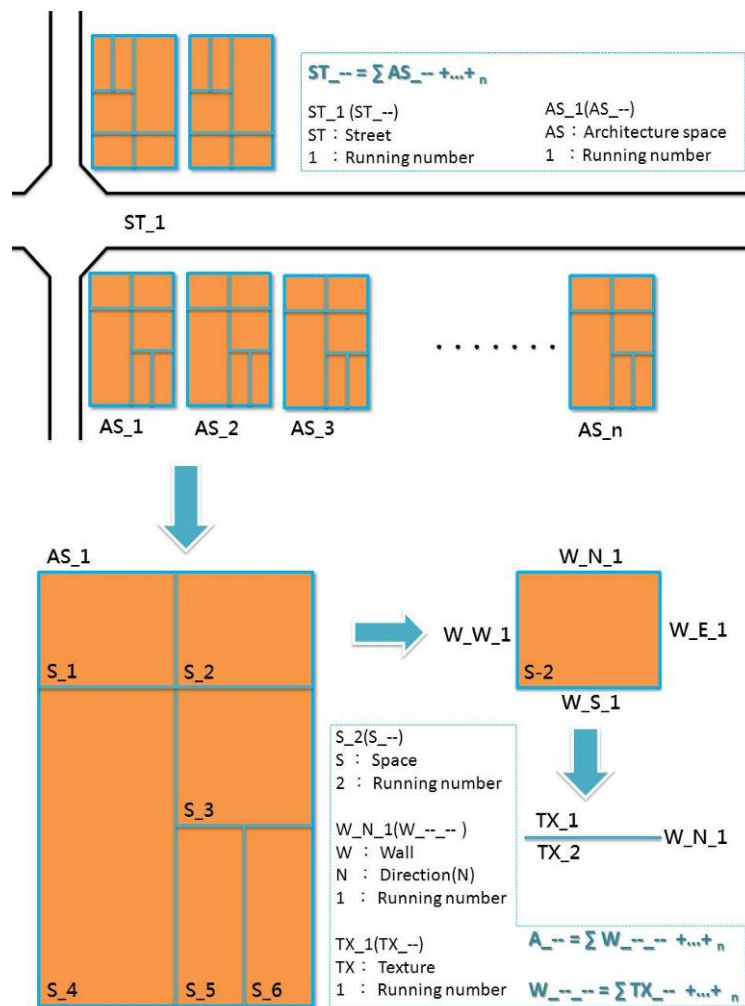


Fig.6. Architecture space study method for build up 3D model

4. An application on historical region by digitizing reality

A new age of information technology (IT) apply in every single piece of place. From the very beginning of using IT to develop the virtual reality and further applications of visualization in heritage restoration, it gave a great impulse for people to have a better imagination, seeing the past experience of space, making communication and interaction with people to the past valuable estate through the IT remediation by so-called “Argument Reality”(AR) .

4.1 The content of eco-museum and valuable of cultural heritage conservation

The new concept of eco-museum is being rise and implement by use of original of cultural and natural resource, not far from the mainstream of human history and natural environment, but through a new transformation process, which is being explained by the community activities in terms of people’s visiting and seeing. It’s a great different to compare with traditional museum basic operation in terms of collection and archives. Furthermore, it shows us another way to study, exhibit the heritage and educate people to understand the origin of the eco-museum, which must go through a specify mechanism and working process. The main ideas of eco museum can be summarized as follows:

- A. Change from top-down management by central government to bottom-up participation by the publics.
- B. Change from traditional governance to monitoring by people participation.
- C. Give up grand discourse discipline and adopt diversity opinions, communal life and narrative story.
- D. A new concept of museum being formed by “living-oriented” instead of “object-oriented”.
- E. Change from past-oriented to present or future-oriented.

From the other side, the eco-museum is to reflect the real life of the contemporary world and to establish the situation by the accumulation of specific knowledge by means of cultural heritage. Under the circumstance, eco-museum is a place for exhibit the real life. The meaning behind the fact is to let people participate and feel the “original” sense of such a place which we have lived in before and after.

Otherwise, eco-museum is a place not only truly reflects the history and cultural value, but also conserves natural and historic landscape. It’s mainly to keep and preserve the original custom, accommodation and living style through a specific and instant place. The communication between cultural inheritance and contemporary sense of eco-museum is deeply connected and experience by a “mixed” phenomenon with the locality of a place.

4.2 An implementation method of eco-museum by digitizing archive

From the above reasons, eco-museum becomes a mainstream to conserve and organize different kinds of heritage in terms of building, monument and living space. It also becomes a key methodology to construct a new style development of traditional clusters for people participation. In some case study, the advantage of Zong-Ye historic district in which Tainan government has been conserved lots of historical buildings, the study periods from Ching Dynasty to Japanese occupation. The buildings can be classified into row housing, temple and related monument. It also documented for different industry development passing through from generation to generation. The rich and diverse historical background makes this place become more suitable for building an eco-museum. It is not only to exhibits the related monuments, but also focus on the community emerged by means of participation. On the other hand, it also helps the local tourism and traditional industry development through the growing and succeeding conservation in this district.

Moreover, referring to a variety of publication and studies about eco-museum, explore the human life and environment being the original idea, especially in self experience. In the past, we were very few to use argument visualization technology applied on a whole urban district, such as Zong-Ye historical district. To have a “human-oriented” approach, gave participant a new feeling for the live intervention in a hybrid area.

4.3 Augmented Reality (AR)

Augmented Reality (AR) is a up-to-date technology to simulate 3D space and object. It makes target object easily appearing in front of instant object a by graphic display processing. The “mixed” space would produce a virtual and reality for people’s sensation. According to Azuma(1997) AR should have 3 fundamental elements to make this kinds of thinking come true :

- A. Combination with virtual and reality.
- B. Real-time interaction.
- C. Three dimensional operation.

Therefore, AR graphics visualization can be acted as a way from simulation to a real world redisplay. Milgram & Colquhoun (1999) have taken this technique into another step for mixed reality. Paul Milgram also raised a critical step to formulate a Reality-Virtuality Continuum theory in order to lay the theoretical basis of AR for more rigorous. AR can be easily applied in different fields of architecture, especially in restoration of historical building, relics and streetscape. The most valuable way is to remediate the 3D image into a real area. It seems to increase education potential for students, researchers and participants. Another important issue to talk about AR and Global Positioning System for city guiding, in

Tainan, We expect to develop a mixed-solution working on open space and environment with above IT knowledge.



Fig. 7 the draft experiment of Augmented Reality

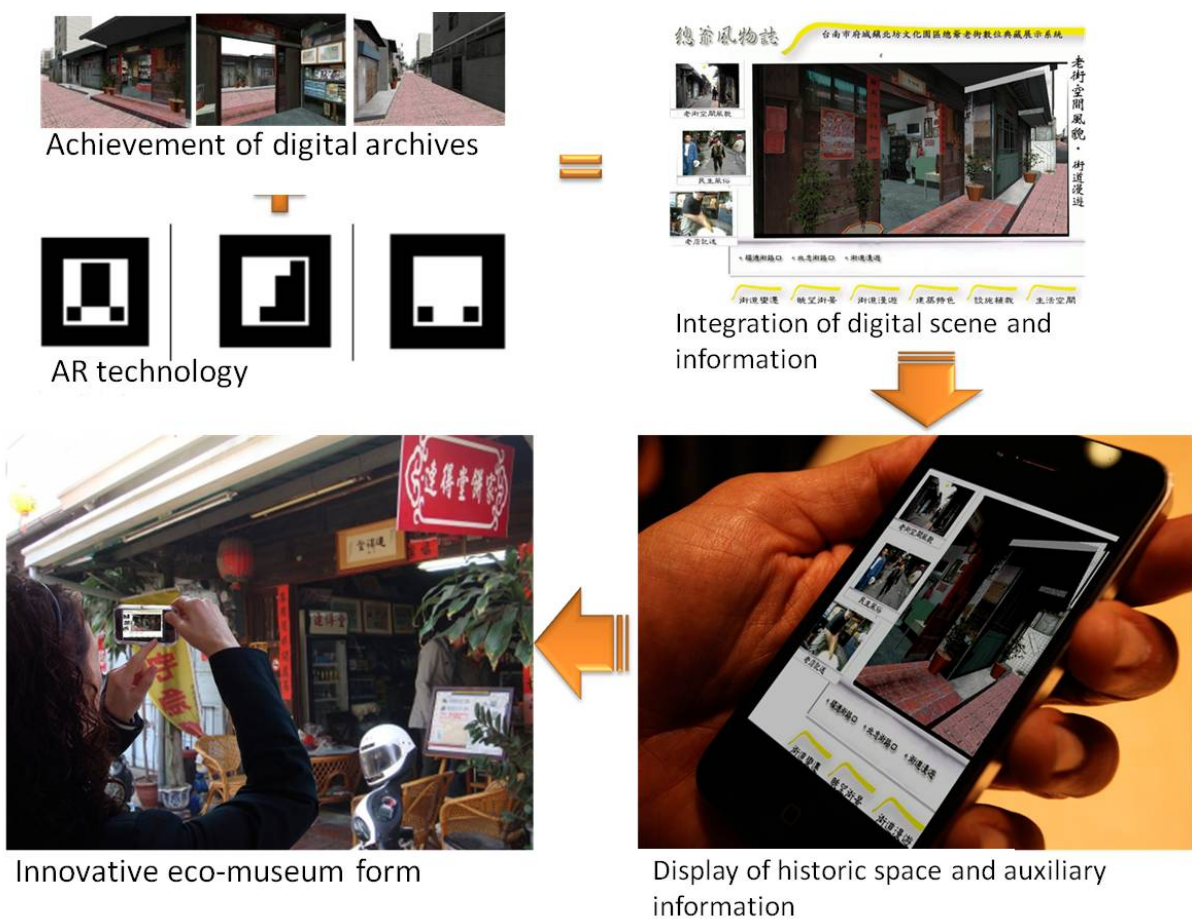


Fig. 8 the application on historic district by Augmented Reality

5. Conclusion

This article puts forward 1.the district analysis through historic map rectifying 2. the reality digital reconstruction of streets digital archives elements 3. the application on AR in historic district, and brings forward an technological approach which could respond to the challenge of losing regional characteristics in redevelopment process with an example of Zong-Ye historic district in traditional Tainan City. Therefore, this proposal which places great emphasis on local history and culture is equipped with applying value for European cities based on plentiful culture in cultural industries and regional development issues.

The achievement of this research is as followings: 1. Digitizing methods of maps toward analyzing historic district. 2. The classifications of street elements in recognizing the characteristics of townscapes. 3. Putting forward comments about the strength, limitation, and potential in AR. This article presents a new methodology linked up contemporary technology in integrating regional cultural heritages and launching urban redevelopment. Otherwise, it also responds to the challenge for cities under globalization trend through the re-interpretation in special viewpoint.

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References

- Azuma, R. (1997). A Survey of Augmented Reality. In Presence: Teleoperators and Virtual Environments 6, 4(August 1997), 355-385.
- Billinghurst, M. and Kato, H. and Poupyrev, I. (2001) The Magic Book: a transitional AR interface, Computers & Graphics, Vol.25, P745-753.
- Chang, L. H. and Hou, J. H. and Liu, Y. T. (2007) Digital Media in Architectural Heritage Preservation: Processes, Standards and A Database Platform, Digital Applications in Cultural Heritage 2007.
- Conzen, M.R.G (1966) Historical townscapes in Britain: A problem in applied geography, In Northern geographical essays in honour of G. H. J. Daysh, J. House, ed., 56-78 Newcastle upon Tyne, UK: Oriel.
- Cullen, G. (1961) The concise townscape, Architectural Press, London.
- Day, A. (2005) A Digital Model of a Heritage City: the Bath Experience, CAAD TAKE 4 Insights of Digital Cities.
- Fan, S. X. (1997) Studies of Tainan historical data, volum.1 and 2, Tainan city government.
- Gleue, T. and Dähne, P. (2001) Design and Implementation of a Mobile Device for Outdoor Augmented Reality, Proceedings of the 2001 conference on Virtual reality, archeology, and cultural heritage, New York: ACM, P161-168.

- International Charter for the Conservation and Restoration of Monuments and Sites (The Venice Charter) (1964), ICOMOS.
- Kao, H. W. (2007) Spatial transformation of Tayouan during Dutch occupied period, Thesis (Master), Department of Architecture, National Chung Kung University.
- Koutsoudis,A. and Arnaoutoglou,F. and Christodoulos, C. (2007) On 3D reconstruction of the old city of Xanthi, A minimum budget approach to virtual touring based on photogrammetry, Journal of Cultural Heritage , Vol. 8 (1), P26–31.
- Kuo, C. G. and Jeng, T. S. (2008) The Research of Augmented Reality Registration Technology Applying on Architecture and Urban Outdoor Guiding Systems– sing “Cultural Heritage Guiding System” and “Invisible Shop Signboard” as Examples, Journal of Architecture, Vol.66, P145–166.
- Laing, R. and Conniff, A. and Craig, T. and Diaz, C. G. and Scott, S. (2007) Design and use of a virtual heritage model to enable a comparison of active navigation of buildings and spaces with passive observation, Automation in Construction, Vol. 16 (6), P830–841.
- Milgram, P. and Colquhoun Jr., H. W. (1999) A Framework For Relating HeadMounted Displays to Mixed Reality Displays, Proceedings of the Human Factors and Ergonomics Society 43rd Annual Meeting, P1177–1181.
- Operational Guidelines for the Implementation of the World Heritage Convention (2005), UNESCO.
- Shipley, R. (2004) Townscape heritage initiatives evaluation: methodology for assessing the effectiveness of Heritage Lottery Fund projects in the United Kingdom, Environment and Planning C: Government and Policy 2004, Vol. 22, P523–542
- Sun, C. W. (1992) Researches of Taiwan traditional urban pattern”, Archbooks.