# The Feasibility of Augmented Reality on Virtual Tourism Website

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***Abstract*—The Taiwan Tourism Bureau is carrying on with the "Three-year Sprint Program" of the Executive Yuan's "Economic Development Vision for 201.," Tourism becomes the star industry in Taiwan and it will play a major role in future global economic development. Not only the physical improvements are encouraged, the information service online is also important. Therefore, we apply Augmented Reality technology for implementing the virtual tourism website. The website provided the necessary information for the destination basically, and increased the multimedia effects for the website especially. Some empirical researches show that a website with a high level of interactivity and rich multimedia is more likely than a text-based website to persuade consumers. Therefore, the virtual tourism website of Taichung City is herein provided for studying the feasibility of Augmented Reality on virtual Tourism. In the work, we conclude the technology advantage of Augmented Reality and demonstrate the effects of novel interactive operation with users. The result of the research will be the valuable reference as a company applying the Augmented Reality for virtual websites.**

***Keywords-Augmented Reality; Virtual Tourism; Unity; User Interaction***

## I. INTRODUCTION

Tourism is a non-smoke stack industry that is held in high importance by countries all over the world. It is regarded as one of the star industrial sectors of the 21st century and it will play a major role in future global economic development. Tourism is a service industry with a key impact on Taiwan's economic development. It can provide the means for a better life for the island's people, promote people-to-people diplomacy, and enliven business activity.

Taiwan ranked 37th in the 2011 global Travel and Tourism Competitiveness Report released by the World Economic Forum on Monday, up six notches from 43rd spot in 2009. Singapore, in 10th place, was the only Asian country on the top-10 list. Hong Kong ranked 11th. There is a long lag in chasing them to us. Both of physical and virtual constructions are two important endeavors for us to upgrade the notch of Taiwan in the world.

Therefore, we apply Augmented Reality technology for mixing the real and virtual objects together to increase the media richness of the tourism website. The novel interactive operations are helpful for attracting users' interests at the first contact. Then, the abundant travel information will have more chances to serve these potential consumers.

## II. RELATED WORK

The related research background in the work includes tourism market in Taiwan and media richness of website.

### *A、Tourism Market in Taiwan*

Since the launch of the Doubling Tourists Arrival Plan in 2002, the number of inbound visitors to Taiwan has risen steadily each year except 2003. The downturn in 2003 is attributed to the SARS. The number of visitors to Taiwan from target tourism markets rose from 870,000 in 2000 to 1.51 million in 2006. This 73% increase boosted the share of target-market visitors from 33% to 43% of all inbound visitors.

As shown in Table 1, the number of people to visit Taiwan, comparing with and the tourism market of 2008, grows extremely high in 2009 [10].

TABLE I. 2009 TOURISM MARKET IN TAIWAN

| Item | Growth | Actual value |
|---|---|---|
| Number of people to visit Taiwan | +14.30% | 4,395,000 man-times |
| Foreign exchange from Tourism | +14.82% | US$ 6,816 million |
| Visitor Visa for Tourism Purpose | +29.47% | 2,298,000 man-times |

In conjunction with the first three-year phase (2007~2009) of the Executive Yuan's " Investment, Warmth" 2015 economic development plan, the Tourism Bureau has drafted and is implementing a Three-year Taiwan Tourism Development Stimulus Plan (2007-2009)[13]. The plan aims to create an

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attractive, unique, visitor-friendly and high-quality travel environment in Taiwan. It also calls for intensified promotion of Taiwan's tourism attractions. Equal emphasis is given to qualitative and quantitative improvements under the plan to meet the needs of international visitors and domestic travelers and thereby enable the sustainable development of tourism in Taiwan.

After Taipei ended its sixty-year ban on direct flights between Taiwan and China, the launch of direct flights across the Taiwan Straits in 2009 led to China becoming a very vital source of inbound arrivals for Taiwanese travel and tourism. In the second half of 2009, direct flights between Taiwan and China changed from being charter-only flights to mostly schedule. Flight routes, frequencies and airline choices were numerous, which resulted in low load factors and overall sluggish demand. Since opening visitation for people from Mainland China in 2008, the visitors is up to 133 millions by July 2010. Moreover, the amount of business revenue and opportunity is about US$2.6 billion US dollars [13]. Therefore, the first phase of the research is to develop Chinese website for focusing the visitors from mainland China.

### *B、Vividness and media richness*

Within an environment like the CME (computer-mediated environment), information can be presented through various formats to draw attentions of media users and consumers. However, consumers usually differ significantly in their preference for information presentation formats as well as their ability to process messages for decision making [1][6]. As advances in technology, new and creative media are available for extensive applications of content presentations in business and communications. However, most empirical studies still use presentation formats as the treatments of experiments to examine the vividness effects of new media in that the formats have been extended to static, animated, audio, audiovisual and/or other presentations [3].

According to Steuer, vividness means the representational richness of a mediated environment as defined by its formal features; that is, the way in which an environment presented information to the senses [8]. Basically vividness is stimulus driven and depends entirely on technical characteristics of a medium. Among those factors contributing to vividness, breath and depth are two generalized but important factors to influence vividness. Breadth refers to the number of sensory dimensions, cues and senses presented (e.g., Colors, graphics) and closely related to media concurrency and media richness [2][3] [9]. Depth means the resolution or the quality of the presentation and is highly correlated with media bandwidth. In the hypermedia CME, both breadth and depth are highly presented [5]. The application of Augmented Reality in the work is simply proposed for the depth of media effects.

## III. AUGMENTED REALITY

Augmented reality (AR) is a term for a live direct or an indirect view of a physical, real-world environment whose elements are augmented by computer-generated sensory input. Additionally Paul Milgram and Fumio Kishino defined Milgram's Reality-Virtuality Continuum that spans an entirely real environment to a purely virtual environment. In between are Augmented Reality (closer to the real environment) and Augmented Virtuality (closer to the virtual environment) [7].


Figure 1. The Virtuality continuum

Many definitions are provided for AR. Ronald Azuma, offering a definition in 1997, says that Augmented Reality combines real and virtual, is interactive in real time and is registered in 3D[1]. The applications of AR are given as follows.

- Advertising: Marketers started to use AR to promote products via interactive AR applications. For example, In 2010 Walt Disney used mobile AR to connect a movie experience to outdoor advertising [10].
- Task support: Complex tasks such as assembly, maintenance, and surgery can be simplified by inserting additional information into the field of view.
- Navigation: AR can augment the effectiveness of navigation devices. For example, building navigation can be enhanced to aid in maintaining industrial plants. Outdoor navigation can be augmented for military operations or disaster management.
- Architecture: AR can simulate planned construction projects.
- AR can create virtual objects in museums and exhibitions, theme park attractions and books.
- Others: More applications of AR are developed recently.

## IV. SYSTEM DEVELOPMENT

The virtual tourism website of the Taichung City is developed in the work. Many famous buildings and foods are introduced in different interactive operations. The user can realize the feelings of AR by a webcam simply. The architecture of the website is shown below.

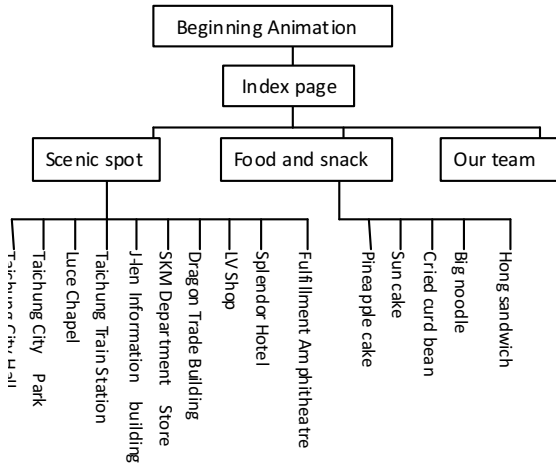


Figure 2. The architecture of the tourism website of Big Taichung City

### *C、4.2. AR tools*

Many advanced tools are used in the work to perform different effects. Modeling is the first step, AR effecting is the second and the final step is to integrate everything in the web.

- Google sketchup: Google SketchUp is a free, easy-to-learn 3D-modeling program with a few simple tools to let you create 3D models of houses, sheds, decks, home additions, woodworking projects, and even space ships.
- FLARTOOKIT: The world's first Flash based augmented reality library ported from NyARToolkit (Java ported version of ARToolKit).
- Google SketchUp Web Exporter: It allows you to enable a simple interactive view of your model for any web page without a browser plug-in.

### *D、4.2. The interactive operations of AR*

The webcam is the only extra device required for AR operation in the work. On the website of Taichung City, the user can trigger the AR experience with a proposed black-white marker.

The Luce Memorial Chapel, shown in Figure 3, is a Christian chapel on the campus of Tunghai University, Taichung, Taiwan. It was designed by the architect and artist Chen Chi-Kwan in collaboration with the firm of noted architect I. M. Pei. The user can view the Chapel closely and easily with AR. The novel interactive way brings users different stimulation to attract users to know more tourism information about the chapel, and also the other Scenic Spots introduced in the tourism website [11].

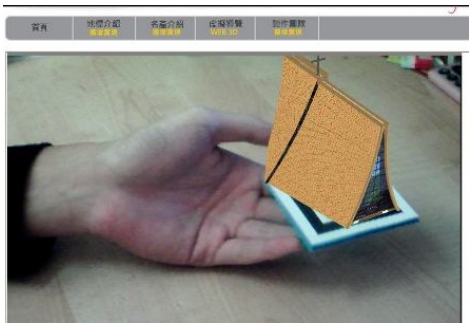

Figure 3 The AR demonstration of Luce Memorial Chapel,

The introduction of Food and snacks is quite necessary in a tourism website. Especially, the Taiwanese food is well known all over the world. In a traditional tourism website, the use can only know the foods or snacks from the photos. However, the user can really see the foods by AR effects in the website. As shown in Figure 4, a package of dried curd bean, one of the famous snacks in Taichung, is "really" displayed in front of users. Naturally, the vivid demonstration can attract more attentions from users.

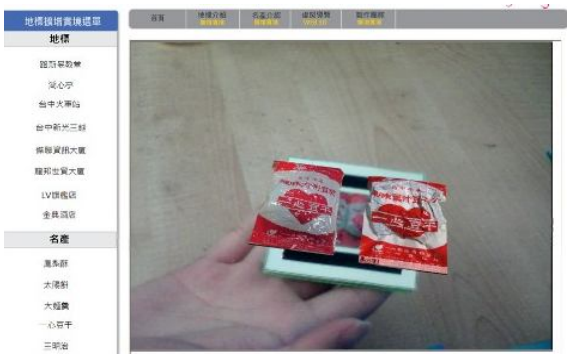

Figure 4. The AR demonstration of a package of cried curd bean

Besides buildings and foods, AR is also applied for vividly introducing people in the work, as shown in Figure 5. The new design of markers can be applied in the ID card, map or brochure.

Figure 5. The AR demonstration of a member of our team

## V. Conclusion and Future Work

Basically, the AR technology is applied for upgrading the media richness of the website. The advantage of novel interactive operations is helpful for attracting users' interests. Then the potential consumers who will visit Taichung in the future will be possibly found. Next, we will keep surveying the user operations behaviors on the tourism website for further improvement on AR effects. Moreover, the mobile AR will also be our research topic soon since the mobile service becomes more important in a tourism website.

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