This is to certify that the
thesis entitled

TEMPLES OF TAIPEI
A HANDHELD TOUR GUIDE FOR POCKET PC

presented by

CHIA-YU TAI

has been accepted towards fulfillment
of the requirements for the

Master of Arts	degree in	Department of Telecommunication

Carrie Heeter

Major Professor's Signature

5/6/03

Date

TEMPLES OF TAIPEI

A HANDHELD TOUR GUIDE FOR POCKET PC

By

Chia-Yu Tai

A THESIS

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ABSTRACT

TEMPLES OF TAIPEI

A HANDHELD TOUR GUIDE FOR POCKET PC

By

Chia-Yu Tai

"Combining open standards-based applications (XML, Java, Macromedia Flash) with everyday tasks, pervasive computing removes the current complexity of new technologies and enables us to be more efficient in our tasks." writes Phillip M. Torrone in his article: The Rise of Pervasive Computing.

This production thesis project focuses on using Macromedia Flash as the authoring tool to turn the idea of pervasive computing into a real-world application. This tour guide on a handheld computer (Pocket PC) provides users with interactive maps, immersive QTVR-like panorama movies using Flash. And it also provides a step-by-step walking tour with visual navigational aids and panoramic views and short Windows Media video clips of interesting temple activities. Furthermore, there is an English-Chinese "phrase book". These useful phrases with Chinese pronunciation are intended to help English-speaking tourists communicate with people in Taiwan. Users' experiences of the tour guide in the field are analyzed. Finally, the future of handheld tour guides is explored.

ACKNOWLEDGEMENTS

It's 2003. I sit down and start thinking about what to write in this acknowledgement, a thought suddenly pops up in my head; then I spend some time trying to find an old magazine in my bookshelf. I finally find what I am looking for. It's the New Media magazine (already out of business now), February edition of 1994. There's an article in this issue called: Learning New Media. In page 48, there's a resource guide listed some colleges and universities which provide multimedia-related courses or degrees. Michigan State University/D. of Telecommunications is one of them. There is a brief description about MSU/TC: offers course in hypermedia, has a new multimedia lab under construction.

It was 1993. I just finished my BA in Advertising and started working as an assistant producer for a TV commercial company. During that time, I started reading some new ideas about new media, convergence, interactive TV in some magazines. And I thought: this could be the area I would like to devote to for my whole life. So I kept looking for learning resources: books, CD-ROMs, and magazines. But I still could not get the whole picture. And then I read the article in the magazine: New Media. It was the first time I knew there were some graduate schools in the US providing new media-related master degrees. After some research, I found the MSU/TC was the only feasible choice for me. (I only applied for MSU.)

In the fall of 1995, I came to the US for the first time in my life. In 1997, I went

back to Taiwan. And then the internet business started booming in Taiwan. I stopped working on my thesis and joined the "roller coaster ride" of dotcom business.

I always consider myself as an idealist and "new media" or "the Internet" as a digital revolution. "Talk about the revolution, well, you know, we all like to change the world," say the Beatles. I used to believe that the internet is going to create a new world in "seven days". So when the dotcom business crashed I felt like it was the end of the world. And then I realize that the digital revolution might come to an end, but the digital evolution continues…

I would like to take this opportunity to thank Dr. Carrie Heeter for the foundation of Digital Media Arts program several years ago. Without her effort and the Digital Media Arts program, a guy from the Far East like me would not attend a university in the Midwest. And I also want to thank her for her encouragement and wholehearted support throughout the project. Gratitude is also extended to Professor Brian Winn for his kindness and the inspiration in class. And finally, I would like to thank my parents for everything they give me.

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Images in this thesis are presented in color.

Chapter 1

Introduction

Pocket PC has gradually become an important player in the PDA (Personal Digital Assistant) or mobile device world. And in the PC world, Flash has emerged as a de-facto development tool for web-based multimedia. This production thesis tries to combine both to create a handheld tour guide of the Temples of Taipei.

In the beginning, my plan was to create a tour guide for the city of Taipei. I realized that the project scope was unmanageable for one author. It also was too broad to appeal to one audience. After discussions with some American friends, the topic: Temples of Taipei was chosen because temples are popular scenic spots for most tourists in Taipei. It was appropriate and manageable for a one-person team. And it let me carefully define a target user and design the product to meet their needs.

Project Objectives

The objective is to design a handheld tour guide which helps English-speaking vacationing tourists aged 18 to 40 to travel on their own and makes their tour in Taipei's temple easier and more informative. Many special events at the temples occur only during one day or one week of the year. Without technology only those tourists who happen to be there at the right time experience those events. There are mysteries and histories, explanation and interesting facts about architecture, artifacts, history, and culture most tourists never learn because they lack a personal guide to point things out. This handheld

tour guide is designed to be played on Pocket PC, but a computer-based simulation is also available online. The design challenge also allows the opportunity to explore the possibility of multimedia on mobile devices such as Pocket PC. The much smaller screen size, limited RAM and hard drive space, relatively poor speaker quality, and lack of a physical keyboard present different design constraints than creating for a desktop PC. Stylus-based computing as well as the mobility of the device are unique and positive yet unexplored design possibilities.

Chapter 2

Designing Applications for Pocket PC in Flash

Designing for a Pocket PC involves much more severe constraints in terms of screen size, RAM, processor speed, screen display quality, and file size. Pen versus mouse interactivity also impacts design. This chapter discusses some of the important design decisions to accommodate the Pocket PC format.

Fonts

Because of limitation of small screen of Flash on Pocket PC, it is necessary to use smaller font sizes such as 10 point type in order to squeeze more textual content into the tiny screen. Regular fonts at smaller font sizes such as 10 or 12 points look blurred on Pocket PC and present serious legibility issues. Anti-aliasing will smooth the edges of fonts and only works fine for text at larger font sizes such as 16 or 24 points in Flash on Pocket PC. In order to solve the legibility problem, I use "pixel font" which is designed to fit precisely to the Pocket PC's screen's pixel grid.

When using pixel font in Flash for Pocket PC, all text should be at exact X, Y positions on the screen or the text will get blurred. To be readable, Flash movies can only be viewed at 100%. This is not currently an issue for Flash on Pocket PC because the Flash player only shows Flash movies at 100% on Pocket PC. The font size should appear at the designed size or multiple of it (for example, 10 points for Tenacity Condensed which I used for the Temples of Taipei project). The text alignment should be set to left and all tracking and kerning should be set to zero. Below is the screen shot of text property panel in Flash

which is correctly set.

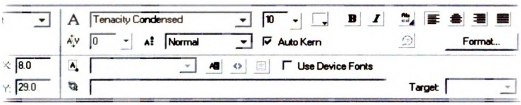

Fig 2.1 Screen shot of text property panel in Flash

When creating the text label under each button for the main page of Temples of Taipei, I initially used middle alignment for the text label of walking tour since it is more aesthetically pleasing. But the word "tour" became blurred because the pixel font only works when text alignment set to left. (See Fig 2.2) After some trial-and-error procedures, I found the solution is to use separate text box for each word and set the text alignment of each word to left. And then adjust each text box to the correct position which makes the text look crisp and aesthetically pleasing. The text label of "photo viewer" in Fig 2.2 is an example of the result of this technique.

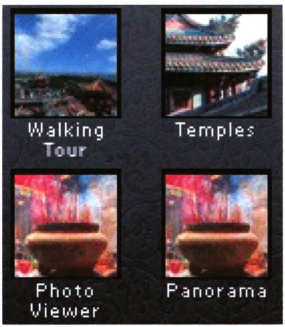

Fig 2.2 Enlarged screen shot of blurred text

Images

It is much easier for Pocket PC to display a bitmap image than a complicated vector image because the rendering of complicated vector image needs more processing power. Performance issue is crucial for developing Flash for Pocket PC because Pocket PC has slower processor and less memory than desktop PC. So I design the interface based on bitmap images, and only used vector image in static text (when exported as a SWF, static text is converted to a vector image) and simple interface elements such as the arrow buttons and the red navigational bar.

Because the quality of Pocket PC's screen is not as good as displays of notebooks and desktops, it is better to increase images' color saturation and contrast in Photoshop before importing them into Flash so the images are more vibrant on the small and low-quality screen of Pocket PC.

Interactivity/Navigation

Mobile devices such as Pocket PC use stylus-based input, no actual cursor exists on screen. This means there is no rollover or rollout effect for buttons. On the small screen, it is challenging to design buttons that explain themselves because there is not much space and no rollover effect for a "button label". If the designer creates many large buttons, there is not much space left for the content. If buttons are too small, users might have trouble tapping or recognizing them. So it is important to balance between size and legibility of button and other media elements when it comes to interface design for Pocket PC.

Pixel Dimensions for a Flash Movie in Flash Player

The screen size of Pocket PC is 240 by 320 pixels. Unless you use the Standalone Macromedia Flash Player 6 for Pocket PC which supports full screen playback outside of the browser, you can not take advantage of the entire screen. The resolution of Pocket Internet Explorer is 240 by 320 pixels. The caption bar on the top and the menu bar on the bottom take 26 pixels each off the vertical resolution. These two areas can not used for content, as shown in Fig. 2.3.

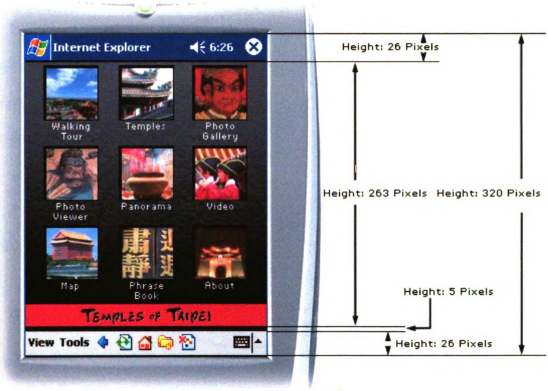

Fig 2.3 Pixel Dimensions for a Flash Movie in Flash Player

When designing content for a Pocket PC that fits on one HTML page, the content of that HTML page must not exceed 240 by 268 pixels or the vertical scroll bar of Pocket Internet Explorer will appear.

When it comes to HTML pages embedded with Flash movie files, it is a different story. For some reasons, the pixel dimensions of that embedded Flash movie file have to be 240 by 263 pixels or the annoying scroll bar will show up. The "missing five pixels" are right between the menu bar and the embedded Flash movie.

Chapter 3

Production Process

Photography

The designated target audience is the so-called MTV generation. The MTV generation consists of Generation X (born 1961 – 1981) and Generation Y (born after 1982). They were raised on fast-paced TV program, MTV and video games and they are the most likely users of handheld devices.

Kathleen Hessert suggests keeping content short and using audio-visual aids to increase both understanding and comprehension when communicating the MTV generation since they have shorter attention spans and demand concise, dynamic and high-impact idea packaging.[1]

It makes sense to keep content short since it is not easy to squeeze a lot of content into Pocket PC's small screen. Anna Marie Pises suggests[2]:

> Be succinct. Think Hemingway. Succinct and directly focused copy is vital, not only because of limited screen size, but because of limited time and attention spans of the mobile lifestyle and customer. The average line of copy on a Pocket PC, for example, is approximately 6 to 11 words in length.

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[1] Kathleen Hessert, Getting Through to the "MTV" Generation, http://www.bbhighway.com/Talk/Interactive_Coach/CommCorner/getting_through_mtv_generation.asp

[2] Anna Marie Pises, Editorial Style: Writing and Editing for Wireless Devices, Flash Design for Mobile Devices.

I also think pictures (visual aids) are important because the target audience (MTV generation) loves to watch instead of read. Furthermore there is an old Chinese saying: a picture worth a thousand words. So I took more than 5,000 pictures using a digital camera in order to get more quality shots. I feel blessed to be able to shoot pictures using a digital camera since it saves me huge amount of time and money on film processing compared to traditional cameras. Digital photography allows me to shoot many more photos than I actually use, letting me choose the very best to include.

In order to compress several objects into a small and tight visual composition, I used a long telephoto lens of around 300 mm. You will see an example below which I shot using a long telephoto lens because I wanted to compress the dragon on the roof , the pillar in the foreground, and the tower and mountains in the background into the small screen of Flash on Pocket PC (240 by 263 pixels).

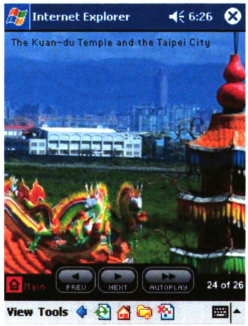

Fig. 3.1 Example of a long telephoto shot

And I also found that cropping a bigger picture into a small one worked well. Fig. 3.2 is the original and bigger version picture of a noisy festive event. If I simply resized it to 240 by 263, users could not understand it well because of loss of details. So I decided to crop the picture and Fig 3.3 is the final picture which visually conveys the message: the festive event is deafeningly noisy.

Fig 3.2 Bigger version of a festive event picture

Fig 3.3 Cropped version of a festive event picture

Video

The Temples in Taipei could become very active during a festival, so I decided it might be a good idea to incorporate some short video clips of interesting activities or ceremonies into the tour guide. There are two ways to integrate video into Flash applications for Pocket PC. One is launching Windows Media Player for Pocket PC file from Flash by linking to a video file. The other is to play video inside the Flash application.

Windows Media Player is a built-in application on almost all Pocket 2002 devices. Windows Media does a really good job on video compression. After some trial-and-error procedures, I managed to encode the video clips at 15 frames per second with video size of 208 by 160 pixels. The encoded video clips play smoothly on most Pocket 2002 devices and look great in terms of video quality. The file size of a two-minute video clip is about

3.5MB. In the final product, I included five video clips. The total file size of these five video clips is 15MB, which makes up 75% of the size of the entire application which is just under 20MB including video, graphics, interface, and sound. The current generations of Pocket PCs have around 16MB of internal storage, most of which is taken up by programs that ship with the Pocket PC or other programs installed by users. Therefore running "Temples of Taipei" requires an add-on memory card to run on Pocket PCs. 20MB seemed like a reasonable compromise between small file size and interesting content.

Before Macromedia released Flash Player 6 for Pocket PC in April of 2003, only Flash Player 5 was available on Pocket PC. In order to play video inside the Flash application using Flash Player 5, I could only import a sequence of bitmap images into a series of key frames to simulate video. Using this technique results in file size problems.. Since Flash 5 does not provide any in-frame compression, the imported bitmap images make the exported Flash file terribly big. Now the Flash Player 6 for Pocket PC is available and it provides some in-frame video compression using the built-in QuickTime Sorenson Spark codec. But there are still some performance issues on Pocket PC if the frame size inside the Flash application is bigger than 160 by 120 pixels. Furthermore, the file size of the simulated "video-like" Flash file is also bigger than the same video clips encoded by Windows Media.

Using Windows Media to deliver video clips does not have the level of control that Flash has. Besides, users have to switch back and forth between Pocket Internet Explorer and Windows Media Player. But I still decide to use Windows Media because it provides bigger frame size (208 by 160 pixels vs. 160 by 120 pixels) and smoother playback on

Pocket PC.

I downloaded the Windows Media Encoder for free from Microsoft. There are two versions available: Windows Media Encoder 7.1 and Windows Media Encoder 9.0. I used Windows Media Encoder 7.1 instead of the newer Windows Media Encoder 9.0 because the 9.0 is quite unstable when encoding video. Besides, it was not surprising for me to find out that Windows Media Encoder does not import video files from the QuickTime format. Actually, Windows Media Encoder is quite picky about the codec and format of imported video files. For example, it does not support AVI files using Microsoft DV codec, either. So I exported the edited video as AVI at 320 by 240 pixels in Cinepak format from Adobe Premiere. Then I imported this video into Windows Media Encoder for encoding.

When encoding video for Pocket PC, I started by creating a "New Audience" with a maximum bit rate of 250 kilobits per second (see Figure 3.3.).

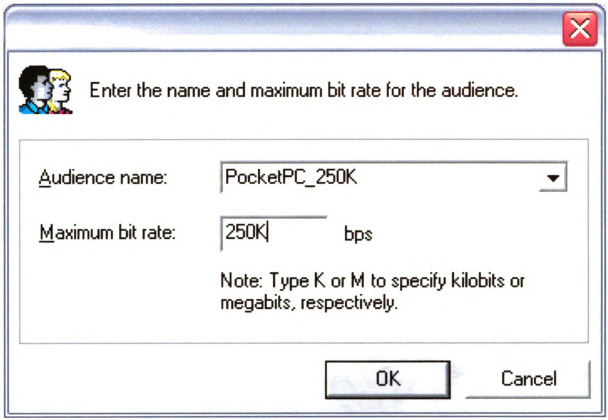

Fig 3.4 Screen shot of creating new audience in Windows Media Encoder

And then I chose the setting for audio using Windows Media Audio 9 codec and 22 kilobits per seconds with 22 khz sampling rate in stereo. For the video, I used Windows Media Video V7 codec with video size of 208 by 160 pixels.

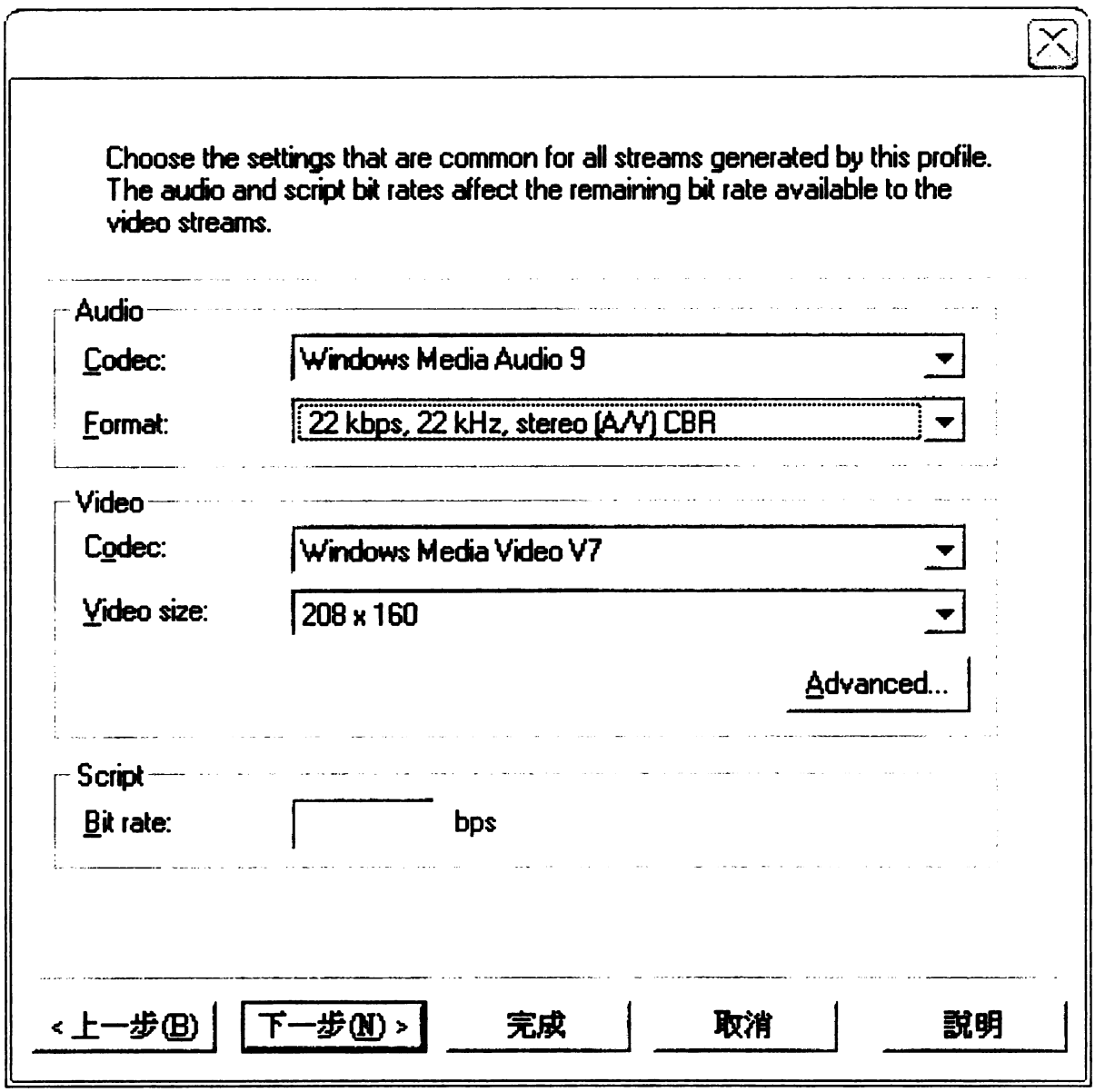

Fig 3.5 Screen shot of common stream settings in Windows Media Encoder

Audio

In Temples of Taipei there is a phrase book intended to help English-speaking tourists communicate with people in Taiwan. There are six categories of phrases for different situations, including basic, emergency, food, hotel, shopping, and transportation. There are about ten useful sentences in each category and users can click on the "play" button of each

phrase to play the Chinese pronunciation. If they are near the person with the handheld, people in Taiwan could hear the pronunciation through the speaker of Pocket PC. I also put the exact sentence in Chinese characters on the right in case the Chinese pronunciation could not be heard or understood clearly because of loud environmental noise levels or the hardware limitations of speakers on Pocket PC. Furthermore, users who are learning Chinese could also use this phrase book to learn some Chinese pronunciation and characters.

Fig 3.6 Screen shot of the Phrase Book

In order to achieve a good balance between quality, file size and performance on Pocket PC, I use MP3 compression in Mono, 32kpbs, and Fast compression for these Chinese pronunciation audio files. Most Pocket PCs only have one speaker, so it's quite logical to use compression in Mono. I decide to use 32kpbs and Fast compression based on information I get from the Internet and some trail-and-error procedures.


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Chapter 4

Research Method

Two adult English speaking visitors to Taipei interested in sightseeing at the temples of Taipei but have not visited the temples yet, who know how to use a Pocket PC, were recruited to use the tour guide to tour one of the temples. Because this is a small usability study, random selection is not important. What matters is to reach potential subjects who fit the three criteria of the target audience (English speaking, interested in but have not visited the temples, already know how to use Pocket PC). Friends and family of the researcher were asked whether they know any potential subjects. A list of six names was compiled and letters of invitation written. The referring person was given the recruiting letter to give to the potential subject. Subjects interested in participating were asked to email researcher Chia-Yu Tai for more information.

Subjects could choose to take the tour alone or with an English-speaking friend. The subjects met the researcher at the temple where they were given a Pocket PC containing the interactive tour and shown how to use it. The self-guided tour could last between 3 and 5 hours depending on how quickly the subjects walk and how much time they spend exploring. The researcher accompanied the subjects (one at a time) observing how often, where, and for what they use the guide. At the end of the tour (or whenever the subject chooses to stop the tour) subjects were invited to complete a seven item questionnaire about their reactions to the handheld guide.

The first two potential subjects who responded to the recruiting email were selected to

participate in the study. Both subjects who volunteered were male. James, a senior of a university in the US, was in his early 20s and Michael, an immigrant to America from Taiwan, was in his early thirties. Michael owned a Palm Pilot. James did not own one, but was familiar with how they worked. Each was an American living in Taiwan. James was working for a language school and taught children in Taiwan English. Michael was working for an international company in Taiwan. Each was a native English speaker. James could understand very few phrases in Chinese. Michael was fairly proficient at speaking Chinese. James elected to take the interactive tour alone, and Michael took the tour with his wife and child.

Chapter 5

Research Results

Wimmer and Dominick suggest[3]:

> The major advantage of field experiments is their external validity: since study conditions closely resemble natural settings, subjects usually provide a truer picture of their normal behavior and are not influenced by the experimental situation. (p.98)

This chapter presents the results from the observation of the walking tour and from the questionnaires filled out by two subjects after they finished the walking tour. Since the research was conducted in a natural setting, the results provide a truer picture of users' normal behavior than a laboratory study would provide.

Observation Results

The self-guided tour could last between 3 and 5 hours depending on how quickly the subjects walked and how much time they spent exploring. It took James about 2 hours and 50 minutes to finish the tour. Michael spent about 4 hours and 10 minutes taking the tour. The researcher accompanied the subjects (one at a time) observing how often, where, and for what they use the guide. James was eager to get started seeing the temple, so he spent only a few minutes exploring different content areas in the Temples of Taipei before starting the tour. He opened the first page of the tour, and then looked around the physical world to get oriented. While he was looking up and back between the handheld and the real world, the power to the screen dimmed on the handheld to conserve battery. The researcher

[3] Roger D. Wimmer and Joseph R. Dominick, Mass Media Research, Third Edition.

had to explain to him that he needed to tap the screen anywhere to bring back the brightness. The screen dimmed frequently while both subjects were trying to use it.

James figured out where the arrow was pointing and started walking, holding the handheld in one hand and the stylus in the other. After walking about 50 feet, he looked back at the handheld device and advanced to the next page of the tour. He looked around the real world, did not recognize where he was, and decided to keep walking in the direction of the arrow, checking the handheld every 30-60 seconds.

When James saw familiar landmarks that matched the next photo in the tour, he paused to look around and appreciate the sights around him for about one minute, then looked back at the handheld and continued to follow its directions. The handheld tour seemed to strongly control James' exploration behavior. Only once in the tour did he deviate momentarily from the path to go look in a room that was not part of the tour. He spent quite a lot of time checking between the handheld and the real world to verify where he was. He almost always read the text at each new location.

Michael struggled more than James did with how to use the handheld. He was frustrated when the power dimmed, sometimes clicking by mistake on a button and navigating to somewhere else in the tour when he didn't intend to do so. At one point Michael notices a link from a location to video. After watching the video, Michael was stuck and didn't know how to resume the tour without assistance from the researcher.

Although James never got lost, Michael made one incorrect turn during the tour, and

in both cases eventually asked for help to get back on the path.

The handheld tour clearly takes a lot of users' attention away from looking at the temple itself. On the positive side, the handheld tour gives users more background information and details than are available in the un-supplemented real world. As Michael and James got more used to the tour, they actually used it less. They became more confident in recognizing each hot spot, and felt less need to check so often to be sure they were on the right track.

Furthermore, Michael is not very comfortable with carrying a somewhat bulky Pocket PC while walking. He sometimes asked the researcher to hold the Pocket PC when he needed to free up his hands for drink and snack food.

Questionnaire Results

Responses to the survey questions will be reported question by question.

1. Which parts of this tour guide program do you like most? And why?

James' favorite part of the tour guide was panorama, because he has never seen anything like it before. Michael liked the walking tour because the tour did introduce him to many interesting sites.

2. Which parts of this tour guide program do you dislike most? And why?

James most disliked the limited option of walking tour. Michael most disliked the length of walking tour since it was difficult for some members of his group.

3. If you were visiting the temples on your own, would you have explored the handheld tour guide before you went to the temple? Do you think it is a good tool to use before, during, or after visiting a temple?

Both James and Michael thought it would be a good idea to explore the tour guide before visiting the temple. Both also said they would enjoy looking at other features of the tour guide such as the photo gallery or videos now that they had walked through the temple and appreciated the location.

4. How much did the handheld tour help you know where to turn and what to look at in the Temple? Did you ever feel lost in the Temple? Did you ever feel lost in the handheld tour?

James thought the tour guide did a good job. Michael felt it was good and helpful to use the handheld tour. He felt a little lost a couple of times.

5. The handheld tour included photographs, text, videos, and maps. Which elements do you want to see more of? And why?

James said more maps or maybe more points of interest would be helpful. Michael said he wants more video clips like an introduction to the sites visited.

6. How hard or easy was it to navigate through the program and find the information you need? Do you have any suggestions to improve the navigation?

James suggested "It would be helpful to say how long a walk between points to expect, i.e. walk 500 feet and turn. Also it would be good to be able to choose the routes of sites visited." Michael said that he wants a self-guided tour which has more options.

7. Did it feel natural to use a handheld tour guide as you walked around the temple? Did using the guide enhance the experience of visiting the temple or did it get in the way of paying attention to the physical objects in the temple?

James said the tour guide introduced him to things he might not have picked up on his own. Michael said the guide is a good accompaniment to the tour.

8. Would you want this kind of tour guide program for other places? What kind of places would benefit from a handheld tour guide?

James said museum and theme park would benefit from a handheld tour guide. Michael said he would like to see tour guides of Snake Alley, Shih-Lin night market, and Yang Ming Mountain in Taipei.

Discussion

Based on observation during the field test, users want to know how long it will take between points, especially longer walk between points like the walk between point A and

point B or point C and point D in Fig 5.1. When the tester walked between point A and point B or point C and point D, he kept looking at the navigational aid picture on handheld tour guide because he wondered if he missed the point to turn or not. Based on the information, it might be a good idea to make distance between each point equal by adding more points between Point A and Point B. Besides, it might help to indicate distance for users to expect.

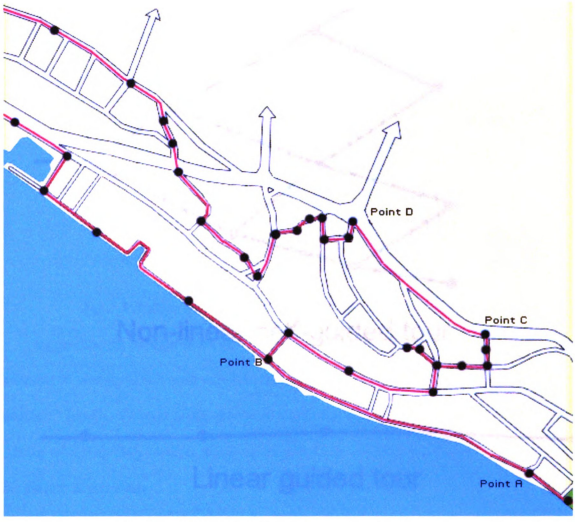
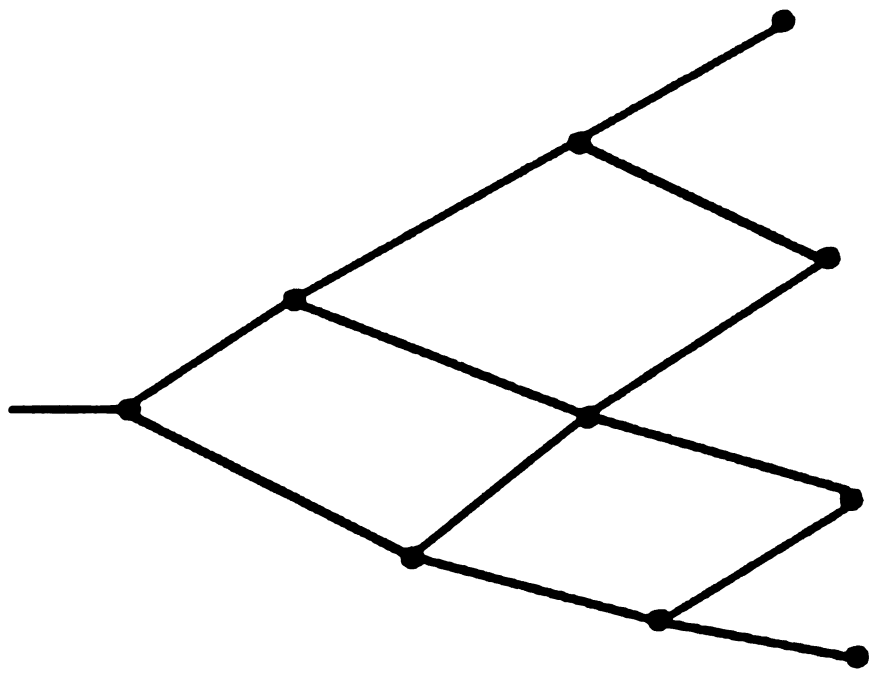


Fig 5.1 Map of Tamshui walking tour

The subjects expressed a desire for the tour to be nonlinear, allowing them more freedom to decide where to go, but still providing lots of information about interesting

things to notice and interesting background stories. Fig 5.2 illustrates the difference between non-linear self-guided tour and linear guided tour. The walking tour of Temples of Taipei is a linear guided tour which only has one option. In a non-linear self-guided tour, users will have more options like turning right or left in each point.



Non-linear self-guided tour

Linear guided tour

Fig 5.2 Non-linear self-guided tour and linear guided tour

In addition to wanting more choices of routes, James suggested that he would like a choice of length of tours such as choices of 3-hour walking tour, 2-hour walking tour etc.

Both users want more in-depth information about the site they visit in the walking tour. Michael wrote: "although the tour did introduce me to many interesting sites, I would have liked it to point out specifics within the site or special things to look for." James suggested that he would like to have more buttons on the picture which brings up more information about the location. (See Fig 5.3)

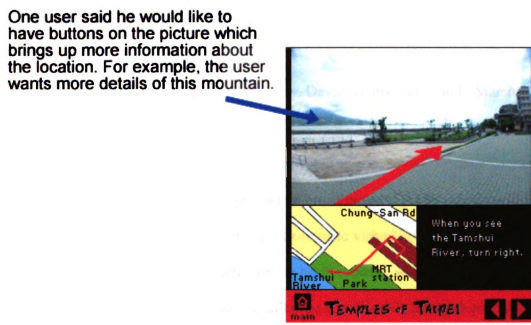


Fig 5.3 Buttons on the picture which brings up more information

James thought perhaps there should be a greater emphasis on maps rather than pictures: "I wonder if this map won't be the larger one and then the picture would be smaller." Ideally, the user could choose to toggle the size and position of the map and the picture whenever they wanted, allowing them to have the large view of either the map or the picture at any time.

CHAPTER 6

The Future of Tour Guides on Pocket PC

Location-based Advertising and the Walking Tour

Location-based services have gained a lot of attention recently. The walking tour part of Temples of Taipei could be considered a simple location-based application.

In an article of Harvard Business Review, David Kenny and John F. Marshall make the following remark:

> Mobile devices and internet access in a broad range of public venues will let contextual marketers link real-life situations to virtual information and offerings. For instance, Unilever's mobile recipe book concept, which will be available on digital phones in Europe, should influence consumers' packaged-good decisions far more than the company's web site ever could. Intended for use while shopping, the mobile tool suggests recipes and breaks them down into their ingredients identified, wherever possible, by their Unilever brand.[4]

The walking tour could be used to identify where the user (consumer) is and advertisements of the nearest restaurant or gift shop could be placed at appropriate spots in the tour. This is a good example of "linking real-life situations to virtual information and offerings." And these advertisements could be more effective than web sites of that restaurant or gift shop because it is so much easier for the consumer to take a few extra

[4] David Kenny , John F. Marshall, Contextual Marketing, Harvard Business Review, Nov/Dec 2000

steps and actually show up at the location being advertised. Furthermore, GPS (Global Positioning System) on Pocket PC will enhance the tracking feature of the walking tour and allow the creation of a much better navigation guide.

The Future of Phrase Book

The phrase book is limited because users can only use sentences which are pre-defined and pre-recorded. There are not many sentences to choose from and adding more sentences is not feasible since the storage space of Pocket PC is so limited.

But it's already possible to design a program for Pocket PC that helps tourists and people in Taiwan communicate with more freedom when one party uses Chinese and the other uses English. A front-end interface designed in Flash for a connected Pocket PC which talks via wireless network to a back-end server has the capability to translate one language to another in real time. Here is how it works. First, English-speaking tourists input a sentence in English using the Flash program on Pocket PC. Then the text in English is sent to the server through wireless internet connection. When the server finishes translating, it sends the sentence in Chinese back to the Flash program and the sentence can be viewed by people in Taiwan. On the other hand, people in Taiwan could also use the Flash program to input a sentence in Chinese and have the sentence translated by the server and then viewed by the English-speaking tourist. The main reason to use a server for translating is that only a server has enough processing power and storage space to translate "natural language" on the fly. Besides, it is easier to add new vocabularies, phrases, sentences, and grammar into the database of the server and the accuracy of translating can be improved everyday. In fact, this kind of translation service is already available on the

internet. For example, I found AltaVista's Babel Fish translation service is a very effective translating tool for languages like Japanese, Chinese, or English.

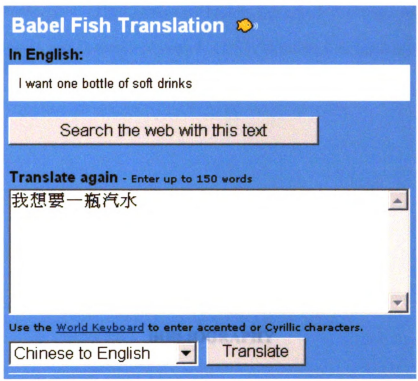


Fig. 6.1 Screenshot of Babel Fish translation service

In the near future, the Pocket PC could have speech-recognition capability to turn English and Chinese speech into text which could be transferred and translated by the server. The communication process could become easier because the text could be input using voice. Furthermore, by using a text-to-speech output program like IBM Embedded ViaVoice Mobility Suite for Pocket PC which generates Chinese or English speech from Chinese or English text transmitted from the translation server, the quality of communication between English-speaking tourists and people in Taiwan could be improved greatly.

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