

Walk-walk: a Location-based Mobile AD/Voucher System for Night Market Strolling

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Abstract—In Taiwan, many night markets are cultural highlights and often local attractions. In such environments, mobile users wade through tightly clustered vendors that are similar nature and which they most likely know nothing about. To make the best purchase, it is desirable to adapt mobile marketing systems into night market business mode. Existing mobile marketing mechanisms however are mostly passive and intrusive. To make the night market scenario be effective and feasible, users' context, location, and preference should be put into consideration. This work designs and implements Walk-walk, a mobile advertisement (ads)/ voucher system for night market strolling. Under this proposed architecture, street vendors could post their ads/vouchers using mobile phones with digital camera. A consumer would receive ads/vouchers befitting her/his location and preference when strolling in the predefined night market area, which enhances the consumer's purchasing experience. A course-based project was conducted for real-life vendor data collection in Feng Chia Night Market, Taichung, where the implemented Walk-walk mobile ad client/server prototype is tested.

Index Terms—voucher, context-awareness, location-based services, mobile ad.

I. Introduction

Night markets are street markets operating at night, dedicated to more leisurely strolling, shopping, and eating. In Taiwan, many night markets are cultural highlights and often attract hundreds of thousands of visitors each week. In such environments, mobile users wade through tightly clustered vendors that are similar nature and which they most likely know nothing about. To make the best purchase, it is desirable for consumers to have the related vendor information in the hand such as prices, menu/catalogs, and navigation to their lo-

cations, or even reviews, and vouchers. On the other hand, vendors, mobile or fixed, would like to be able to issue their advertisements (ads)/ vouchers with an easy and low cost way to attract their potential customers.

With 3G and WiMAX gaining popularity in recent years, interests in mobile marketing have been growing as well [9]. The mobile phone is becoming a means of communication, and many instances and applications of mobile marketing have been deployed. However despite its convenience and relatively low cost, many drawbacks have also been identified concerning mobile advertising, including spamming [6], indifference to user preference [8], and intrusiveness [9]. On the other hand, in Taiwan many Web sites provide voucher services such as Vpon [13], i-City [12], MessageMedia [15], i coupon go[14], etc. To use their vouchers in a night market, however, is laborious. Some of them require users to print the vouchers on a paper, while others require that users manually download the desired vouchers onto their cell phones. These active and explicit operations forbid the vouchers to be dispatched automatically from the server side. Users without preparation in advance would not know the existence of the vendors, not to mention the efforts to download their vouchers. Thus, current business models of voucher systems are unsuitable for a night market.

This work designs and implements *Walk-walk*, a mobile ad/voucher system for night market strolling. Under this proposed architecture, street vendors could post their advertisements and vouchers

using mobile phones with digital camera. Consumers would receive advertisements and vouchers according to location and user preference when strolling in the predefined night market area, which greatly enhances their purchasing experience.

The rest of this paper is organized as follows. Related work is described in Section II. System architecture is described in Section III and system implementation and case study are described in Section IV. Section V presents the system prototype and Night Market Passport is described in Section VI and conclusions are made in Section VII.

II. Related Work

There are some researches about mobile advertising. Giaglis [4] showed that mobile advertising is one of the most popular applications of mobile commerce. The key factor influencing mobile advertising is advertisement delivery and personal characteristics. Georgiadis [3] implemented location-aware information services with contextual considerations to display various user personal points of interest/ attractions. Lee [8] analyzed user response rate and found out that free contents had higher click rate and younger users below 20s are more likely to response. Chen [1] implemented a recommending system that filters information on behalf of the user to reduce spam. Han [5] introduced a framework that distributed advertisements with interactive location-based mobile gaming and it can be used to collect nearby m-coupons.

Mobile advertisement system also puts emphasis on user interface and interaction. There is a platform-independent and location sensing ensemble system implemented by Debroy [2] that highlights click to call for some selected businesses. Hristova [6] presented a context-sensitive advertising system that adapted to user location, device and emotions to deliver less intrusive advertisement. Mahmoud [9] indicated that context-aware mobile advertisements are driven by information related to user's location, time and preferences.

To reduce intrusive and spamming information push, Wang [11] added an information classification on database such as user preference. Kim [7] analyzed user's preference over time to build a preference model that uses a data scheduling scheme to achieve effective advertising. Sung [10] proposed a context-aware personalized service infrastructure that recommends services to the right users in right time.

III. System Architecture

A. Overview

As shown in Fig. 1, the *Walk-walk* system is illustrated in the client/server architecture. The client side covers both consumer and vendor components, while the server side consists of ad collector, ad dispatcher, and user monitor.

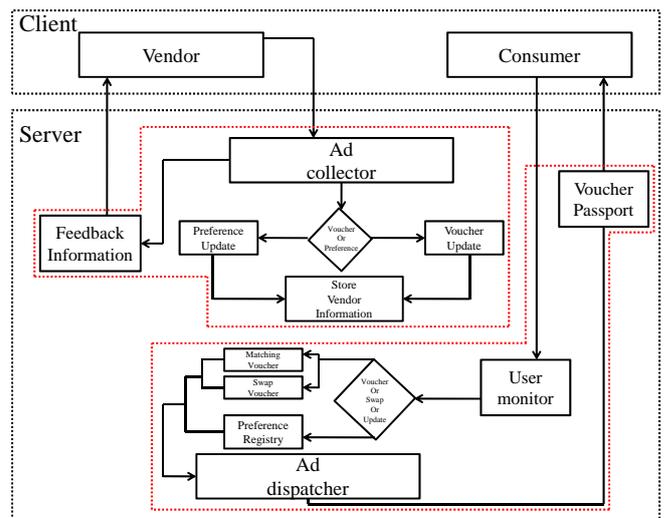


Fig. 1 *Walk-walk* system architecture

The ad collector is responsible for collecting advertisements and vouchers from vendors and it can classify them according to their properties. The ad dispatcher sends the voucher to users according to user preference and context. Street vendors would upload advertisements and vouchers to the server through the ad collector, which would classify the relative category by the property then store to the Voucher database. After that, the ad collector matches the voucher's property up with user preference, to select which voucher was

exactly that user wanted. After the matching process, the voucher selected by the ad collector to the ad dispatcher would then be pushed to the client.

B. Client / Server Applications

This section describes the details of the client and server applications of our *Walk-walk* system.

(1) Client Application

The client application consists of two parts, the vendor application and the consumer application.

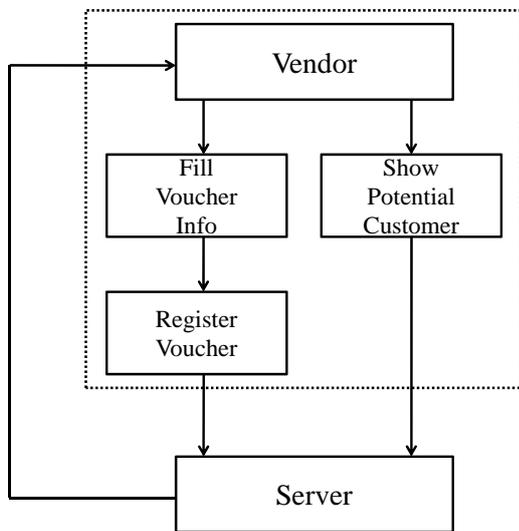


Fig. 2 Walk-walk vendor application

(i) Vendor Application

As shown in Fig. 2, the vendor application lets vendors fill up voucher information, register available vouchers and acquire information of potential clients. The vendor application is installed on the vendor’s fixed or mobile devices which allow the vendor to register vendor preference and vouchers to the server. After the vendor fill up information through a pop-up menu, the vendor application will send a request to the server asking for the registration of vendor preference and vouchers. If the registration is successful, the server will send a confirmation message back to the vendor.

The vendor application also provides a function to allow the vendor to view the distribution of po-

tential customers. After the vendor sends a *Show-PotentialCustomers* request to the server, the server will send a customer distribution diagram based on the location services provided by the server.

(ii) Consumer Application

As shown in Fig. 3, the consumer application will send the voucher acquisition request to the server. After the server receives the acquisition request, it will push a voucher passport to the consumer based on a match program in the server.

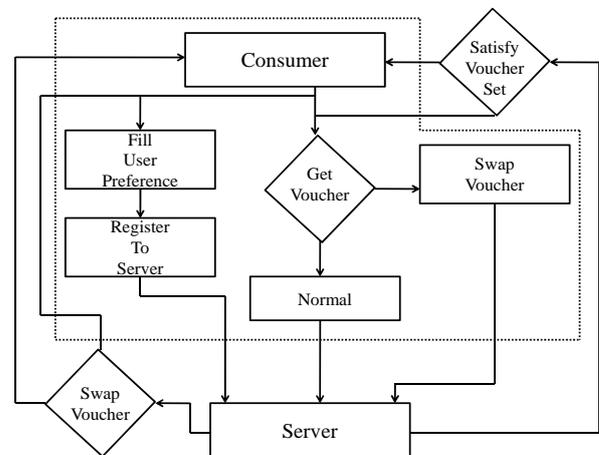


Fig. 3 Walk-walk consumer application

If the consumer is not satisfied with the vouchers provided by the server in the voucher passport, he/she can use the *VoucherSwapping* function provided by the consumer application to swap unnecessary vouchers to some preferred vouchers. It should be noted that there may exist some constraints for the client such as swapping frequency due to some business models of the mobile voucher system.

(2) Server Application

In the *Walk-walk* voucher system, the server application consists of two parts, the ad collector application and the ad dispatcher application

(i) Ad Collector Application

As shown in Fig. 4, the ad collector can classify vouchers based on the properties and preferences of the vendor. After the vendor registers vouchers

through the *VoucherRegistration* component, the vendor application will send a registration request to the server. If the request is a voucher request, the system will first classify vouchers and then match with the *VoucherKeywordBank* to precisely identify and separate each voucher. At last, the vouchers which are registered by the vendor will be updated to the voucher database through the *VoucherUpdate* component. If the request is a preference registration or update, the system will try to find out which vendor that the preference belongs to through the *ClassifyVendor* component. Then, the *PreferenceUpdate* component will update or register the vendor's preference.

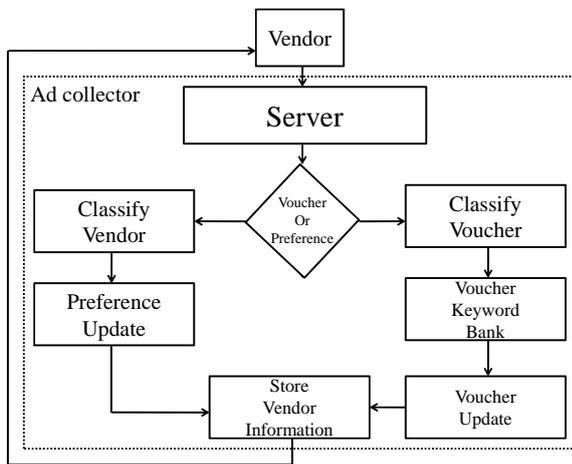


Fig. 4 Server-vendor interaction

(ii) Ad Dispatcher Application

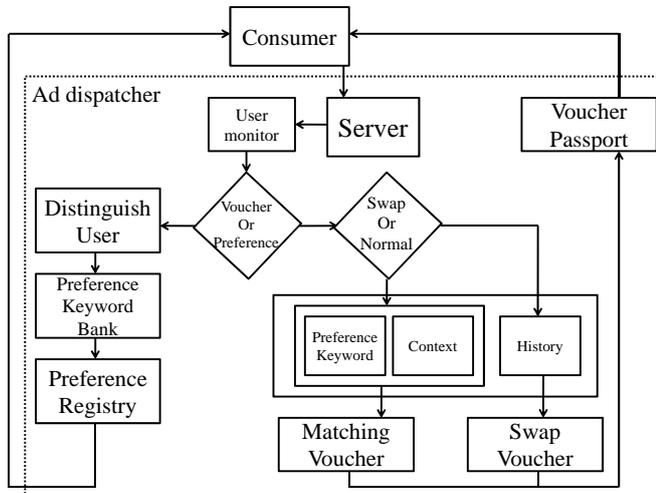


Fig. 5 Server-consumer interaction

As shown in Fig. 5, when a consumer uses the system at the first time, the consumer application would automatically update the user's preference to the server. The server will provide voucher or preference services based on the request from the consumer application.

If the request is a preference request, the user's preference will be identified by using the function of "Distinguish User". Then, the user's preferences are matched with the *PreferenceKeyword Bank* to identify the user's interests. Then, the user's preference will be registered or updated by the Preference Register.

Otherwise, if the request is a voucher request, the system will determine whether the request is a normal request or a voucher swapping request. If it is a normal request and the consumer uses the system for the first time, the ad dispatcher will produce a personalized voucher passport to the consumer according to the voucher set received from the ad collector and the preference registered by the consumer.

If the consumer does not like some vouchers in the voucher passport, the consumer can swap the vouchers. After the swap request is sent to the server, the ad dispatcher will send another set of vouchers to the consumer according to the user's usage history and preferences.

The *VoucherSwapping* function may have some constraints for the client such as swapping frequency due to some business models of the mobile voucher system, e.g., the sale price of voucher passport.

IV. System Implementation & Case Study

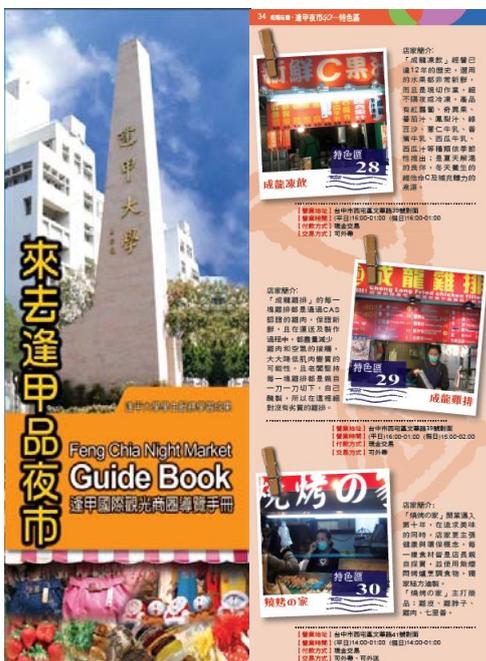
A. System Implementation

The *Walk-walk* server is a Windows-based application that was implemented by several tools, including Microsoft Visual C# 2008, Microsoft Office Access 2007, and Microsoft Windows Server 2003. The following functions are implemented on the server, including user location service, ad collection service, and ad distribution service.

The vendor client and consumer client are Windows mobile applications that were implemented by several tools, including Microsoft Visual C# 2008 and Microsoft Windows Mobile 6.1. HTC diamond mobile phones are used to serve as the platform of the client applications.

B. Real-life Data Collection

Feng Chia Night Market, one of the largest night markets in Taiwan, contains hundreds of vendors and is located just around the campus of Feng Chia University. To integrate practical writing with real-life experience as well as providing a guide book for visitors to the night market, case studies were conducted by 16 students of Department of Chinese Literature in Feng Chia University to investigate various vendors and their information in this night market. To complete the Feng Chia Night Market Guide Book[17] as shown in Fig. 6, they visited vendors one by one, 3 hours a day during the four-month long course duration. Up to 85 real-life vendor data were collected through the effort.



(a) Cover (b) Vendor Information

Fig. 6 Feng Chia Night Market Guide Book

V. System Prototype

Walk-walk was designed for night market strolling guide for Feng Chia Night Market. Much valuable vendor information was collected, including some basic vendor information such as name, description, logo, sale products, and its rough GPS location.

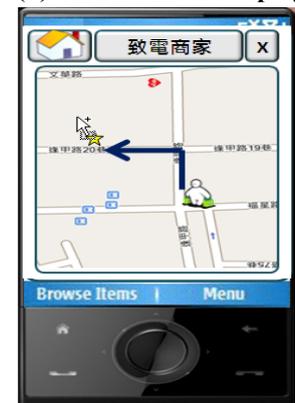


(a) Vendor upload

(b) Advertisement display



(c) Vendor Information



(d) Vendor Navigation



(e) Advance Vendor Info



(f) Advertisement edit

Fig. 7 Walk-walk system screenshots

As shown in Fig. 7(a), a user, strolling in night market, would get distributed vouchers according to her/his context and location, which would be displayed like Fig. 7(b). A click on the advertisement would show advanced information, as shown in Fig. 7(c) and Fig. 7(e). Further click would bring up the navigation screen to guide the user to the giver of the ad, as shown in Fig. 7(d). A vendor can also use our *Walk-walk Vendor* system to edit and upload its ad as shown in Fig. 7(f).

VI. Night Market Passport

Inspired by the idea of *Tainan City Tour Passport* [16], a future application of *Walk-walk* is the Night Market Passport System which generates a *voucher set* before the user enters a designated area. The set can be generated according to users' preference, total discount amounts, local attributes, etc in order to foster more intensive and systematic consuming experience.



Fig. 8 Night Market Passport screenshots

When the user comes to night market, user would receive Night Market Passport through *Walk-walk* system immediately. The Night Market Passport would be generated according and selecting to user's preference, location and context-aware information, et al. As shown in Fig. 8, there are three different kinds of user which are

Mrs. at age 45, Ms. at age 30 and Boy at age 20. Three of the user has different preference and location, also the Night Market Passport that dispatch by *Walk-walk* system which are independent of each other. After clicking on the down/up button, the user's mobile device would switch to another ad/voucher page, or by clicking on the use button, the user could start strolling night market through the Night Market Passport with real time ad/voucher. Thus, the system can be used to assist the user in tracking and knowing more about purchasing information, real time discount information and her/his consuming records.

VII. Conclusions

This work presents *Walk-walk*, a location-based mobile ad/voucher system for night market strolling. Under this proposed architecture, street vendors could post their advertisements/vouchers using mobile devices. Consumers would benefit from enhanced purchasing experience. Note that we are currently working on the implementation of our system, and some of its components could have further improvement.

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