Place Recommendation for Pedestrian
Reflecting Real-Time Situation and User's Preferences

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1．Introduction

Data that changes over the course of months or years (static data) is used in most place recommendation systems: data like location, working hours, and ratings. However, a system with dynamic data, i.e. data that contains information changing on hourly or daily basis, does not exist. In this paper, a framework that utilizes dynamic data is proposed in order to solve problems such as waiting in long queue at a restaurant, checking destination weather condition, and finding an available car park. The research is concentrated on dynamic data processing, data storing, and data output while maintaining a suitable match to the user's preference.

2．Related Work

Systems available today including *Gourmet Navigator*[2] and *Foodspotting*[3] recommend surrounding restaurants according to the current location the user is in. With the places listed as recommendation on the system, the users only receive the static data or the information on which of the restaurants or food has higher rating and better reviews but without handling any dynamic data or the knowledge of the situation of the restaurant at the time, such as whether there are people waiting in line.

3．System Framework

3.1　Component

This research consists of three main components in the system framework including: check-in system, user preferences, and recommendation system as shown in Figure 1.

3.1.1 Check-In System

The first component is the check-in system. The purpose of this system is to collect dynamic data from users or shops using mobile devices or a front-end system. The check-in system is portrayed as the information provider on Figure 1. Several kinds of data can be considered as dynamic, but we focus only on the queue length at restaurant or cafeteria in this paper. This idea can be generalized to other kind of dynamic data such as crowd density or seats availability. The value for the length of the queue is received, and it is stored to the database according to timeframe and the day
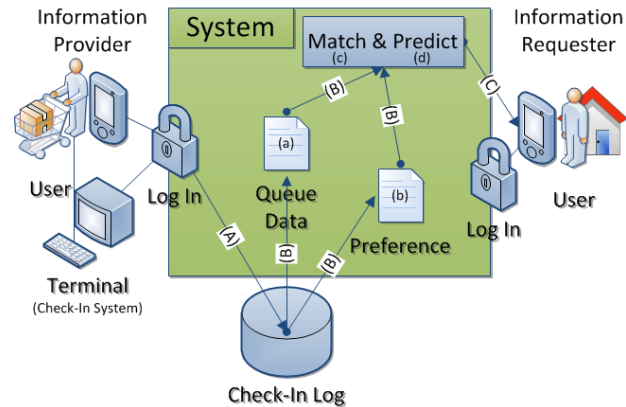

Figure 1: System Framework Layout

of the week. In order to classify the time factor of the data, each check-in will be associated with timestamps. This analyzed data is then outputted and stored to the database in the table for each of destinations.

3.1.2 User Preference

The second component is the user preference. The system keeps a log of the user's destinations from every check-in he/she made. With a timestamp on the check-ins and user information, the logged data will be dissected into date and constant time interval. Hence, the preference data is outputted to the "match and predict" portion of the system.

3.1.3 Recommendation System

The third component is the recommendation system. The recommendation system utilizes Logistic Regression[1] to match the user's behavior logged in his/her preference to the dynamic data checked in by other users at the point in time or timeframe for each log entry. The utilization of logistic regression will enable the system to output destinations matching the user's preference on past experiences of places.

3.2　User Scenario

The scenario is separated into two roles: Information Provider and Information Requester. The Information Provider inputs data to the system and the Information Requester requests the system to recommend the destination to the user.

3.2.1 Information Provider

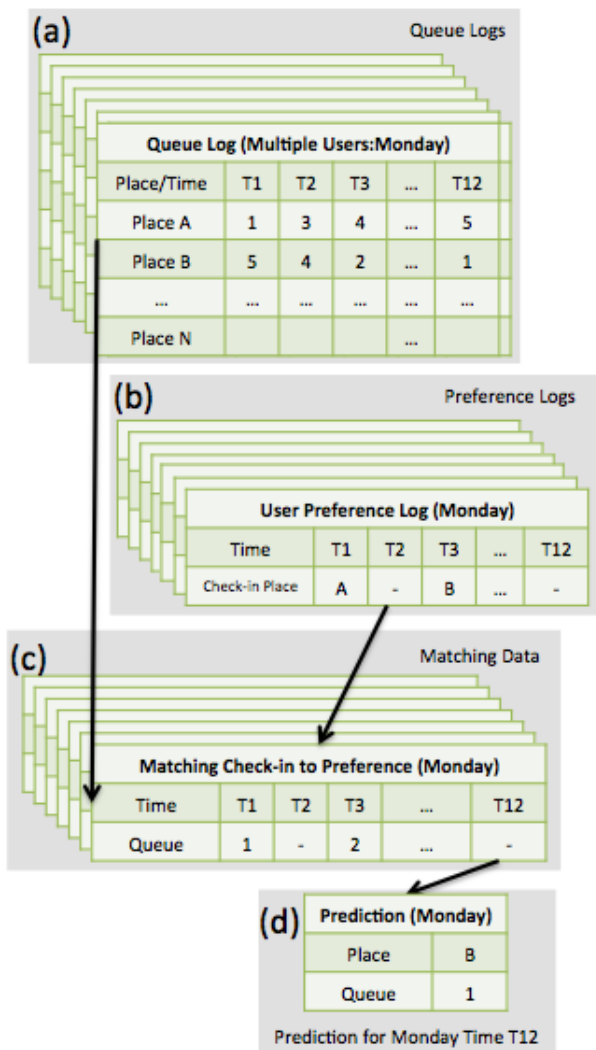In order to input dynamic data to the system, first the user or a front-end system logs into the system in order to

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Figure 2: Match and Prediction System Flow

figure are illustrating a seven-day period of data in order to compare the data with previous week on that particular day.

The system gathers data from check-ins and stored into the timeframe (T1-T12). The information is aggregated from many users in various places who checked in queue length data into the system. The system stores these data as queue data as shown in both Figure 1(a) and Figure 2(a).

The system then arranges the data for each user according to timeframe and location to produce the (b) user preference log of the information requester. With this log, the system is able to match the preference log to the data in queue log.

When the user requests for a recommendation, (c) the system matches the preference log to the check-in data in order to produce user behavior pattern. In case when there are no real time data in a particular timeframe, the system can utilize old data from the database for estimating the length of the queue.

Finally, (d) the system gives recommendation of place to the user. For example, with the value derived from T12 in (a), place B is recommended to the user in which the user prefers lower queue ratings as shown in T1 and T3 from (c) matched data.

4 . Conclusions and Future Work

Creating the system framework with the check-in system, preferences, and recommendation system components is the essential part for enabling effective evaluation of the place recommendation system reflecting dynamic data or the situation of the place. The matching method uses user's history of place visits, to match check-in data from other users and be able to output an effective recommendation to the target user group.

Since the proposed framework includes very limited data types, it is important to increase the variety of data in order to fulfill other situations. Consequently, the number of user's preferences must be increased too. In this research, data is gathered by observation and synthesizing data, but it is necessary to implement check-in system in order to gather a more accurate data.

References

[1]   Burez J., Poel D. (2007). CRM at a pay-TV company: Using analytical models to reduce customer attrition by targeted marketing for subscription services. *Expert Systems with Applications 32 (2007) 277–288*

[2]   Gourmet Navigator. July 28, 2011. <http://www.gnavi.co.jp>

[3]   Foodspotting. July 28, 2011. <http://www.foodspotting.com>

identify the credibility of the data source. The user selects his/her destination from a list of places in the system where the dynamic data will be provided. Then the queue length is inputted as 5-point rating (1 is the shortest and 5 is the longest) for how long the queue is. (A) Finally, the check-in data is submitted to the database along with timestamp and username.

3.2.2 Information Requester

In order to request a prediction from the system, first the user must log into the system in order to match his/her profile to the data logged from the previous check-ins. (B) The system calls the log information from the system's database in order to calculate and match data, and (C) then the system output a recommendation to the user.

3.3   Matching and Prediction

This section shows how matching and prediction is done on the system from a sample scenario shown in Figure 2. Queue log, user preferences, and matching table in the