

A User Behavior Analyzer for a Public Transit Navigation System

Genki KENJO Masaki ITO Takao KAWAMURA Kazunori SUGAHARA

Graduate School of Engineering, Tottori University
4-101 Koyama-Minami, Tottori 680-8552, Japan
{s082021, masaki, kawamura, sugahara}@ike.tottori-u.ac.jp

ABSTRACT

We developed the analyzer of users' behavior for a public transit navigation system in order to improve the usability of the system and find the required functions for it. The analyzer records users' situations and behaviors, such as the page transitions, searched routes, and device type. With these data, the analyzer generates a graph that illustrates the usage trends and the result of the evaluation of the usability.

Author Keywords

User behavior analysis, transit navigation, logging data.

ACM Classification Keywords

H.5.2. User Interfaces: Evaluation/methodology

General Terms

Measurement

INTRODUCTION

In recent years, the use of the feedback from the users, such as bug reports and access analysis has been attracting attention in the fields of web marketing and system development. There are already many access analyzers such as "Apache-LogViewer" and "Google Analytics" [2]. In the web marketing, for example, online stores analyze the trend in shopping, and recommend other items that may interest the customers. In the web development, developers survey users' environments such as browsers, networks and locations, and optimize the web pages to the average users. The developers also survey users' transition on the web, and optimize the layouts and structures of the pages.

We developed the shortest-path-planning system for route buses and railways called "Bus-Net" [1, 3, 4] in 2006 and have been operating the system as a web service in Tottori prefecture, Japan for six years. The system provides the appropriate itinerary to the destination in using route buses and railways. The itinerary to be provided includes the names of bus stops or the stations the user needs to transfer as well as the time for the bus/train to arrive and leave at each bus stop/train station. The system is also available as the smartphone applications for iOS and Android, and as a service on

information terminal in public places such as a train station and a hospital."Bus-Net" has more than 50,000 accesses per month, so we can say that the system is one of the important infrastructures for people in Tottori prefecture.

Lately, we started to further improve the Bus-Net system and tried to reflect the users' behavior data we collected on it. However, existing analyzers assume only generic web pages, and do not support specific functions of a certain web application. In this paper, we developed a user behavior analyzer so that we can reflect user feedback and further improve our public transit navigation system.

USER BEHAVIOR ANALYZER FOR "BUS-NET"

In order to improve the usability and add the function to the system, we developed the analyzer of users' behavior on the system. Although there are already many access analyzers for web services, they all assume only generic web access, and do not support specific functions of a certain application. Following functions are required for an analyzer for a public transit navigation system.

1. Considering the privacy

The analyzer needs to be designed carefully about how it treats the privacy information such as the users' current location, the name of school and company. However, how much the log contains privacy information depends on the application. Therefore, for privacy protection, the analyzer should be specially designed to the application.

2. Supporting various devices

The analyzer needs to record the information about the usage from various devices such as smartphone applications for iOS and Android as well as the web service. It needs to support different types of input for the usage information, and deal with the information together.

3. Focusing on the activity after using the service

The important factor to evaluate public transit navigation is the actual activity of the user after using the application. We can measure the satisfaction of the service by seeing, for example, if a user actually uses the route buses or trains or if a user uses them again next time. Therefore, the system needs to consider a time series of users' activity.

IMPLEMENTATION AND OPERATION

We developed the analyzer for the log of "Bus-Net" as a web application as illustrated in Figure 1. We utilized Ruby on Rails for the implementation. In order to protect the data for privacy concern, we are managing the system by ourselves. We started operation of the system in 2011. The total number

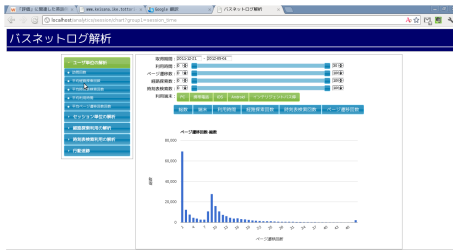


Figure 1. User Behavior Analyzer

of logging data is 2,227,742, and the period of time is 121 days.

Since the system needs to expect various format of the information of usage, such as the information from web application and smartphone applications, we designed the flexible internal format for the log. The expression and granularity in the logs are different depending on devices. Therefore we designed a set of tags that express the abstract operation to "Bus-Net," and associated the tag to each behavior on the log. For example, the system associates "Setting-Conditions," "Route-Search," and "Setting-Landmark" tags to the operation of clicking "setting departure point" button on the web. With the tags, the user of analyzer can search for the log from different devices without considering the difference of the format.

In order to focus on the activity after using the service, we developed a time-series view of behavior of a certain user as well as the overall statistics of the system, as illustrated in Figure 2. The view enables to grasp the reaction of the user to the itinerary that the system provides. For example, if the user searches again with different conditions soon after receiving the itinerary, we can suppose that the initial result does not satisfy the user.

ANALYSIS RESULT

The distribution of device types is illustrated in Figure 3. The most used device type is a mobile phone; the second is a PC; and third is a smart phone. With referring to other data about when users access to the system, we can say that the users of "Bus-Net" tend to use the system right before taking buses with their mobile devices. Most users visited nine pages while using the system as illustrated in Figure 4. Many people seem to use "Bus-Net" without confusion because nine is the minimum number of pages to reach to the search result of the itinerary or the timetable.

CONCLUSION

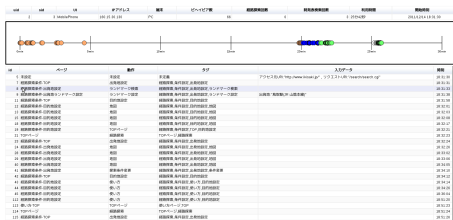


Figure 2. Time-series view of behavior of certain user

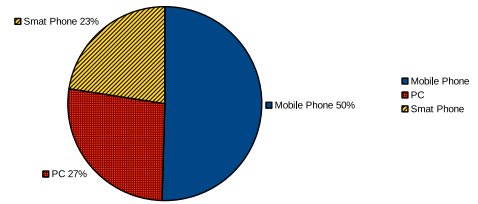


Figure 3. Device type of use

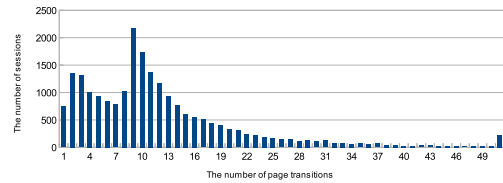


Figure 4. Distribution of the number of page transitions

In this study, we developed a user behavior analysis system for a public transit navigation system to evaluate usability and further improve "Bus-Net." The system consider the privacy, supports various devices such as smartphone applications and web applications, and provides a time-series view of behavior of a certain user to evaluate the satisfaction of the service. We demonstrated initial result of the analyzer.

We are planning to record the usage information of a smartphone application in addition to the web application, and analyze the difference among them. We believe that the result will be helpful information to improve both applications.

REFERENCES

1. Bus-Net. <http://www.ikisaki.jp/>.
2. Google Analytics. <http://www.google.com/intl/ja/analytics/>.
3. Kawamura, T., Kusugami, G., and Sugahara, K. Path planning system for bus network including walking transfer. *IPSJ Journal* 46, 5 (5 2005), 1207-1210.
4. Kawamura, T., and Sugahara, K. Practical path planning system for bus network. *IPSJ Journal* 4, 2 (2 2007), 780-790.