ChoiceLog: Life Log System Based on Choices for Supporting Decision-Making

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Abstract. When we are faced with choices, we often make decisions based on past experiences where we faced similar choices. If we could refer these choices, we would be able to make better decisions. In this paper, we propose a new life log system called "ChoiceLog". ChoiceLog can record the options that user choose and the options that they reject. Further, it can display recorded data via searches and notifications in order to support decision-making. We implemented ChoiceLog as an iOS application and conducted two evaluations to estimate its usefulness. From the results of the evaluations, we found that ChoiceLog could support decision-making processes in cases where there were a large number of choice selection logs. Moreover, for long-term use, we are planning to make it possible to filter notification from ChoiceLog based on date, time, and preset or user-customizable tags.

Keywords: life log, decision-making, watershed events, choice, mobile, location-base, ChoiceLog.

1 Introduction

There are two types of watershed events in our lives. First, incidental events (e.g., a disaster or winning a lottery). Second, events with choices (e.g., what to eat for lunch, or which car to buy) that are referred to below as "choice events". When we face the latter type, we want to make the best possible decision based on past experiences where we faced similar choices. If we could recall those choices, we would be able to make better decisions.

In this paper, we focus on life log systems for dealing with such choices. Life log systems are used widely for archiving activities, analyzing trends, and sharing information [1]. In terms of decision-making, these systems should enable the user to find logs that are suited to the current choice event. However, it is difficult for users to recall past situations using log data (i.e., pictures, movies, text and geo-tags) that are recorded in conventional life log systems. The reason for this is that conventional systems do not include capabilities for recording information about options that were selected, options that were rejected, and the results from these choices.

Some decision-making systems are currently available for supporting decision-making processes. However, it is difficult for users to perform efficient

decision-making with these systems because they do not record log data about the options that the users rejected.

In order to solve these problems, we propose a new life log system called "ChoiceLog" for supporting decision-making.

2   Related Works

2.1   Life Log System

A life log is collected in order to allow users to recall past experience and to support decisions about future behaviors based on those experiences [2].

In this paper, Kanzaki et al. [3] proposed a life log system for healthy life based on pictures of food. the phrase "life log" refers to an archive of personal experiences that includes video, audio, location data, and other types of data. The phrase "life log system" refers to a system that can be used to record and search data in a "life log." We also use these words.

Logs can be collected in manually or automatically. In the former case, a user inputs text, captures images, and records movies, location data, and other types of data. This means that the user can determine the type of contents that are included and the volume of logs that are recorded. However, it is difficult for users to record the logs and determine how to search them. Foursquare [4] is a life log system that is specifically designed for recording location data. It allows users to recall activities based on location data. In this system, the user must perform "check-in" operation at each location. However, this system is unable to record logs about locations that the user does not visit. Therefore, the user cannot search for logs about locations, where the user has planned but not visited, because such logs do not exist in the system.

If the logs are collected automatically, users are freed from the trouble of manually recording the logs. Life Log Video [5] is a life log system that uses various sensors to collect data automatically. However, the users' subjective responses, such as "delicious" and "funny," cannot be included in the logs. Therefore, it is difficult for users to find logs because there are no tags or keywords that reflect their subjective viewpoints. Moreover, users cannot record detailed logs about their choices because it is difficult to extract information about choices from sensor data.

There are many researches that have attempted to make it easier for user to collect logs and search for them. For example, FoodLog [6] records photos of meals in log entries and calculates nutritional balance data automatically. However, it is impossible for the user to record information about dishes and restaurants that has not been selected because this system is narrowly focused on managing information about the nutritional balance properties of food.

2.2   Decision-Making Support System

There are existing researches and systems that have been designed in order to support decision-making processes. Kuramoto et al. [7] proposed a support

system for choices about restaurants. Their system draws out the user's preferences and needs as the user interacts with a variety of agents with different opinions. However, this system does not record histories of interactions with agents or the restaurants that users have chosen. Further, it does not use previous logs for future recommendations. Therefore, users are required going through the same process with agents every time they use this system. It is considerably inefficient for users to be unable to make decisions based on past decisions and experiences.

3   ChoiceLog: Life Log System Based on Choices

In order to solve these problems, we propose a new life log system that is referred to as "ChoiceLog." ChoiceLog records the options that users actually select and the options that they reject. It also displays recorded logs via searches and notifications in order to support decision-making.

ChoiceLog supports decision-making when a user faces similar choice events. It allows the user to reflect on past choices and other options that were rejected so that decisions can be made efficiently. ChoiceLog records logs that include the options that were available during a choice event. We refer to this log unit as a "choice selection" (e.g., "lunch," "color of cardigan") and refer to the selectable options in the log unit as "choices" (e.g., "hamburger," "chicken burger," or "cheese burger").

When a user wants to record a choice selection, the user inputs details about the choice in the ChoiceLog using text and/or photos. Then, the user enters checkmarks the options that were actually selected. ChoiceLog records the location data that is associated with this choice automatically. These features enable the user to search for data about past choices using text or location data. In addition, ChoiceLog sends automatic notifications to users about certain types of past choice selections that were recorded at locations that are near the user's current location. This type of notification does not require the user to input any text or actively search for data. As a result, ChoiceLog can reduce the burden on the user and prevent the user from missing a chance to benefit from the information in the ChoiceLog.

The following example shows how ChoiceLog can be used to enable effective decisions. One day, a man orders curry at a restaurant. A few days later, he visits the same restaurant and orders curry again. However, ChoiceLog displays a notification on his smart-phone about the past choices that he made at this location. When he sees the notification, he recalls that he wavered between selecting curry and beef steak and chose curry. Further, he remembers that he did not enjoy the curry. As a result, he decides to change his order and selects beef steak instead. In this situation, the user was able to make an appropriate decision because of the ChoiceLog and was able to avoid repeating the same mistake.

4   Implementation

4.1   Overview

ChoiceLog is implemented as an iOS application and uses the camera and GPS functions so that users can easily record data and store photos related to choice selections and perform searches based on location data.

When a user faces a choice event, the user launches ChoiceLog and records a choice selection using the following five steps:

1. The user enters a title for the choice selection in order to identify it.
2. The user enters details for each choice with text and/or photos.
3. The user enters checkmarks for the choice(s) that are selected.
4. The user decides whether location data is attached to the choice selection.
5. After the user enters the data that are mentioned above, ChoiceLog records them as a choice selection.

The user can delete a choice selection itself or change the name of a choice selection at any time. ChoiceLog includes a function for searching choice selection based on the entered keywords. Further, the user can search for choice selections that were previously recorded in the vicinity of the current location. These logs for previous choice selections are indicated by pins on a map. The user can also obtain information about previous choice selections in the current vicinity via automatic notifications from ChoiceLog.

4.2   Interface

Figures 1, 2, 3, and 4 show screenshots from ChoiceLog.

Figure 1 shows the "Top view" that a user sees first when launching ChoiceLog. In this view , the user can obtain a list of recorded logs that is ordered from newest to oldest.

If the user wants to record a new log, the user navigates to the "Add choice selection view" (Fig. 2) by clicking the top-right button. In this view, the user can enter the name of the choice selection and the choices that are available. When the user clicks the "add a choice" button, a new field is added in order to allow the user to enter the name of choice. The user can also capture a photo and attach it to a certain choice by clicking on the photo frame to the left of the choice. When the user clicks on the right edge of a text input field, the user can attach a checkmark to this field. Checkmarks are used to indicate the choices that the user actually selected. If the user wants to attach location data to a choice selection, the user turns the "Location" switch on. When the data have been recorded for the choice selection, the user clicks the "Done" button in the top-right corner of this view. This action returns the user to the top view.

The "Detail view" (Fig. 3) is displayed when the user clicks a choice selection in the top view. This view shows the name, time, and location for the previously recorded choice selection. It also displays the names, photos, and checkmarks for the choices that are related to the choice selection. In this view, the user can
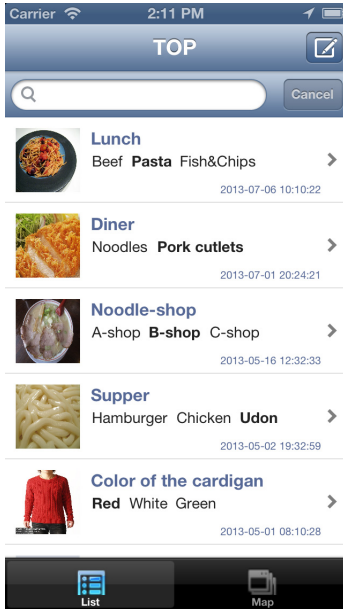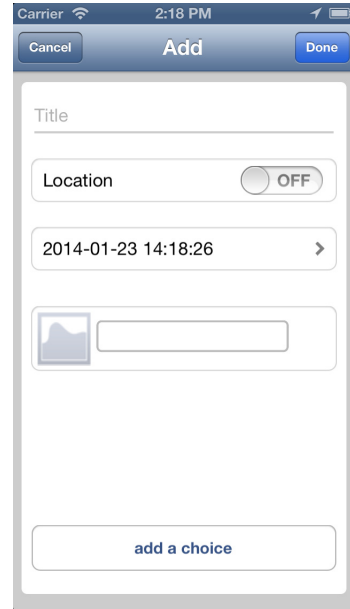
Fig. 1. Top view

Fig. 2. Add choice selection view

edit or update the data by clicking the "refresh" button in the top-right corner. The user can return to the top view by clicking the top-left button.

The "Location search view" (Fig. 4) is displayed when the user clicks the "Map" button in the lower-right corner of the top view or the detail view. The map and pins are displayed for the log that is associated with the location that is close to the user's current location. When the user clicks a pin, the name of the choice selection is displayed. When the current location in the view is incorrect, the user can update current location by clicking the "refresh" button in the top-right corner.

4.3   Notification

ChoiceLog uses the iOS Local Notification functionality to send notifications to the user about the choice selection whose location data is close to the user's current location. Figure 5 shows a notification for the choice selection for the "Noodle-shop." When the user clicks on this notification, ChoiceLog is launched and the detail view is displayed for the choice selection. ChoiceLog sends notifications about choice selections that are located close to the user's current location each time the user moves 50 [m].
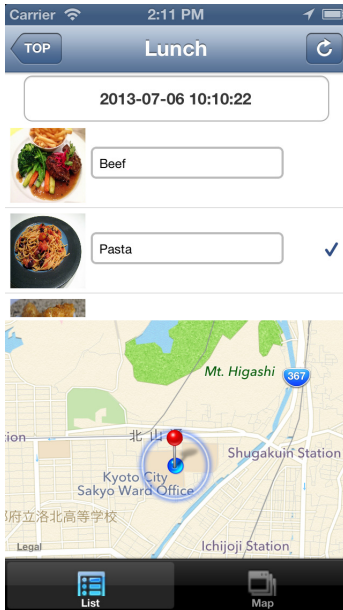
Fig. 3. Detail view

Fig. 4. Location search view

Fig. 5. Notification

5   Short-Term Evaluation

We performed an empirical evaluation in order to evaluate the usefulness, advantages, and disadvantages of the system based on the opinions of participants. We asked participants to use ChoiceLog in their daily lives during this evaluation. We used a prototype of ChoiceLog during this evaluation. The prototype included all the functions that are described in Section 3, except for the photo attachment function.

5.1   Procedure

We asked one teacher and four students who were majoring in information science to participate in the evaluation. We interviewed each of them in private after

they had used the prototype for one week. We asked the following questions during the interview:

1. Describe situations where ChoiceLog was useful.
2. Describe situations where ChoiceLog was not useful or a nuisance.
3. Were there items that you could not record even though you wanted to do so?
4. What new function(s) would you like to see added to ChoiceLog?

At the beginning of the evaluation, we told the participants that the experimenter could browse the participants' logs for evaluation purposes.

5.2 Results

The results from the interview were as follows:

(1) Describe situations where ChoiceLog was useful

- I felt that ChoiceLog was useful when I was wavering between several menu choices at the school cafeteria.
- I used ChoiceLog to decide what I should do next while entering the log data.
- I used ChoiceLog for reminders by entering information about tasks that I needed to complete at home or for school.

(2) Describe situations where ChoiceLog was not useful or a nuisance

- I felt the notification was not appropriate for my situation at that time.
- I had trouble when composing sentences about choice selections and/or choices.
- I had trouble while entering the name of choices.
- I would like to be able to attach comments to logs (e.g., This restaurant is not good.).
- I would like to be able to combine the logs for choice selections that are recorded at the same location.
- The current location on the map was occasionally incorrect.

(3) Were there items that you could not record even though you wanted to do so?

- I did not record logs because I was tired of entering text.
- I did not want to record some logs because of concerns about my privacy.

The answers for this question were similar to the answers for question (2). The participants pointed out that entering text was cumbersome. For the former question, we also asked what type of situations caused them to feel tired. The answers were as follows:

1) Entering text was simply dull.
2) There was insufficient time to enter text for logs. For example, one participant was with a friend and another wanted to enter a log, but the train had just arrived.

(4) What new function(s) would you like to see added to ChoiceLog?

- I would like to receive notifications about choice selections related to the current time of day.
- I would like to be able to search logs based on the type of choice selection such as "drink," "restaurant menus," "foods," and other relevant categories.
- I would like to be able to use templates for entering text about a choice selection and choices.
- I would like to be able to record logs using voice input.
- I would like to be able to check other people's data for the current location.
- I would like to be able to access logs from other people that are similar to my logs.

5.3   Discussion

From the results for question (1), we concluded that ChoiceLog is useful for decision-making for choice events that occur frequently, such as making menu selections in a school cafeteria. However, the experiment did not highlight any other situations where ChoiceLog was useful. This was probably due to the short, one-week length of the experiment. Because of this short time period, the participants could not record log data a sufficient number of choice selections and they did not have adequate opportunities to be reminded about previous choice events. Therefore, there were insufficient choice selection logs to support decision-making. A long-term experiment is needed in order to confirm the usefulness of ChoiceLog as a decision-making support system.

However, there were some cases where the participants used ChoiceLog for other purposes. For example, some of the participants used the ChoiceLog to record to-do lists and reminders. We plan to consider other uses for ChoiceLog in a future work.

In addition, there are some improvements that are needed for the long-term use of ChoiceLog. From the result for questions (2) and (3), it can be seen that users felt that entering text for logs was tedious and difficult. It is important to make the text entry process simple and easy. If it is not easy, the users might stop entering choice selections. This could lead to failures during decision-making owing to the lack of valuable logs. We expect that the addition of a photo capturing function will improve the usability of ChoiceLog.

The results from questions (2) and (4) suggest that it is essential to send notifications that are suited to the user's current situation, based on time and location.

6   Long-Term Evaluation

We performed an empirical evaluation in order to evaluate the usefulness of ChoiceLog as a decision-making support system. This evaluation was based on actual cases where the system was used. During this evaluation, we asked participants to use ChoiceLog in their daily lives. In order to solve the problem with small numbers of logs that is described in 5.3, we conducted the evaluation over a long-term period of about 6 months.

The participants used a version of ChoiceLog that included some of the improvements that are mentioned in 5.3. These included

1. the implementation of a photo attachment function in order to make ChoiceLog less reliant on text input,
2. the implementation of an editing function for changing the names of choices,
3. the optimization of the timings of notifications, and
4. fixes for bugs.

6.1   Procedure

Six subjects participated in this evaluation, including one teacher and five students who were majoring in information science. They used ChoiceLog for six months and were interviewed every two weeks. During the interviews, the participants were asked to describe situations where ChoiceLog was helpful or unhelpful. We asked the participants to capture screenshots of ChoiceLog so that they could remember the situations where they felt that the information or notifications in ChoiceLog were helpful or unhelpful.

6.2   Results

There are five cases that were obtained during the interviews:

Case 1 (HELPFUL)

One day, a participant was wondering whether to purchase her usual item or the seasonal special at a confectionery shop. Because she was considering the choices, she launched ChoiceLog and searched for a log from the list. She remembered that the seasonal special at this shop had been delicious when she had visited before. Therefore, she decided to purchase the seasonal special.

Case 2 (HELPFUL)

Before lunch time, one of the participants wondered whether to order lunch from shop A or shop B. When he considered the possibilities, he recalled that he had recorded logs about these shops in ChoiceLog and he had not liked the lunch he ordered at shop A. Therefore, he decided to order lunch from shop B.

Case 3 (UNHELPFUL)

At about noon, one of the participants received a notification from ChoiceLog as she was walking near a station. The notification was about a beer that she had purchased at a restaurant near that station. She felt uneasy about this notification because she did not want to receive such notifications during the daytime.

Case 4 (HELPFUL)

When one of the participants started to cook dinner using items in the refrigerator, he recalled that he had recorded a log about the dinner that he had cooked two days ago. He searched for the log for that dinner in a list in ChoiceLog and found the dinner menu for that day and others as well. Therefore, he could cook dinner using the other menu.

Case 5 (HELPFUL)

When one of the participants walked by a shop, she received a notification from ChoiceLog. The notification was about an item. She had been confused about which of the two items to purchase. She had bought the former item. The log was recorded ten days prior. Because of this notification, she was able to recall that she needed to purchase the item and that it had been out of stock previously. In this case, she did not purchase the item immediately because she did have adequate time. However, she purchased it the next day. Because of ChoiceLog, she was able to remember that she had to buy an important item.

6.3   Discussion

ChoiceLog was useful for decision-making in cases 1, 2, 4, and 5. Based on cases 1 and 5, we found that ChoiceLog can support the decision making process when there is a large number of choice selection logs, as mentioned in 5.3.

In cases 1, 2, and 4, the participants recalled the contents of previously recorded logs when they searched for or referred to the logs for decision-making purposes. This suggests that the mere act of recording choice selections makes it easier for participants to recall previous situations where they faced similar choices. However, it can be difficult to perform efficient searches for logs for choice events from the distant past.

This is because the user may forget the data that are recorded in ChoiceLog or the volume of the log data may become large. The results from case 5 suggest that the notification function in ChoiceLog may serve as an effective of as a solution against this problem. If the period of evaluation was longer and the number of logs was larger, we might be able to determine the effectiveness of the notifications for decision-making.

Based on the results from the long-term evaluation, we found additional areas where ChoiceLog can be improved. In case 3, the user wants to suppress certain notifications because they are not appropriate for her current situation. This result indicates that ChoiceLog should allow users to control notifications using filters that are based on dates and times.

In addition, some participants wanted to receive notifications based on their current location. For example, some users do not wish to receive any notifications when they are at their office or home, but want to receive notifications when they are shopping. Therefore, ChoiceLog should allow users to determine the locations where they want to receive notifications.

Some often, participants wanted to be able to select preset tags or user-customizable tags when they are entering titles of choice selections instead of being required to enter text for the title. Implementing this change would make ChoiceLog effective. It would make it easier for users to record and search for logs and it would make the titles of notifications more meaningful as well.

7   Conclusion

We proposed a new life log system called "ChoiceLog" for supporting decision-making processes. ChoiceLog can record the choices that users actually select and the choices that they reject. It can also display recorded data via searches and notifications in order to support decision-making when users are faced with similar choice events. ChoiceLog includes three main functions. It records choice selections with text and/or photos. It displays choice selections based on searches by keywords or locations and it notifies users about certain choice selections that were recorded at locations that are close to the user's current location.

We implemented ChoiceLog as an iOS application and evaluated its usefulness. During the short-term evaluation, we found that ChoiceLog was useful for decision-making for choice events that occurred frequently. However, we found that, owing to the short-term nature of the experiment (i.e., one week), the only place where the participants found that the ChoiceLog was useful was in the school cafeteria. During the short-term evaluation, we received input regarding potential improvements. Therefore, we improved the process for entering choice selections.

Further, we conducted a long-term experiment in order to confirm the usefulness of ChoiceLog as a decision-making support system. We found cases where ChoiceLog can be useful for decision-making during choice events. We found that ChoiceLog could support user decisions in cases where there are a large number of choice selection logs. However, it can be difficult to perform efficient searches when there is a large volume of log data. In order to solve this problem, we are planning to make it possible to filter notifications from ChoiceLog based on the date, time, and preset or user-customizable tags.

We are planning to include further evaluations of the usefulness of ChoiceLog in a future work after the introduction of these improvements.

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