Development and Evaluation of an Exhaustive Recording-Retrieving System of Daily PC-related Activities

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Abstract

We have developed an exhaustive recording-retrieving system, which records the entire activity of personal computer use by storing screen images and various types of textual information. By keyword search and browsing, users can retrieve useful information from the record and utilize it for their current problem solving. Three users tested this system in daily basis for 6 to 12 months. Although they did not utilize the system as often as expected, the instances were positive, and the overall results indicated the potential usefulness of this system.

Introduction

It is often the case that the activity in the past problem solving is somewhat similar to the one in the current problem solving. This is why the record of the activity in the past problem solving is sometimes useful for the current problem solving. The activity on personal computer is no exception. Based on this, we have developed an exhaustive recording-retrieving system that records the whole activity of personal computer use.

There have been many systems that record various aspects of human activities. Recording of what users do is a rather common practice in many applications. For instance, a web browser such as the Internet Explorer records what pages a user has visited while browsing and provides the list of those pages as a "URL history" to the user. In the MyLifeBits project, a platform was proposed to archive every aspect of personal life as much as possible (Gemmell, Bell and Lueder 2006). Although recording is not rare in many systems, it is not exhaustive in the sense that entire activity of problem solving is not recorded exactly. We believe that recording should be exhaustive if it is used for facilitating future problem solving for the following reasons.

The primary reason for the necessity of exhaustive recording is that the activity of problem solving consists of component activities, which are closely related to each other. In fact the real problem solving activity on personal computer involves multiple applications software. For instance, if you face a problem of network printer and try to fix it, you may have to use a network diagnosing program to see the current state of the network, you may also want to use web browser to find out similar problems reported in some web pages and you may want to contact your friend by e-mail to get suggestions on how to fix the problem.

Since our logging system exhaustively records the entire activity on personal computer use, once you locate the activity of similar problem solving in the records, you can restore exactly what you were doing in the context. This means you have better chances to get information you want. If each component activity is separately recorded, as is the case in existing applications, it is difficult to restore the actual sequence of trials used in the problem solving.

The other advantage of exhaustive recording is that it provides more keywords for searching than other individual recording. Since entire set of activities for a particular problem solving is recorded in a closely related way, any applications that were involved in the problem solving provide potential keywords for locating the problem solving in the record. Suppose you want to retrieve a particular command name for diagnosing a particular network state and you know you used it in the similar situation in the past. What you have to do is to locate the problem solving activity in the record by keyword search and to inspect the record to find the command name. Since various applications were involved in the problem solving, such as web browser, terminal software and email handler, many potential keywords are available in those applications software. In the case of individual recording separately done in each application software, words used in one application such as a web browser do not necessarily work well for searching the command prompt window.

In summary, the unique property of this proposed system is the integration of what is already available on each independent application. By integrating them into one system, more contest-oriented search of useful record, embedded in the flow of activities across different applications becomes possible.

Implementation

In order to record continuously the entire set of activities of the computer use across different applications, we need to minimize the amount of storage required for. This problem is overcome by taking the screen image every 10 seconds. In this way, the amount of storage required for logging is considerably reduced but still we can restore an activity

from the logged data at length. Actually, the quality of stored screen image is as good as the original screen image.

Besides the screen images taken at every 10 seconds, various types of textual information are recorded all together, such as keystrokes, copied contents of clipboard, window operation and mouse operation. This textual information added to the record play an important role for the keyword search when users try to locate an activity in the database. We call this recording part of the system NecoLogger.

In order to make use of the recorded data, the system provides the users with a retrieval support and with the proper views of searched data. Specifically, a keyword search system is implemented and the corresponding views are provided, one of which is the thumbnail view of screen images for browsing shown in Figure 1. We call this retrieving and displaying part of the system Retrospector.

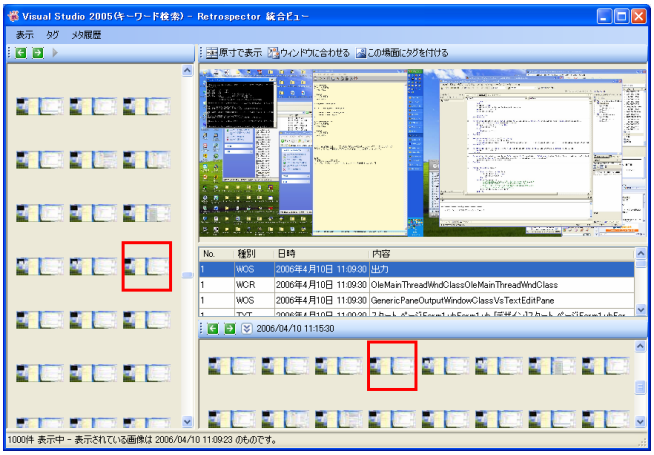

Figure 1: Thumbnail view of screen images.

Result

We evaluated this recording-retrieving system in natural settings. Three personal computer users were asked to use this system all the time when their personal computers were on. They were encouraged to use the system whenever appropriate. The test period for this evaluation varied from half a year to one year depending on the users. We collected informal reports from them several times on how they had used the system.

Based on their reports we collected 12 cases in which they used the system successfully. Three cases out of the twelve cases demonstrate the strength of this system. Namely, multiple applications were involved in those three cases. In the other nine cases, a single application was involved.

One of those three cases was the following. Facing a network problem, a user of the system noticed that he had solved the similar problem several months before, so he used a command name as a keyword and he successfully located the activity of solving the network problem in the record. He then inspected the other activities he had been engaged in at that time by examining through the screen images one by one and collected variety of information that he needed. Specifically, he got several network diagnosing commands and web pages that contained useful information to fix the problem at hand and detailed procedures of how to fix its.

Another interesting case was building a free software system. Knowing that he had built the same software system in the past, by using the name of the free software as a keyword and approximate period of building system, he could easily locate the target activity in the logged record. He then browsed the other activities and collected useful information such as building options from the scene of chatting with his friends.

Discussion

Although there were only a few cases in which multiple applications were involved, the overall results have shown that this system is promissing.

The number of times this system was used was less than we expected. One reason for this would be that users were not familiar enough with how to utilize this system and missed the occasion where it could have been used. Another reason would be the scarcity of textual information. In the current implementation of this system, textual information displayed in windows such as web pages is not recorded. This would decrease the usefulness of this logging system. We plan to include more textual information in the future implementation.

Conclusion

We have developed an exhaustive retrieving-recording system that records the entire activity on personal computer uses. Three users tested this system on daily basis for 6 to 12 months. Although they did not use the system so often as we expected, the overall results showed the potential usability of this system and the future direction of our research.

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References

Gemmell, J., Bell, G. and Lueder, R.(2006) MyLifeBits: A Personal Life for Everything. *Communication of the ACM*, 49(1), 89-95.