

STRUCTURAL REPRESENTATION OF PERSONAL EVENTS

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ABSTRACT:

Now we are developing a wearable recording system which can capture images from user's view point in user's everyday life automatically. The user refers to the images which is acquired using this system later, and these images support a user's activity, such as human memory and human thoughts. Amount images which are acquired becomes so huge that it is difficult for the user to refer them. So the mechanism for viewing effectively is very important, such as summary. In this research, we describe the concept for summary mechanism of everyday life images.

1. INTRODUNCTION

We aim at developing the system, which can record people's everyday life as information and reuse the information, to be able to support people's memory and thoughts[1][2][3][4]. The behavior image of the everyday life is acquired and recorded as a view-point image. This system has a mechanism which it can acquire images selectively (Figure 1).

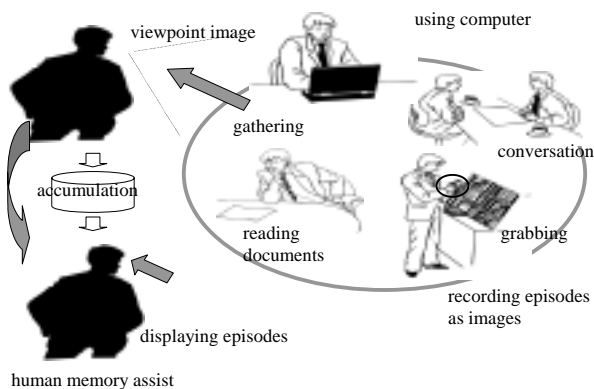


Figure 1 Record everyday life and reuse.

The image record is considered as important for user, but the data volume is too much to look through all acquired data exhaustively. Therefore, effective accessing methods to the data would be the key. One of the effective accessing method is the search system to extract necessary information for user from the recorded image data and another one is the summary system to select and restructure the recorded image data to make easy to acquire the information.

In this study, we examine the latter system (summary system) and the designed concept about the system presents summarized information to user by structuring the image.

2. EVERYDAY LIFE RECORDING AND GIVING ATTRIBUTED INFORMATION

2.1 Everyday life recording system

2.1.1 Hardware of everyday life recording system



Figure 2 Hardware of wearable everyday life recording system: (upper part):outside appearance/(lower part): head mount camera

The behavior image of the everyday life is acquired and recorded as a view-point image by equipping user with approximately 10mm diameter of head-mount camera. Figure 2 shows this system.

The head-mount camera acquires the 15 view-point images per seconds, and recorded images are transmitted to the server

computer for data accumulation through wireless LAN. Figure 3 shows a block diagram of this system.

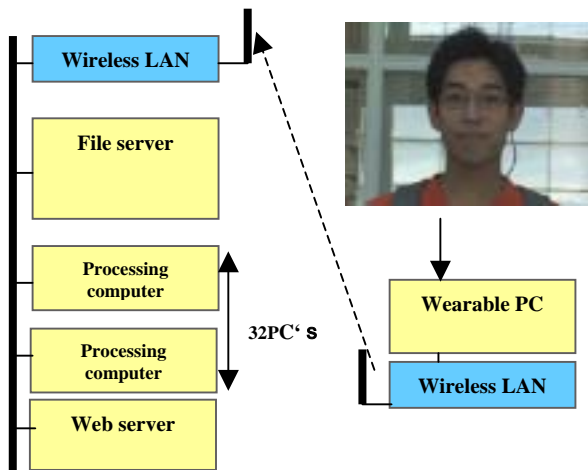


Figure 3 Block diagram of wearable everyday recording system.

2.1.2 Extraction of staring scene

The part what the user comparatively and stably stares in the acquired image by this system assumes, "meaningful scene for the user (hereinafter called as staring scene)" and extract it. It is determined if the image is staring scene or not by using

similarity between near frames of the images[5]. Similarity between two frames with the interval of several frames means below:

1. Similarity is high if a user is looking at same spot, and we assume this type of scene is meaningful.
2. Similarity is low if a use is moving his eyes, and we assume this type of scene is meaningless.

Figure 4 shows this process.

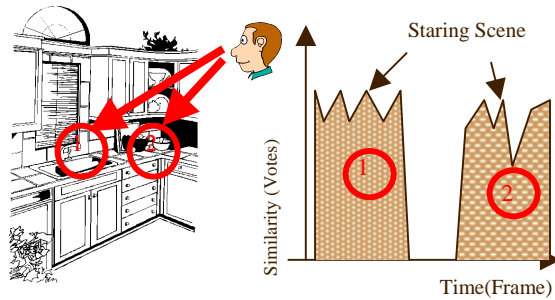


Figure 4 Extraction of staring scene.

The image which is the most similar to images at near frames is assumed as "a typical image in a scene". Figure 5 shows the example of results about extraction of staring scene.

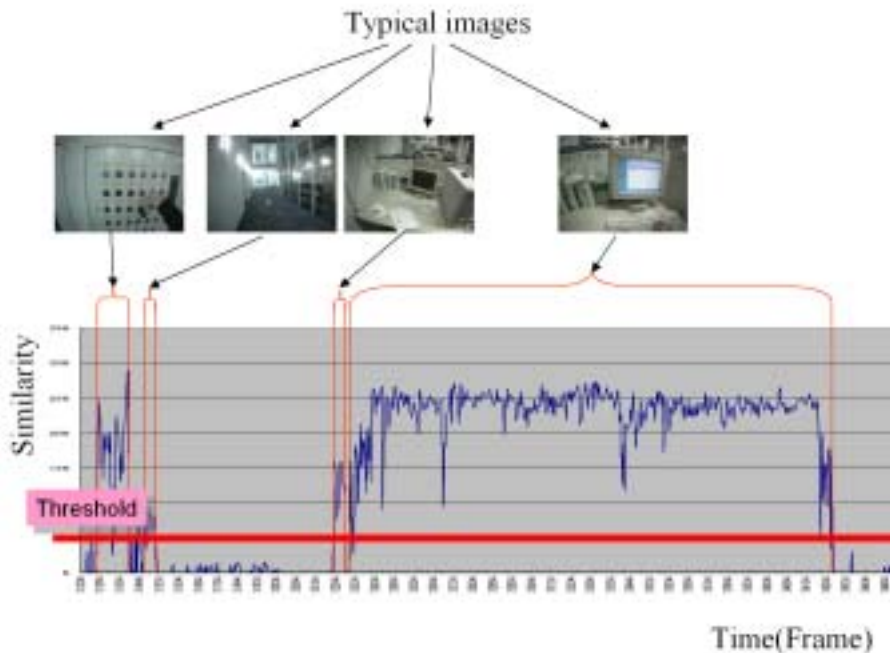


Figure 5 Example of results about extraction of staring scene.

2.2 Giving attributed information

We give attributed information related to the spot and behavior of image data to staring scenes. We give the attribution of the place by using the similarity between the typical images as same as the case of seeking the staring scene, that is:

1. If similarity of two typical images is high, the attributed information related to the spot of these scenes are the same.
2. If similarity of two typical images is low, the attributed information related to the spot is different from the other.

Figure 6 shows the process in order to give attributed information related to the spot.

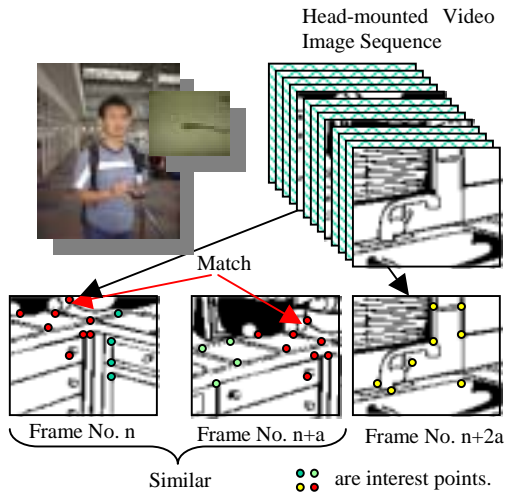


Figure 6 Attributed information related to the spot.

Moreover, attribution of the behavior is given as following: we extract the skin-colored area from the view-point image by using color information, and considered the area as part of "face" or "hands". The scene which includes the "face" is considered as having "conversation", and the scene which includes the "hands" is considered as having the behavior of "grabbing" (Figure 7, Figure 8). The acquired behavior is given as the attribution to the image data[9].



Figure 7 Scene which includes the "hands".



Figure 8 Scene which includes the "face".

After taking the abovementioned procedure, the image recorded data is put away in the server computer.

3. ACCESS CONCEPT TO RECORDING IMAGE DATAS

The image recorded data is put away in the server computer after the attribution information is given to them. the data volume is too much to look through all acquired data exhaustively. Therefore, effective accessing methods to the data would be the key.

One of the effective accessing method is the search system to extract necessary information for user from the recorded image data and another one is the summary system to select and restructure the recorded image data to make easy to acquire the information. We focus the summary mechanism.

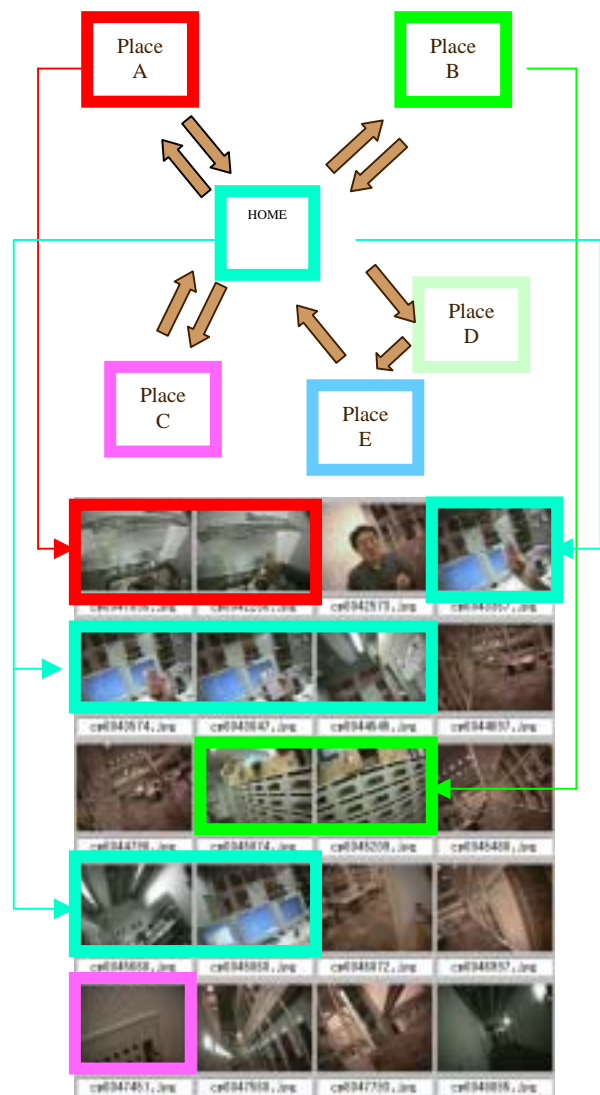


Figure 9 Characteristics of everyday life, "home" and "repetition".

It is necessary to determine the information, which is the keys of structural adjustment, to realize structuring the image. It is not easy to extract the keys of structural adjustment in the case

of everyday life image, in different from news, movies, TV dramas and other programs used high-level editing technology. Moreover, the summarized information in everyday life image that is necessary for the user is not always same. Therefore;

1. The system must be adaptable to individual life-style.
2. Necessary information is changed with time passage.

Keys of structural adjustment must be adaptable to these abovementioned factors. From analysis of the records, we found the characteristics of everyday life, "home" and "repetition" (Figure 9). Everyday life records are divided into three types, "home", "moving", and "the other places excluding home". Therefore, we introduce the concept of "home" as a key of structural adjustment for everyday life.

In most of the case, a user spends a lot of time in a certain spot. We name the spot where the user exists with high

probability as "home". We observe the characteristic that the user goes and comes between "home" position and other spots in most of the cases (repetition characteristic). We attempt to make structural adjustment of everyday life image by using the concept of the "home". We basically summarize the everyday life with the time passage when we summarize our own everyday life, but on the other hand, we handle the matters in "home" collectively with the expression of "in our spare time".

The concept of the summary which we presented agrees to the summarizing method we usually use in our everyday life. The abovementioned difference of life style by individuals and time passage can be explained with the "change of home".

Figure 10 shows an example of the result of summarization.

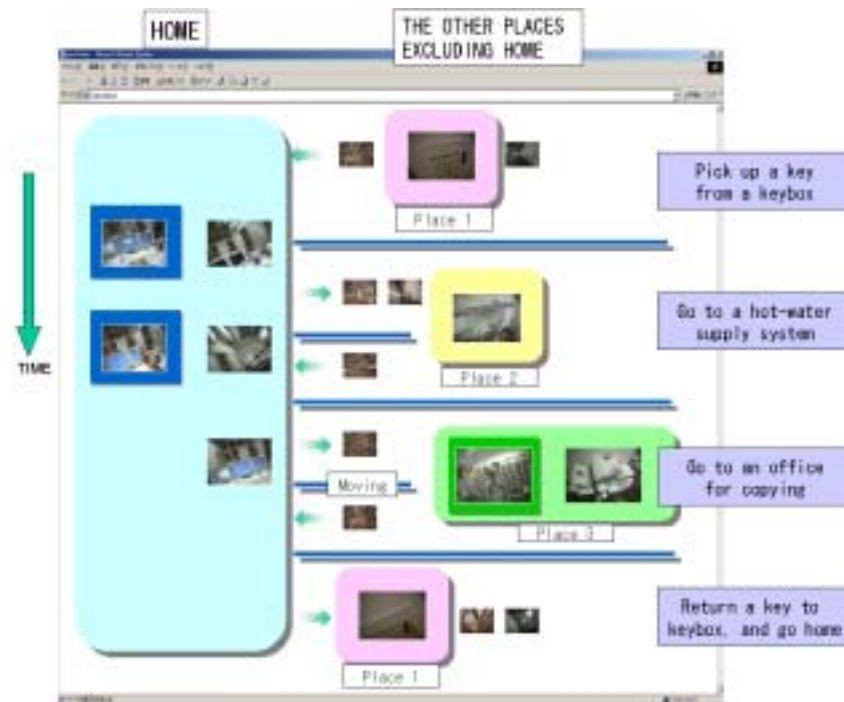


Figure 10 Example of summarization result.

In this example, a user takes action in accordance with a following scenario:

- (1) A user goes to school.
- (2) The user picks up a key of user's room from a keybox.
- (3) The user moves to user's own room.
- (4) The user enters user's own room, and uses a computer.
- (5) The user goes to a hot-water supply system room with a pot, and puts hot water into the pot.
- (6) The user goes back to user's own room, and uses the computer.
- (7) The user goes to an office, and uses a copying machine.
- (8) The user goes back to user's own room, and uses the computer.
- (9) The user makes an exit from user's own room, and moves to the keybox.
- (10) The user return the key to the keybox.
- (11) The user goes to home.

Figure 10, the scenes shown in bigger size are the places of defined behaviors. Furthermore, "home" is arranged at the left,

and "the other places excluding home" at the right. The arrow represents the back-and-forth between the two.

In the result of summarization, the time flows from top to bottom. In "the other places excluding home", time flows from left to right and right to left simultaneously. For example, the arrow points to the left at the first line whereas it points at the right at the next line. Additionally, we considered the user moving between the bigger sized scenes and showed them in small pictures.

4. EXPERIMENT

We actually gather the behavioral image record and summarized the image to examine the effectiveness of proposed system as following the designed concept as abovementioned. A testee is a student of Future University Hakodate (FUN). The testee was equipped with the everyday recording system which is described in Section 2, and took action in various places of FUN. We recorded about 40 minutes

everyday life images, and analyzed them. The experimental environment is shown in Figure 11.

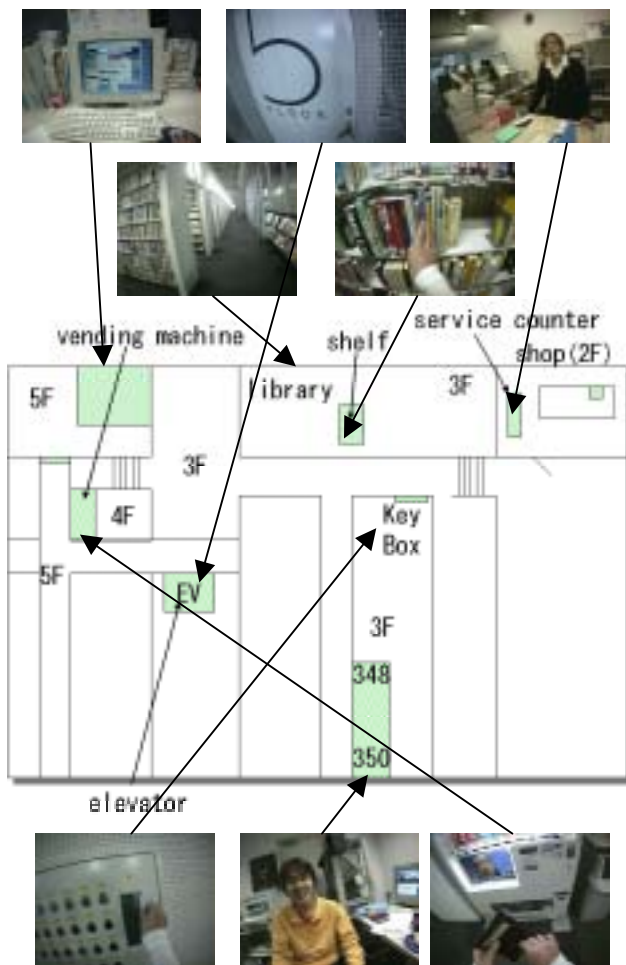


Figure 11 Experimental environment.

5. CONCLUSION AND FUTURE WORK

In this research, we described the designed concept for summary mechanism of everyday life images to grasp them roughly. Everyday life images are edited and arranged spatially using the characteristics of everyday life, "home" and "repetition", which we found about. Through these processes, we could acquire summary information of images.

For the next step, we are considering the evaluation of this summary method. In order to do this, we need to apply the proposed method to the samples of everyday life recordings which the number of people is increased and the time of experiment is extended.

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