

exPhoto: a Novel Digital Photo Media for Conveying Experiences and Emotions

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Abstract

We previously reported u-Photo[2] that is a digital photo image that emb information about networked appliances and sensors in ubiquitous computing environment. A concept of u-Photo is intuitive interactions, remote operations and service reproductions. Now, we propose a digital photo media exPhoto for recording and recreating user's emotion and surrounding environment for conveying user's experiences. User can easily record experiences in taking a photo by the exPhoto Camera. Moreover, user can look back in detail own experiences by using the exPhoto Viewer. We demonstrate that a novel digital photo media for snapping and conveying experiences and emotions.

1. Introduction

The spread of information technology such as WWW has provided us a new way to enjoy photograph. Through various online photo management systems, we enjoy publishing our experience and touching unknown world. This phenomenon greatly shows the potential of photo media. Recently, many researchers have paid attention to enhance photo's ability to record users' experiences. For example, many research tried to add various environmental information as meta-data of photographs such as temperature, sound, location, etc.[1]

However, there remains following two problems to enhance photo media; (A) the way to record the user's emotion, and (B) the way to reappear the captured user's emotion or environmental information. One of the purposes of taking a picture is to capture user's experience. Therefore, to record user's emotion is important for photograph in the future. At the same time, reappearing captured experiences is also important for looking back or sharing user's experiences. Only showing the sensor data on the display does not provide intuitive understanding of experiences.

In order to attack these problems, this paper proposes exPhoto, an new augmented photo media to store the user's experience including the user's emotion. In addition, we also developed exPhoto camera which can record and reappear the users' experience as exPhoto media. Through these tools, users can look back or share their experiences in detail.

2. exPhoto

The major feature of exPhoto is snapping contexts, such as user's emotion and surrounding environment to the photo image at a time. A further important feature is conveying user's experience intuitively. When a user takes a digital photograph, exPhoto system acquires a user's heart rate and

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the environmental information, such as sound and temperature, when taking a picture by camera and sensors. The context data is written in the comment area of the JPEG file. When a user views the photograph, the exPhoto recreates the image and the environmental sound, and expresses the temperature and the pulse of photographer's heart by motor vibration.

2.1. Capturing User's Emotion and Surrounding Environments

exPhoto system acquires user's emotion and surrounding environment in using a Ultra-Mobile PC equipped with multiple sensors. Therefore, users can collect sensor data in many places by carrying this device. Moreover, exPhoto extracts user's emotion from a vital sensor. As a vital sensor, we adopt heart beat sensor. Although traditional methods to get emotion and surrounding environment, such as writing a note and tagging a photograph, can hold user's emotion, these methods need users to halt and require key inputs when a user takes a picture. Using other vital sensor, such as a brain wave sensor or a skin temperature sensor, are difficult to use for wearing sensor and detecting change in data. For example, it is difficult for users to go on a trip with an brain wave sensor and to take a pictures. In addition, we create a prototype and study how effective this method for extracting user's emotion by heart beat sensor.

2.2. exPhoto Media Format

Acquired data are saved in the exPhoto media format. This format is based on a JPEG format, with an XML description of sensor data in the comment area. In addition, digital still images are suitable to carry and distribute. For example, once a user takes an exPhoto, he can send it to friends by attaching it to e-mail.

2.3. Recreating User's Emotion and Surrounding Environments

In order to recreate user's emotion and surrounding environment based on the acquired sensor data, when a user views the photograph, the exPhoto recreates the image and the environmental sound. In addition, peltiert device and motor express the temperature and the pulse of photographer's heart by motor vibration. Period of vibration changes depending on the heart rate of the user that has taken the photograph. In this way, a user can intuitively look back own experience and convey at various places and time. Moreover, to display the photograph one by one automatically, the slide show tells the change in time and the situation in detail to the user.

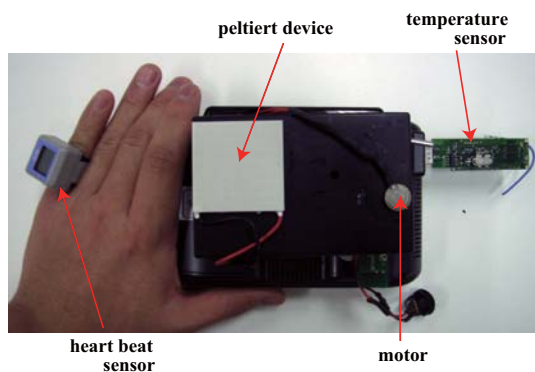


Figure 1. Prototype of exPhoto Camera

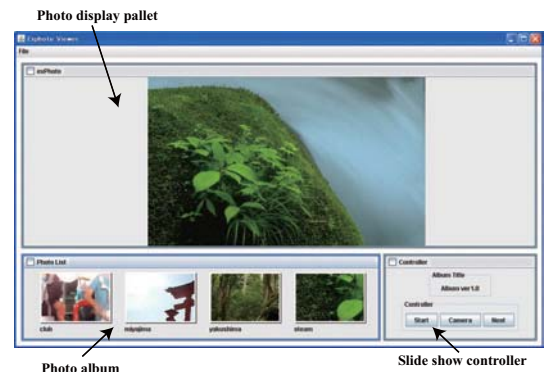


Figure 2. exPhoto Viewer

Table 1. exPhoto Camera

PC	Vaio TypeU (VGN-UX91NS)
sensor	heart beat, temperature sensor
actuator	motor, peltiert device

2.4. Hardware

exPhoto system is composed of exPhoto Camera to take a picture, exPhoto Viewer that reproduces the photograph, and the actuators that conveys the temperature and the vibration. These function are implemented on Vaio Type-U with equipped sensors and actuators. We designed and implemented a prototype of exPhoto on a SONY Vaio Type-U mobile PC with the sensors and the actuators described in the previous section. With a exPhoto Camera shown in Figure 1, a user can record and recreate his experience. These sensors include ambient temperature and heart beat sensor, and we used micro controller PIC16F88 attached with peltiert device and a motor for recreating ambient temperature and user's emotion respectively.

3. Applications

We demonstrate three applications in our prototype of the exPhoto system. In each demonstration, attendees can experience taking, viewing an exPhoto, and sharing user's experience by exchanging exPhoto data.

3.1. Application 1: Recording user's experience

A basic use of exPhoto system is to record digital still image, sound, ambient temperature and user's heart beat. When a user wishes to record user's experience, a user simply focuses on exPhoto camera and takes an exPhoto. A user can record his/her emotion and surrounding environment just by pushing the shutter button. For example, when a user goes to a music concert and take a picture, he/she can record ambient temperature rise, the sound, and increase in heart rate.

3.2. Application 2: Looking back on user's experience

Looking back on user's experience from recorded data is the second demonstration. When a user wants to remember an experience, he operates an exPhoto Viewer. The exPhoto Viewer holds a set of taken photographs as an album, and reproduces the photograph. In the prototype implementation of exPhoto Viewer shows in Figure 2. A user can play back exPhoto images by dragging an album to a Photo Display Pallet. On pushing start button in a Slide Show Controller, the sound is played by the exPhoto device, the temperature is reproduced from the peltiert device, and user's emotion is reproduced through the vibration motor equipped in exPhoto Camera. A user can perceive the ambient surrounding where the picture is taken by the touch, therefore the technique of exPhoto is intuitive.

3.3. Application 3: Sharing experiences with others

The last demonstration is sharing experiences among the participants. The current use of the photography is not only taking a photo but also exchanging and distributing it. The systems that supports

recording and recreating user's experiences should be adjusted to usage scenes. We demonstrate an application that downloads photographs taken by the exPhoto Camera from Flickr[6], and shares user's experiences with exPhoto Device. For example, we can share not only beautiful scenery of California, but also the sound and a high temperature in the place. This function supports to tell the experience.

4. Related work

There are similar researches that share a part of our motivation. SenseCam[4] is a wearable still camera that records a series of images and captures a log of sensor data. A user recollects the experiences by reviewing these images and the sensor data. However, a user should imagine the situation when taking a picture from the graph of sensor data. exPhoto intuitively expresses this situation by exPhoto Camera.

Context photography[3] captures context when the picture is taken, by sensing physical input in addition to light and representing it visually in real time. Context photography is similar to the exPhoto in the point of capturing context or sensor data when the picture is taken. However, how to feel visual effects depends on a person, visual effects cannot convey the situation when taking a picture in detail.

5. Summary

We proposed a system named exPhoto to record and recreate user's experience. The exPhoto Camera captures image, sound, temperature, and user's heart beat. The exPhoto Viewer provides the image when a user has taken the picture. Moreover, the actuators provide ambient temperature and user's heart beat intuitively. We show the exPhoto system and some applications, and attendees experience taking, viewing and sharing the experience with the system. The future work includes the following: transmission technique of emotion such as sound, selection of reproduction equipment such as multiple contexts are conveyed with one actuator, extraction technique of emotion such as using multiple vital sensors.

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