

# u-Photo Tools: Photo-based Application Framework for Controlling Networked Appliances and Sensors

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## ABSTRACT

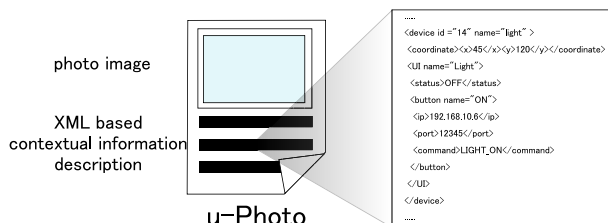
u-Photo[1] is a digital photo image which includes information about networked appliances and sensors in ubiquitous computing environment. u-Photo Tools provide the method for generating u-Photos and the method of viewing u-Photos. Users can easily lookup information about networked devices using “taking a photo” metaphor provided by u-Photo Tools. Moreover, users can intuitively view the information and control the device using photo-based GUI. The key of this research is our novel media, u-Photo. u-Photo records the status of the service(e.g. status of playing video or sensor information), and we can easily share devices by sharing u-Photo.

## Keywords

photo-based application console, networked appliance, networked sensor, ubiquitous computing.

## U-PHOTO

In a ubiquitous computing environment, there would be a lot of services provided by networked devices such as networked appliances and sensors. These services can provide much information to users or other services. To connect and use the services, users should know some information such as IP address, and service type about the services.



coordinate of the devices in the photo image.

## DEMONSTRATIONS

We show three applications to illustrate u-Photo Tools. In each demonstration, attendees will experience taking, viewing a u-Photo, and controlling target devices shown in Figure 3.



Figure 3: Taking a u-Photo

### Hardware

In our demonstration, we use a PDA attached with a CCD camera, two laptop PCs, a light that can be controlled from the network, and a small size network printer. These devices are connected with each other by a wired or a wireless network. Visual Markers for image processing are attached to each device. As for network sensor units, U.C. Barkley Mica2s[2] are used.

### Applications

We will demonstrate the following three applications using u-Photo Tools.

*Application A: Controlling Devices using u-Photo* Our first demonstration is device controlling through u-Photo. We use a light and a printer as the devices. If a user takes a u-Photo of a light and open it using u-Photo Viewer, an “light icon” will be displayed on the top of the light image. By clicking the icon shown in Figure 4 and clicking the menu of “Service” again, the GUI that shows application menu of the light will be shown on the display. The user can control each device from this control panel. In the case of device which needs contents such as videos, audios, and printers, a user can use the metaphor of “drag-and-drop” of files to a device icon. If a user drags a printable file and drops to the “printer icon” in u-Photo, the file will be printed.

*Application B: Indicating Environmental Information* Getting environmental information from sensors is the second demonstration. Users can know the environmental information of a room when they take u-Photo and monitor current environmental information using u-Photo. No visual markers are attached to Mica2 because we assume that each sensor is embedded to environment. In this condition, environmental information can be looked up in “near an appliance” or “whole room”. In a prototype implementation of u-Photo Viewer shown in Figure 4, users can get environmental information near the light by clicking light icon and “Status” button. In-

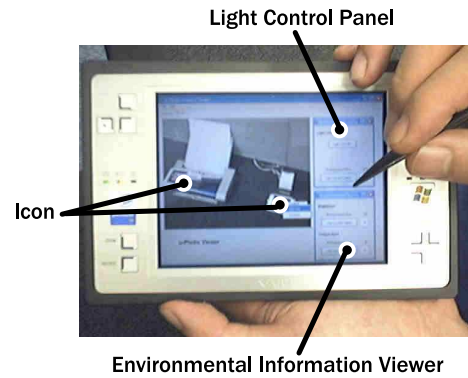


Figure 4: u-Photo Viewer

formation in the whole room is shown in the bottom of the screen.

*Application C: Suspend/Resume User's Task* The last demonstration shows a task migration of playing a video between different devices. In this demonstration, we assume that a user takes a u-Photo of the TV screen on which a video is played before leaving that place and plays the rest of the video on a different display using the u-Photo afterwards. In this application, the Wapplet[3] is applied to transfer media data on the network. We use two PCs as the source and the destination of migrating video. As the way to migrate tasks, u-Photo Viewer provides the method of destination device lookup.

## SUMMARY

We have designed a suite system named u-Photo Tools to lookup and use services running on networked devices. u-Photo is a digital photo image including contextual information of services. u-Photo Creator provides easy service discovery and u-Photo Viewer provides intuitive service using. We present u-Photo Tools and some applications at Ubi-Comp 2004, and attendees will experience taking, viewing a u-Photo, and controlling target devices.

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