u-Con: A Smart Space Remote Control System

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This paper describes a remote control system for a ubiquitous environment - u-Con system. The u-Con system enables a user to control remote appliances via a network. The user can control the appliances by a clickable picture which is displayed on a controller such as a tablet PC and a PDA. The user can dynamically select the feedback device to verify the status of the controlled appliance.

1 Introduction

In ubiquitous environment, a user can access and control various appliances via a network by using the controller such as a cell phone and a PDA [1–3]. One of the problems is that the controller cannot provide the progress of the operation to the user easily. Also, the user cannot verify the progress or a result using other types of appliances instead of the originated controller. This problem is critical when the operation requires a visible progress information with a picture rather than a text based message. For example, the operation such as watering a flower, and adjusting a light is desirable that the progress is provided with a picture.

2 Design of u-Con

To overcome the problem, we designed u-Con system that has an independent control and feedback component. The user can control the appliances by a clickable picture and transfer the progress and the result of the operation to a powerful appliance such as a public display.

The overview of the u-Con system is shown in Figure 1. At the control component, the controller such as a tablet PC sends a XML based command to a home gateway. The home gateway is connected to all controllable appliances in the house. Then the home gateway transfers the command to the light server and the light server will control the light volume of the entrance hall. Also, the home gateway is connected with the feedback component to invoke it. The appliances such as a camera server will be invoked by the home gateway and start transferring the data to the feedback appliance.
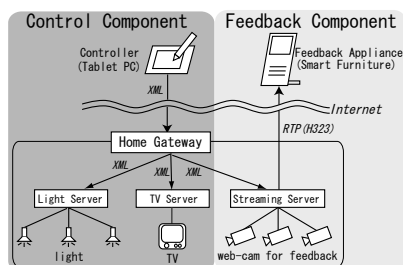

Fig. 1. The u-Con System

3 Implementation and Evaluation

We implemented the prototype of the u-Con system in a smart living room that contains various appliances such as a light, TV, and sensor nodes. The prototype

system is comprised of three parts - the controller, the feedback appliance, and the target appliances. We used NEC VersaPro tablet PC VY11F/GL-R for the controller which is shown in Figure 2. The controller displays clickable picture interface. The user can choose a target appliance to control and select a feedback appliance to verify the progress and the result of the operation. The feedback appliance shown in Figure 3 is a Smart Furniture. Smart Furniture is connected to the camera server and can show the video image provided from the camera which is shooting the whole room. We used the H323 protocol for transporting the camera data. The target appliances such as the light and TV are controlled by a server that are connected to the room network. Also, we measured a delay in the operation as an evaluation. The average time lag till the result of the operation is shown on the feedback appliance was about 0.6 sec. The result indicates that the time lag may not cause any serious problems in ordinary appliances.

Fig. 2. Controller 　 **Fig. 3.** Feedback Appliance

4 Conclusion and Future Work

The prototype of the u-Con system provides a clickable picture interface to control appliances and real-time video feedback to the powerful appliance for verifying the progress and the result of the operation. This system is suitable for the operation which requires a visible progress of the operation such as controlling the light volume, and watering a flower. To make the u-Con system flexible, we are modifying the interface that enables the user to change the feedback appliance easily.

References

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