Point & Click - Interaction in Smart Environments

Michael Beigl

Telecooperation Office (TecO), University of Karlsruhe, Vincenz-Prießnitz-Str. 1,
D-76131 Karlsruhe, Germany
michael@teco.edu

Abstract. A problem in smart environments is the interaction with a myriad of different devices, in particular the selection which of the devices should be controlled. Typically, different devices require different control tools. In contrast, a generic Point & Click appliance is proposed. To interact with a device in the environment this generic control appliance is pointed at devices for selection providing visual feedback to the user, obtains control information from the device, and allows control with the help of a simple user interface.

1 Introduction

An important issue in smart environments is how to interact with a wide diversity of devices, and one interesting but little explored aspect is how to select devices for interaction. Typical approaches are the use of separate controls for different devices (e.g. separate remote controls for TV and video), selection based on profiling of user action [1], and selection based on context-awareness technology [3]. As an alternative approach we propose the use of a generic Point & Click appliance. We call this appliance AIDE (Appliance for Interacting with Devices in the Environment)

Our Point & Click system consists of a control appliance, the AIDE device, for Ubicomp environments and a small extension for devices in such environments. We suggest a generic control appliance is useful in particular for interaction with devices, which possess *no own user interface*, or whose function is to be controlled although they are *in spatial distance*, but within visual proximity, and their *use is not familiar*. The following paragraph will present such a device and the belonging infrastructure.

2 AIDE: A Point & Click Appliance

“Pointing” is an important way of communication for humans, if (indirect) control over objects is to be executed: Pointing refers to things, which are of interest, both to inform about the things and to arrange control. Humans transfer this metaphor to the operation of technical devices: Although modern remote controls do not require pointing to the controlled device humans tend to direct them directly towards the device. The action of pointing is used to select an object for the following command (i.e. the device, which should be controlled). Pressing a key or the articulation of a

command causes the selection to be performed. Therefore, the call of a function can be split into two phases: The pointing-phase where you select a device and the phase where a command is selected and send to the device by clicking.

2.1 Pointing-Phase

An important principle for the structure of user interfaces is feedback [2], which prescribes a response of the selected function to humans. If there are several devices located near to each other, no decision can be made which device should be controlled by simply pointing. Optical feedback has to be provided during the pointing phase before the selection itself is triggered. When pointing to a device which should be controlled the selected device has to be recognized by the human as selected. The system presented below simplifies the selection of a device by an optical feedback in form of a red laser-point. This phase of selecting a device by pointing at it and the optical feedback which device is selected are the major difference between the Point & Click appliance and universal remote control applications e.g. [4].

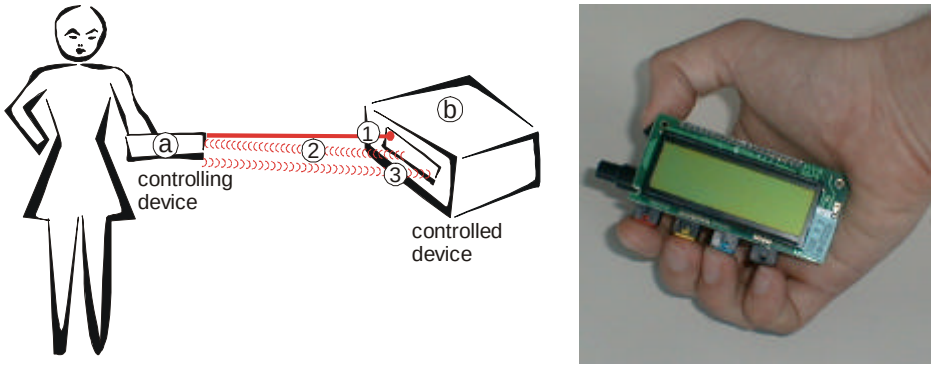

Fig. 1. The control appliance (a): A human selects a device in the environment (the controlled device (b)) with the help of a controlling device through a laser (1). After selection, commands are transmitted to the controlling device (2). A human chooses one of the displayed commands with the associated button at the Point & Select AIDE device (right figure).

2.2 Click

For pointing and selecting the device function we have developed a small control appliance (Figure 1, right), the AIDE device. AIDE has a LCD screen to display available commands that can be sent to the controlled device. The entire process of control can be described schematically as follows. First, the AIDE device (a) is directed towards the controlled device (b) and the activation key is pressed (pointing phase, 1). A laser beam gives an optical feedback, showing which device is selected. When the controlled device detects the laser beam, it transfers the control description to AIDE using infrared communication (2). This description containing all possible

commands is shown on the AIDE's display. The user selects one of the displayed commands using the keys at the side of AIDE (click). The selected command is transferred to the controlled device and the action is carried out at the device (3).

3 Implementation

In order to designate the device for everyday usage it should be so small that it fits into a trouser pocket without problems. Handheld Computers as PalmPilot are still too big for the proposed usage scenario. Since no special requests regarding flexibility for communication and command display exist, we refrain from using standard markup languages and protocols as HTML/HTTP or WML/WAP. Plain text was used to describe the commands that are shown at the display. Each line of the display contains one instruction.

The AIDE system consists of two components: the AIDE control appliance and an extension for controlled devices, which can be attached to existing switching inputs (e.g. buttons). The AIDE device consists of 5 buttons, which are arranged around the LCD display, and a laser pointer, an IrDA (Infrared Data Association) communication unit and a processor. The LCD display operates in upright mode to support the handling of the AIDE device as a pointing device. The button on the right side is used as the activation key, the 4 buttons present at the left side as selection keys. The device is controlled by a PIC 16F84 microprocessor; communication is performed through an IrDA transmitter. The module used at the controlled device uses similar hardware, but without laser diode and LCD display.

4 Conclusion

We demonstrated advantage of generic control appliances as one possibility to control the diversity of devices in a smart environment. A major difference between the presented control appliance and universal remote controls is the split of interaction with devices in the environment into two phases: Point and Click, where in the pointing phase the control appliance provides a optical feedback to the user.

Further usability tests must show specific strengths of such a system. A further reduction of the dimensions of the AIDE device as well as an increase of the display resolution will widen the application possibilities.

5 References

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