

A Remote Multimedia Presentation System Using a Direct Pointing Stick

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Abstract: Desktop conferencing systems are used for discussions among participants seated at individual computers. The systems can be used for remote presentation or remote teaching if the computers are connected to a large screen. However, there are usability problems if a conventional input device such as a mouse or a tablet is used. This paper describes a remote multimedia presentation system that integrates a direct pointing stick with a multimedia conferencing system. The conferencing system has a shared chalkboard that supports script programs. The pointing stick has an optical sensor with a switch. While the presenter is pressing the switch, the sensor detects any changes in brightness, and transmits data by radio to a receiver connected to a personal computer. When an object being pointed at is detected by the shared chalkboard, a script program for some functions, such as turning pages, zooming, or changing graphic objects is executed at the presenter's site and the remote site. This integration makes it easy for the presenter to operate the system while standing beside a large screen, and for the audience to understand the presenter's precise intentions.

1. INTRODUCTION

Desktop conferencing systems are used for discussions among participants seated at individual computers [1]. Such systems provide interactive conferencing involving the exchange of multimedia data, such as motion video, voice, images, graphics, and text, via a communication line.

Desktop conferencing systems can be used for remote presentation or remote teaching if the computers are connected to a large screen. With such a configuration, it is possible for audiences at both the presenter's site and the remote site to watch the computer screen. However, there are problems if a conventional input device such as a mouse or a tablet is used.

One problem is that it is difficult for a presenter standing beside a large screen to use a mouse or a tablet, since this requires the presenter to move to the computer, thus breaking the flow of the presentation.

Another problem is that the audience cannot understand the presenter's precise intentions while the presenter is operating a mouse or a tablet. To do so, they must be able to watch the presenter's gestures. However, they cannot watch both the screen and the presenter, because the presenter does not stand by the screen while operating a computer.

To solve these problems, we developed a remote multimedia presentation system that integrates a direct pointing stick with a remote multimedia conferencing system. Two personal computers are connected by an ISDN line. Transmission of motion video and voice is realized by the use of an ITU-T H.320 motion video CODEC card. A motion video window and a shared chalkboard, which can execute script programs, are projected onto a large screen by a video projector or an overhead projector (OHP) with a liquid crystal display (LCD).

The pointing stick has an optical sensor with a switch. While the presenter is pressing the switch, the sensor detects any changes in brightness, and transmits data by radio to a receiver connected to a personal computer. The shared chalkboard sequentially blinks graphic objects that are assigned script programs, and receives data from the pointing stick. The shared chalkboard can identify the object being pointed at by checking the timing of the object's flashing. When the object being pointed at is detected, a script program for some function, such as turning pages, zooming, or changing graphic objects is executed at the presenter's site and the remote site.

In Section 2, we explain our remote multimedia conferencing system, which is the basis of our remote multimedia presentation system. In Section 3, we describe a direct pointing stick, which is a special input device for presentation. In Section 4, we present our remote multimedia presentation system, which integrates a pointing stick with our remote multimedia conferencing system. In Section 5, we discuss the advantages and disadvantages of the system, and compare it with another type of presentation system. In Section 6, we summarize our conclusions.

2. OUR CONFERENCING SYSTEM

We developed a remote multimedia presentation

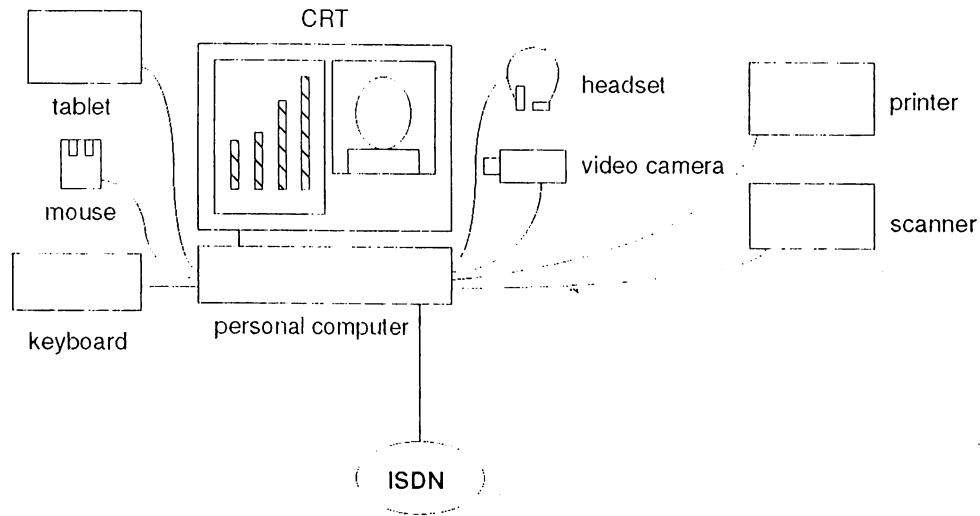


Figure 1: Configuration of our remote multimedia conferencing system

system based on a remote multimedia conferencing system [2]. Figure 1 shows the configuration of the latter. Two personal computers are connected by an ISDN line. Transmission of motion video and voice is realized by the use of an ITU-T H.320 motion video CODEC card. A display shows a motion video window and a shared chalkboard. The system runs under OS/2* as a window application. A video camera, headset, scanner, printer, mouse, keyboard, and handwriting tablet are attached to each of the personal computers.

The shared chalkboard, based on our graphic editor [3], is the major application of the system. Users can create graphic objects such as rectangles and circles, move the objects, and modify their attributes. They can also turn pages, zoom, and scroll. When a user performs operations on a chalkboard, the same operations are performed at the remote site, and thus each user can see the same image on the chalkboard.

3. A DIRECT POINTING STICK

Recently, several electronic presentation systems have become available. Such systems project computer-controlled information onto a large screen, using a video projector or a LCD on an OHP.

The use of conventional input devices in presentation systems leads to the problems described in Section 1. To solve these problems, two types of presentation system have been developed. One type projects the computer output onto a large digitizer [4]; the other uses a video camera, and processes a

scanned image [5]. Both types emulate a mouse. Although such systems solve the problems described in Section 1, they require expensive equipment.

The problems can be solved more economically by using a direct pointing stick [6] as an input device. Figure 2 shows the configuration of such a system. The pointing stick has an optical sensor at its tip, a switch on its handle, and a radio transmitter inside the handle. The length of the stick is about 70 centimeters.

A presenter stands beside a large screen and points directly at objects on the large screen by using the pointing stick. It is not necessary for the presenter to move away from the screen to operate a computer. As a result, the presenter can concentrate on the presentation. In addition, it is easier for the audience to understand the presenter's precise intentions, because they can watch both the large screen and the presenter's gestures.

While the presenter is pressing the switch, the sensor detects changes in brightness, and transmits the data by radio to a receiver connected to an asynchronous port of a personal computer. When the presenter is not pressing the switch, no data are sent to the receiver. A presentation system checks the transmitted data periodically, and judges that the switch is being pressed if data are being sent. While the switch is being pressed, the system sequentially blinks objects. It can identify the object being pointed at by detecting the timing of the object's flashing. When the object being pointed at is detected, the system takes appropriate actions.

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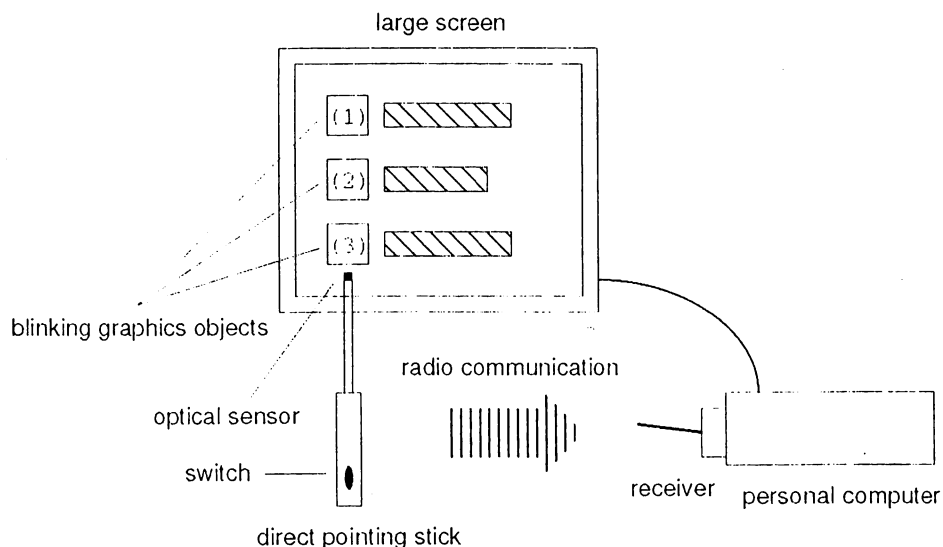


Figure 2: Configuration of a presentation system using a direct pointing stick

4. REMOTE PRESENTATION SYSTEM

In this section, we present our remote multimedia presentation system, which integrates a direct pointing stick with our remote multimedia conferencing system.

4.1 Configuration

Figure 3 shows the configuration of our remote multimedia presentation system. Since the system is based on our remote multimedia conferencing system, which was explained in Section 2, its basic configuration is the same.

A large screen is connected to a personal computer. The presenter stands in front of the screen, and addresses audiences at the local site and the remote site. The screen shows a motion video window and a shared chalkboard. The motion video window at the remote site shows the presenter, and the one at the presenter's site shows the audience at the remote site. Any kind of projector, such as a video projector or an OHP with a LCD, can be used with this system.

The presenter operates a computer by using a pointing stick instead of a conventional input device such as a mouse or a tablet.

4.2 Extension of Chalkboard

We extended our chalkboard to integrate a direct pointing stick with our remote multimedia conferencing system.

Our chalkboard can execute message commands sent by another program for such functions as turning pages, zooming, creating graphic objects, moving objects, and changing the attributes of objects. In addition, message commands can be assigned as script

programs to graphic objects. When a user selects an object, the script program assigned to that object is executed. Only one thing was necessary in order to integrate a pointing stick with our remote multimedia conferencing system: the ability to detect an object being pointed at with the pointing stick.

While the switch of the pointing stick is being pressed, the shared chalkboard sequentially blinks graphic objects that are assigned script programs, and receives data from the pointing stick. The shared chalkboard can determine which graphics object is being pointed at by checking the timing of the object's flashing. When the object being pointed at is detected, the script program assigned to it is executed at the presenter's site and the remote site.

5. DISCUSSION

In this section, we discuss the advantages and disadvantages of our system, and compare it with another type of presentation system.

5.1 Advantages

Our system has four advantages.

First, a presenter can easily operate the system while standing by a screen, without having to move to a computer to operate it with a mouse or a tablet.

Second, it is easier for the audience to understand the presenter's precise intentions, because he or she can point at objects on a large screen directly with a stick. By watching the stick, the audience can predict which topic will be presented. If the presenter sits at the computer, on the other hand, the system can send motion video of only his or her face, without any

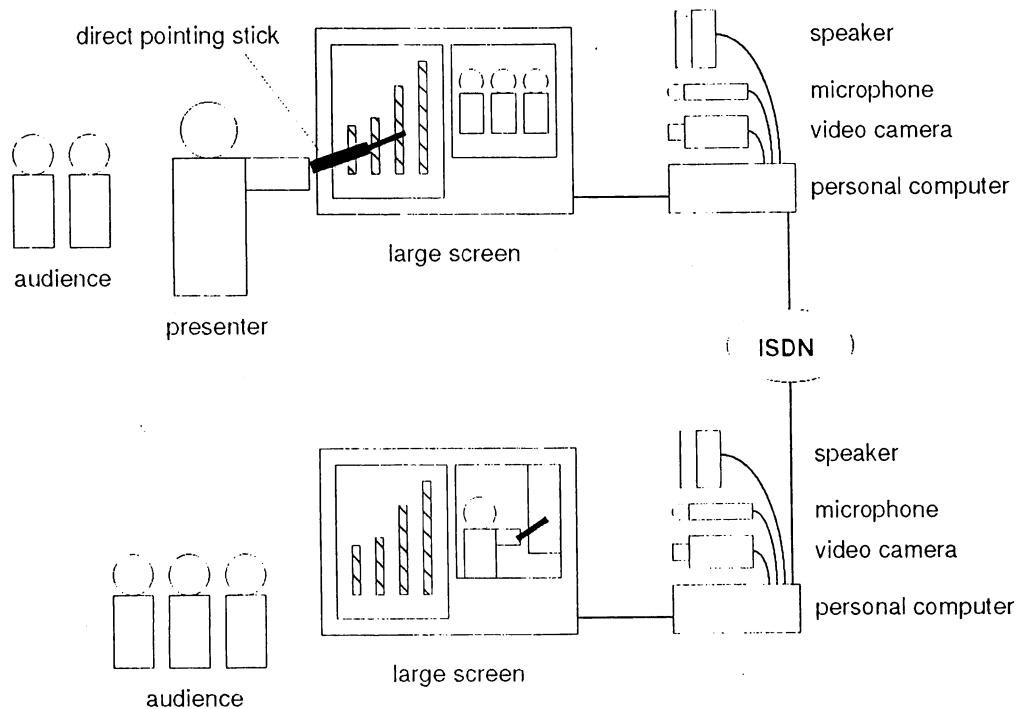


Figure 3: Configuration of our remote multimedia presentation system using a direct pointing stick

gestures. In our system, the audience can watch both the shared chalkboard and the presenter's gestures at the same time.

Third, installation is easy. Since the pointing stick detects only changes in the brightness of the screen, not the absolute brightness of the screen or the position of the stick, no adjustment of the brightness or position of the screen is necessary.

Fourth, the direct pointing stick and its receiver are inexpensive and portable.

5.2 Disadvantages

Our system also has two disadvantages.

First, lighting is difficult. Since a large screen is not bright enough, the system requires the room to be darkened; on the other hand, a video camera needs light. Thus it is necessary to arrange the lighting carefully.

Second, the resolution of most large screen is not high enough. Since a high-resolution large screen is expensive, we use a NTSC display instead.

5.3 Comparison of a Direct Pointing Stick and an Electronic Whiteboard

We developed another type of remote multimedia presentation system in which an electronic whiteboard is integrated with our remote multimedia conferencing system [4].

Figure 4 shows the configuration of the system. This system was also developed on the basis of our

remote multimedia conferencing system, described in Section 2. It has an added electronic whiteboard, OHP, and LCD. An electronic whiteboard with a digitizer is connected to a personal computer. A motion video window and a shared chalkboard are projected onto the electronic whiteboard by an OHP and LCD. A presenter uses a pen, which emulates a mouse, to write on the electronic whiteboard.

Both presentation systems have common advantages and disadvantages. Since both systems allow a presenter to stand in front of a large screen, easy operation for the presenter and easy understanding of the presenter's precise intentions are common advantages. The lighting and resolution of the screen are common disadvantages.

Let us now examine the differences between the system with a pointing stick and the system with an electronic whiteboard.

First, the system with a pointing stick is easier to install. Since the latter measures the position of the pen, it is necessary to adjust the position of the image projected onto the electronic whiteboard.

Second, a pointing stick and its receiver are more inexpensive and portable than an electronic whiteboard.

Third, any kind of large display can be used in the system with a pointing stick, whereas, only projection-type displays can be used in the system with an electronic whiteboard.

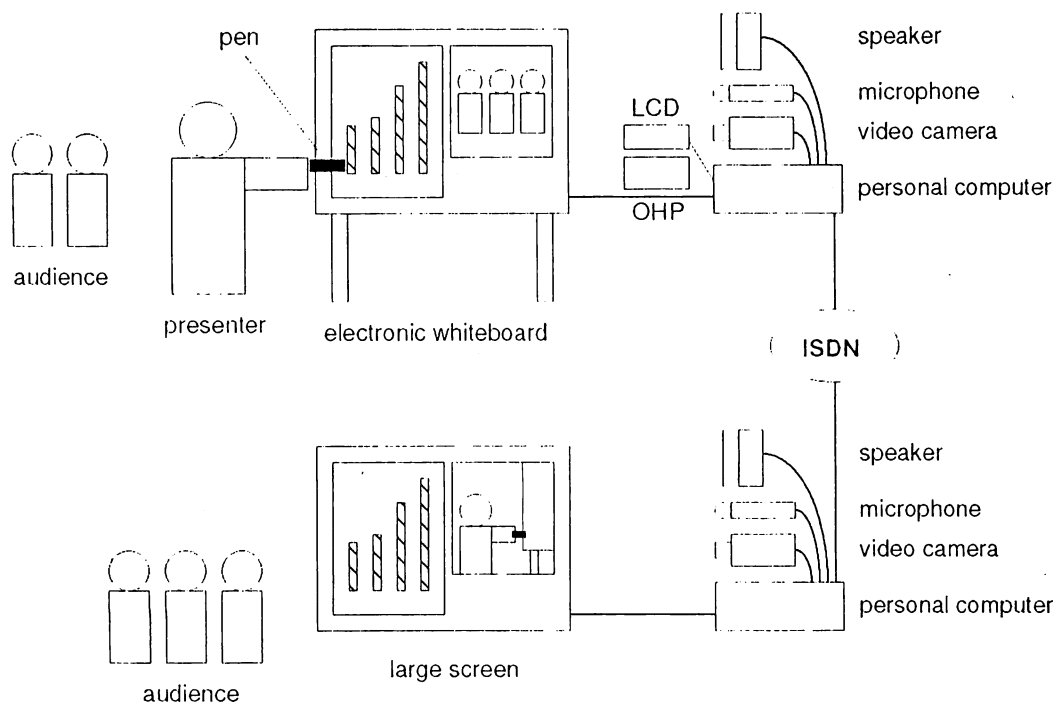


Figure 4: Configuration of our remote multimedia presentation system using an electronic whiteboard

Fourth, it is easier for audience to watch a pointing stick than a pen on an electronic whiteboard, because of size.

Fifth, any kind of operation can be performed in the system with an electronic whiteboard, while only pre-defined script programs can be executed in the system with a pointing stick.

Each system has advantages. It is important to select a system that is suitable for the situation. If most of the time is to be spent on the presentation and there is expected to be little time for discussion, the system with a pointing stick is more convenient. On the other hand, if much time is allocated for discussion and several people want to draw figures and text on the shared chalkboard, the system with an electronic whiteboard is preferable, for flexibility.

It is possible to use both a pointing stick and an electronic whiteboard: the pointing stick can be used for the presentation, and the pen and electronic whiteboard for questions and answers.

6. CONCLUSIONS

We developed a remote multimedia presentation system by integrating a direct pointing stick with a remote multimedia conferencing system. It has two major advantages over other presentation systems. First, a presenter can easily operate the system while standing beside a large screen, without having to move to

a computer to operate it. Second, the audience can more easily understand the presenter's precise intentions by watching his or her gestures, whereas if the presenter sat at a computer, the system could transmit a motion video of only his or her face.

Our tests of the remote presentation system confirmed that the above advantages are very significant. We also found that the combination of the pointing stick and a multimedia capability helps to create an impressive presentation. It is possible to combine digital video, digital audio, and animation. For example, when a presenter clicks a city on a map, the system can play a recorded video of the city and give a recorded narration. The same effects can be obtained at a remote site. This example demonstrates that the integration of technologies for multimedia, groupware, and advanced input devices can lead to new kinds of application.

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[‡]Cyclops is a trademark of the Proxima Corporation.