Developing a Distance Education Support System
- Switching Multiple Media Devices Automatically under Voice Control –

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Abstract

We have developed an automatic media switching system with which the lecturer can switch the media equipment with his or her voice. This makes it easier for the lecturer to give a dynamic lecture using PowerPoint slides, a still camera, videos and a whiteboard.

1. Introduction

Unlike face-to-face classes, distance lectures are delivered by way of a network. As a consequence, the amount of information that is imparted to the student is limited, and the flow of information tends to be in only one direction: from the lecturer to students in remote places. A common result is a boring class. To avoid this result, lecturers need to communicate actively with students and give easily understandable lectures, making full use of multimedia. For example, their classes should be multimedia-driven, dynamic classes, featuring PowerPoint materials, the display of videotaped and still-camera images of real teaching materials, the transmission of handwritten characters from an electronic whiteboard, and so on. To make such classes a reality, however, lecturers have to operate a variety of devices. This burdens them considerably in the course of delivering lectures.

To reduce the burden on lecturers, we have developed a distance education support system that automatically switches multimedia devices under voice control. The system recognizes the lecturer's voice and switches media automatically. Verification of effectiveness has confirmed that the system has a sufficiently high voice recognition rate and can be fully put to practical use.

2. System Configuration

Figure 1 shows the system configuration and a system connection diagram. In response to voice switching commands uttered by the lecturer, the system switches among various sources of multimedia information, such as (1) PowerPoint materials placed on the PC, (2) videotaped images coming from a VCR, (3) still-camera images of real teaching materials, (4) images of the lecturer captured by an external camera, and (5) handwritten characters transmitted from an electronic whiteboard, and then transmits the information of the lecturer's choosing to an imaging device. The system can be used not only for distance education, but also for ordinary face-to-face classes.

3. Software Functions and Operations

Figure 2 shows system operations. As shown in the figure, when the program is launched, the system stands by, waiting for a communication session with the controller to open. When the lecturer utters a command name through the microphone, the voice recognition engine is launched to initiate its recognition process. The voice recognition engine compares the voice input signal with the voice recognition keywords. If the voice input signal matches the keywords, it is routed to the system controller, and the corresponding device is selected from among a set of multimedia devices. Thereupon content is transmitted from the selected device. Table 1 lists the media switching commands that may be uttered by the lecturer.
4. System Reliability Measurement Results

To verify the reliability of the system, (1) two subjects uttered eight commands. For both of them, the system registered a selection rate of 100%. Next, (2) two subjects read an article in a technical magazine for 5 minutes each to measure the recognition rate. The result was that there was no wrong recognition at all. To simulate actual lectures, a test sheet was prepared as shown in Table 2 and was read to measure the recognition rate. Although the test was made under such exacting conditions that single-word and double-word commands appeared frequently in the test sheet, wrong recognition occurred only once.

<table>
<thead>
<tr>
<th>Command name</th>
<th>Meaning (Action)</th>
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<tbody>
<tr>
<td>&quot;Now&quot; &quot;PC&quot;</td>
<td>Selects PowerPoint, etc., from the PC.</td>
</tr>
<tr>
<td>&quot;Now&quot; &quot;Next&quot;</td>
<td>&quot;Next&quot; displays the next slide in sequence, &quot;Back&quot; displays the previous slide.</td>
</tr>
<tr>
<td>&quot;Now&quot; &quot;Back&quot;</td>
<td>Plays back and stops the materials videotaped and stored in the video equipment beforehand.</td>
</tr>
<tr>
<td>&quot;Now&quot; &quot;Main camera&quot;</td>
<td>Switches to the external camera that shoots pictures of the lecturer and other objects required.</td>
</tr>
<tr>
<td>&quot;Now&quot; &quot;Video&quot;</td>
<td>Displays documents and other objects placed on the teaching material presentation equipment.</td>
</tr>
<tr>
<td>&quot;Now&quot; &quot;Play back&quot;</td>
<td>Plays back and stops the materials videotaped and stored in the video equipment beforehand.</td>
</tr>
<tr>
<td>&quot;Now&quot; &quot;Stop&quot;</td>
<td>Plays back and stops the materials videotaped and stored in the video equipment beforehand.</td>
</tr>
</tbody>
</table>

Table 2: Test Sheet

5. Conclusions

A distance education support system that automatically switches multimedia devices under voice control has been developed. The idea of using two-word combinations as keywords to carry out device switching has remarkably improved the system's recognition rate. The system is now in practical use. It enables lecturers to easily deliver appealing lectures at a distance using multimedia.

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[References]