A Study on Software Tools for Flexible Presentations

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ABSTRACT
Most presentation systems are designed to present prepared material organized in a linear sequence of slides. While this is suitable for business communication, some situations such as teaching in school require more improvisational communication to facilitate learning and understanding. To address this issue, I chose school lectures as my research field and have developed dynamic presentation systems that support such improvisational communication. This should provide a way to cope with various uncertainties concerning presentations and make presentations more flexible.

ACM Classification: H5.2 [Information interfaces and presentation]: User Interfaces.

General terms: Design, Experimentation, Human Factors.

Keywords: Presentations, PowerPoint, tablet PC, education, predictive handwriting, speech recognition, handwriting recognition, multimodal interfaces, context-sharing.

INTRODUCTION
Computer-based presentation systems are very popular. The presenter can efficiently convey prepared information to the audience with beautiful visuals and text. In these systems, the editing and presentation are clearly separated. In editing, the user can add text and visuals, change sequence etc. The user organizes the information as a sequence of slides. During the presentation, the user navigates through the sequence easily with successive clicks. Unfortunately, these tools are not flexible enough to allow improvisational changes during presentation such as changing the orders of the slides. These changes are usually dealt with by rapid-fire clicking of the “next” button to skip over sections of the presentation, or by a hand-waving discussion of the topics without appropriate visuals.

Such static presentations, or a presentation with a linear slide sequence of prepared material, are suitable for business communication where the goal is to communicate as much information as possible in a limited amount of time. However, it is inadequate for teaching in schools. The goal is to teach students “how to think” or “understand the new concepts”. To do so, it is important to carefully guide the student's thinking with close interaction. While preparing materials in advance is also important, lectures should be much more improvisational (Figure 1). The teachers need to slow down and describe details when students are not following or when they show more interest. On the other hand, they need to skip through some part of the prepared material when it turned out to be inappropriate or uninteresting.

Figure 1: Snapshot of School Lecture: School lectures are often the combination of navigating prepared materials and on-the-fly improvisational editing.

To address this issue, my research program currently progresses along two supporting paths. One is to find a good balance between easy-to-use and flexibility for user interfaces during presentation time through a longitudinal study. The other is to make handwriting text entry more effective and facilitate improvisational communication.

KOTODAMA SYSTEM [13]
Classroom Presenter [2] and other systems such as [1, 8, 9] allow the user to annotate slides as presentations are given using a Tablet PC stylus. These annotations provide for adhoc adaptation and interactivity during presentation time. Electric whiteboard systems such as [5, 6] can provide an extreme case of flexible presentations in which almost all the materials are written by a pen as they are given.

The above described tools can be used to give presentations with a certain degree of flexibility. My goal here is to develop a tailored presentation tool for school teachers that tolerates dynamic improvisations. Although Anderson [2] examined an actual usage of pen annotation functionality at

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university lectures, few reported about how much degree of flexibility is actually required for presentations by real users.

I have developed a dynamic presentation system, named “Kotodama,” that supports both such improvisational communication and navigating prepared digital materials. It is a hybrid of a presentation system designed to navigate prepared materials and an electronic whiteboard to enable digital writing. The user can freely write text and put visuals on a canvas and shows the result instantly to the audience. An important feature is that it does not separate editing and presenting. It uses an identical user interface for both. I provided the system to teachers in local schools and they used it in real classes to teach various materials for two years.

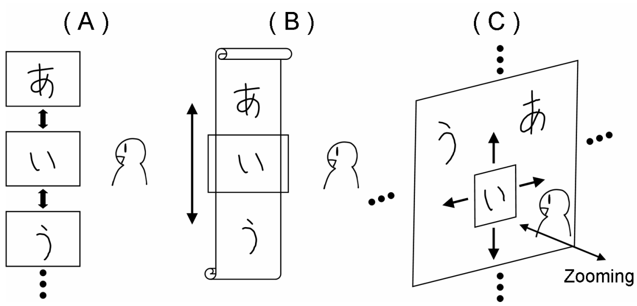

Figure 2: Three Methods for Information Navigation: (A) Slide Sequence Method, (B) 1D Scrolling Method, (C) 2D Zoomable Surface Method.

	Slide Sequence Method	1D Scrolling Method	2D Zoomable Surface Method
Ease-of-use	*Very good*	*Good*	*Bad*
Flexibility	*Bad*	*Bad*	*Good*
Smoothness	*Bad*	*Good*	*Good*

Figure 3: Properties of the Three Methods.

I ran two studies using the system with the school teachers. The first study used a system that supports flexible editing and three basic navigation methods as shown in Figure 2, 3 (slide sequence method, 1D Scrolling method, and 2D zoomable surface method) to assess the degree of flexibility they need when using prepared materials. The result shows that the teachers edit a lot and that various navigation methods are used according to individual needs. One important observation is that the balance between ease-of-use and flexibility is important. I observed that some teach by the combining the slide sequence method and the 2D zoomable surface method to do “globally static, locally dynamic” traversal (Figure 4). This is a good strategy to keep a good balance between the easiness and flexibility: navigating the global flow should be easy, allowing local changes to be flexible.

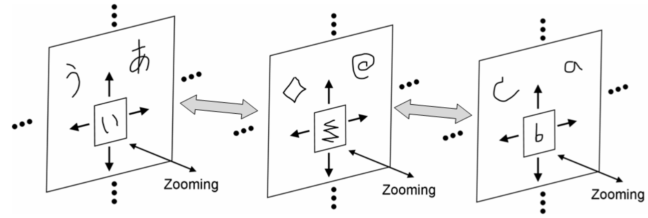

Figure 4: Navigation Model for Slide Sequence Method and 2D Zoomable Surface Method in Combination: Multiple 2D zoomable surfaces are discretely connected.

The second study is built upon the results from the first study. I designed a new navigation method named “Smart Slide” method (Figure 5). The user can freely draw on a zoomable 2D canvas and set a sequence of views in it as slides. During the presentation, the user can visit these views one by one with animated transitions and also can deviate from it with continuous scrolling and zooming.

The idea of defining specific views in a field and navigating these views one by one is not new [3, 4, 7]. Our contribution is that I integrate this feature to a pen-based presentation system and investigated its use in real school lectures.

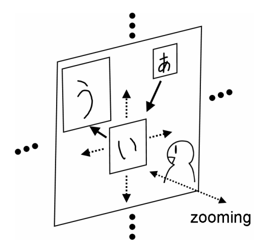

Figure 5. Smart Slide Method: Initially, the user navigates the view using the same interface as the 2D zoomable surface method. At a certain time of editing / presenting materials, the user can specify a view as a Smart Slide. The user can navigate between the registered Smart Slides easily, allowing straying off anytime.

The results show that the teachers effectively used the mechanism. The dynamic creation of slides was supported by the participants in general. The participants agree that it is too constraining to decompose a presentation into pieces from the beginning and that Smart Slides enable more flexible thinking during preparation. As evidence of this, no participant registered and fixed a Smart Slide before starting to edit the content (Figure 6). Participant (a) first arranged the contents from the global view, repeatedly experimenting with many possibilities, then registered individual views after everything was fixed. This kind of process is difficult to support in the predefined slide sequences and Smart Slide effectively supports the flexible creation process.

They also appreciated the ability to stray off from the predefined path or to completely ignore them during presentation. Figure 6 shows that all the participants who had registered Smart Slides, except for participant (d), strayed off from the predefined Smart Slide sequence. The patterns of the straying off were often "globally static, locally dynamic." From this fact, we can infer that registering Smart Slides does not mean that all their materials are fixed, even if the users explicitly register them.

Similar observations are available in the inner-slide level contents. Just as the first study indicated, this study also found a high ratio of as much as 71.4% of participants who dynamically modified or created the materials on-the-fly. This shows that setting a slide frame does not necessarily mean finalizing the content.

We can infer that we should design tools to tolerate such uncertainty as well as to tolerate the dynamic feature that presentations have by nature. Even with the flexibility to set frames in editing, the tools should provide the full editing functionalities during presentation as long as the manipulation workload is reasonable. The combination of discrete slide traversal and continuous manual navigation in presentation can be one of the ways to achieve the goal.

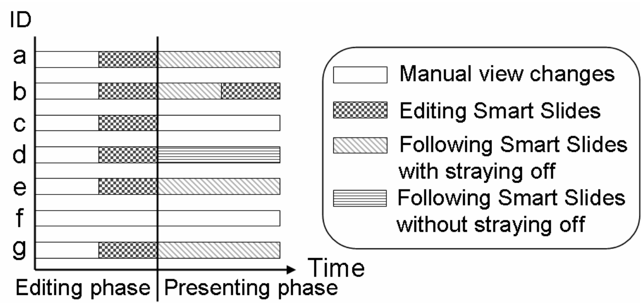

Figure 6. Working Patterns of the Participants in the Study: Rich diversity was observed. (The lengths of each bar do not correspond to the actual time spent.)

SPEECH PEN [14]

Writing is superior to just showing pre-authored slides in that the presentation becomes more flexible and more engaging [12]. In addition it saves the time that would be required to prepare complete slides.

One problem with writing is that it is tedious to write long texts by hand. It is reported that as much as 18% of lecture time is consumed by writing on the board [11]. Although it is not always desirable to reduce the time (e.g. it helps students to follow the lecture), excessive writing may distract the writer and the audience.

I propose predictive handwriting to reduce the burden of manual writing for the Japanese language. The system predicts possible next words based on speech recognition and handwriting recognition, and allows the user to choose a desired word or sentence from a list to reduce manual writing. Prediction has been frequently used in typed text entry, but I am not aware of a previous system that has incorporated prediction for handwriting. The biggest concern as to whether such a system will be effective is that users might not prefer predictive methods because of the cognitive overload required to choose the correct prediction. To counter this concern and justify our approach, I first performed a user study that examines the user's behavior in Japanese writing. The result shows that people prefer selecting to writing in general and that selection is especially preferred for words consisting of many strokes.

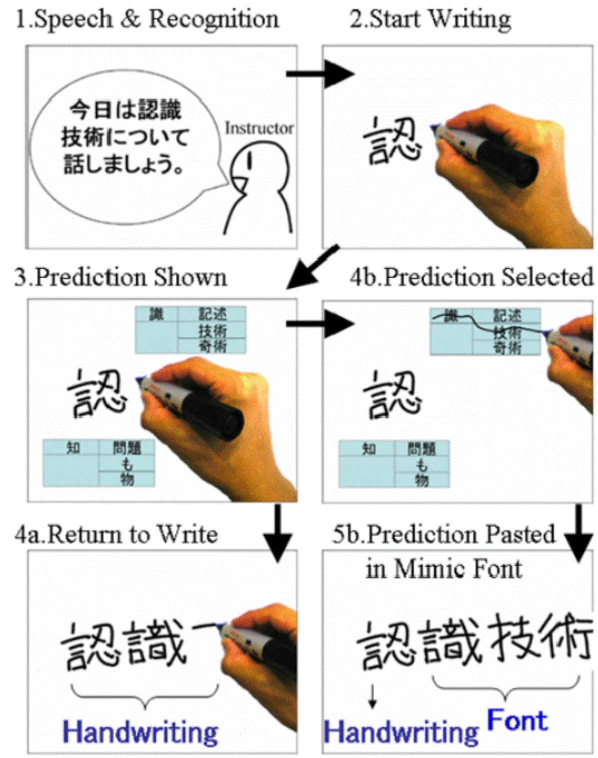

Figure 7: Overview of Speech Pen. The instructor says "Today's topic is about recognition technology," and writes "Recognition technology" on a white board.

Based on these observations, I developed a prototype system called speech-pen to examine the possibilities of predictive writing. Figure 7 illustrates the basic concept of the system. This system helps the instructor's manual writing – not the entry of *typed* texts – by suggesting possible further writing based on speech and handwriting recognition (Figure 7-3). If the instructor finds a correct prediction in the list, he can paste it on the board to save manual writing (Figure 7-4b, 5b). If not, he can simply ignore the predictions and continue writing (Figure 7-4a). The system uses a customized font that mimics the instructor's own handwriting to seamlessly integrate the manual writing and automatically generated texts.

In addition to supporting the instructor's writing, the speech-pen system also supports the audience's note-taking by providing similar predictions. The result of the instructor's speech recognition is sent to each of the audience's tablet PCs and used as a context to generate correct predictions for note-taking. I call this "ambient context" sharing because it is a kind of context-sharing usually done in the background.

A preliminary study shows the effectiveness of this system and the implications for further improvements. Figure 8 shows example writing obtained in the study. I added underlines after the study to highlight texts added by the system. I observed a wide diversity of natural-looking writing styles, which signifies a flexibility of our system not seen in other context sharing systems [1, 10].

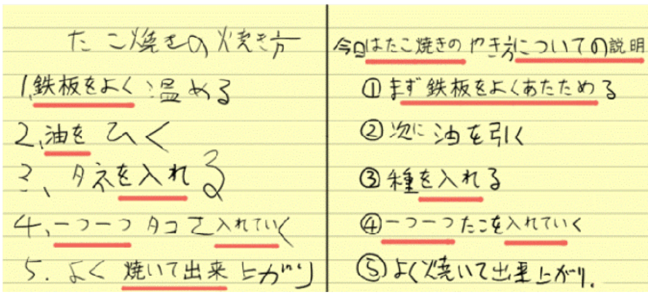

Figure 8: Example Notes Obtained in the Study. The left note is by an instructor and the right note is by a student. A red underline indicates a place where a prediction was used.

FUTURE WORK

Up to now I have mainly focused on methodologies and tools for improvisational arranging and editing on presenting materials. This is one way to cope with the audience-related uncertainty of presentations (i.e. we often can not prepare for all the possible interactions with the audience in advance) and make presentations more flexible. Beside this approach, I will study more about the other uncertainties and how to cope with them. For instance, many presenters are still suffering from the uncertainty in terms of hardware environments on stages (i.e. we often can not know hardware environments for presentations in advance, such as lighting conditions, display environments, and pointing devices). I believe technologies can assist the presenters to adapt their preparations at their offices to actual situations automatically or with less effort. To cope with presenters' psychological uncertainty is also challenging. Even with sufficient preparations of materials, some presenters feel nervous on the stage. A Machine-assisted presentation training system and an on-the-fly feedback system to give ministrant information based on presenter's recent performance such as to suggest appropriate speed of the talk are also promising solution to make presentations more flexible.

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