

and interactively manipulate content and information during presentations. Furthermore, MultiPresenter provides presenters with more control over how visual aids are used during a presentation. For example, a presenter may decide to show two slides simultaneously for comparison, to have an important slide visibly persistent for a longer period of time, to show an overview slide alongside the regular stream of slides, or to construct meta-slides based on content from other slides. MultiPresenter is currently being used in class by several instructors in our university.

SHARABLE PRESENTATION SPACES

Often in classrooms, there is a need for the students to approach the visual aid used by the instructor. A student might want to visually show his or her ideas, to interact with the artefacts on the existing screen to ask a question, or to show an electronic document or electronic reference that is relevant to the class. This kind of involvement of students in the lecture is part of what is called *active learning*. Active learning refers to various techniques in which students do more than simply listen to a lecture, where less emphasis is placed on *transmitting information* and more on involving active student participation [1]. Learners engaged in active learning practices have shown to increase the degree to which they transfer their learning to new settings [2].

As a way to promote active learning, we believe that enabling students to be actively able to control parts of the screen, and bring their own content to be viewed by all, can be very useful to class interaction. Many students today bring computing devices such as a laptop, PDA or smart phone to class. We can encourage students' participation by allowing them to bring content, annotate and write on a shared controlled space. Using the blackboard, a student who wishes to show his or her ideas, to visually ask a question, or to elaborate on the teacher's visuals, needs to approach the board, write on it and go back to his or her place. This takes time and stops the class flow; consequently it is very rare in today's university teaching. With today's technology, we can allow students to visually present ideas to the entire class by using their personal devices.

There have been some projects enabling sharing and controlling of information on public displays [3], yet these projects do not focus on presentations or on the unique characteristics of a classroom setting. We are currently designing a system that will allow students to more actively participate in class by giving them partial control of the screen, providing students with the ability to add, change, or highlight existing content on the projected display. Some of the questions that we are currently addressing are how should we allow such an interaction? What kinds of access control should we build in order for such a system to work? What kinds of pedagogical patterns are best for such kinds of involvement?

A presentation scenario, especially one given in a classroom, is not a symmetric situation. The instructor should have control of what is presented on the screen, be able to close windows, remove users who misuse the system, and decide which data is allowed to be controlled and which restricted. Furthermore, the user interface to control these actions should be intuitive so it will not add to the cognitive load of the instructor.

Another design question needed to be addressed is how many students should be allowed to control the screen at one time. Allowing only one audience member to control the screen at a given time, is simpler, and avoids many pitfall situations which multiple audience control can have. However, this mode is limited to direct interaction with whole class focus, like when an audience member asks a question, and is not suited for backchannel types of interaction. Allowing multiple people in the audience to control the screen at once (each with their own pointer), may have resource sharing problems, and cause audience distraction if applied when the instructor is presenting, but different types of interactions like a question window during the talk, or special collaboration groups that can use the screen during assignments are then possible.

CONCLUSION

In our continuing investigation of enabling instructors and students to more effectively use presentation display spaces, we have begun to build tools that allow instructors to share and make better use of the large displays at the front of classrooms. We believe these efforts will allow students to better comprehend the presented material and to be more involved in the learning process allowing them to engage in active learning, ultimately promoting student' learning.

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