Classroom Learning Partner: Supporting In-Class Assessment in Large Classes

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Efforts are underway to improve teaching and learning by employing classroom formats in which students take an active role in their learning and are no longer simply passive listeners in a lecture-style classroom. Some of the most recent efforts have focused on the development and use of computational systems to support classroom activities and student interaction. Of particular importance are those systems that support in-class assessment, as there is compelling evidence that feedback to students improves learning, especially when the feedback occurs at the time a new concept is being introduced. The goal of the research described here is to support in-class assessment in large classes by means of software that interprets and aggregates handwritten and sketched student answers. Classroom Learning Partner has been successfully deployed in the first author's introductory computer science class in Spring 2006. It interpreted and aggregated numbers, strings (including multiple-choice and true-false answers), sequences, and sets. It will be deployed again in Fall 2006, and development will focus on sketched answers.

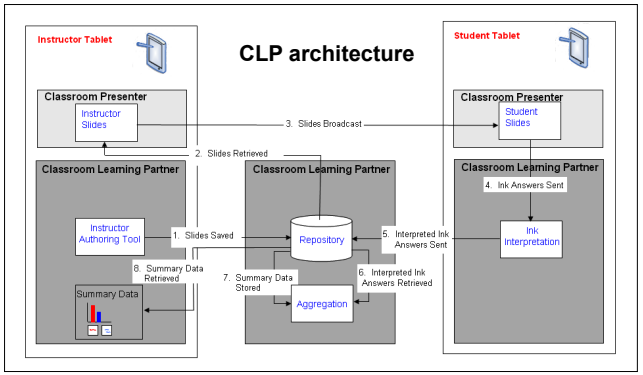


Figure 2. Steps 1-8 represent the process of using Classroom Learning Partner

Start with a Classroom Presentation System

Using Classroom Presenter [1], an instructor lectures using slides on a Tablet PC, annotating the slides by writing on them with digital ink. The slides and ink are displayed simultaneously on a large screen and on the instructor's and students' Tablet PCs. When an instructor displays a slide containing an exercise, the students handwrite answers on their Tablet PCs, then anonymously submit the digital ink answers to the instructor via a wireless network. An instructor then can select submissions to display on the public screen.

Shown in Figure 1 are examples of student answers to an in-class exercise in MIT's introductory computer science course. Note that both answers are semantically equivalent, with "num" and "#" standing for "number", and "bool" standing for "boolean".

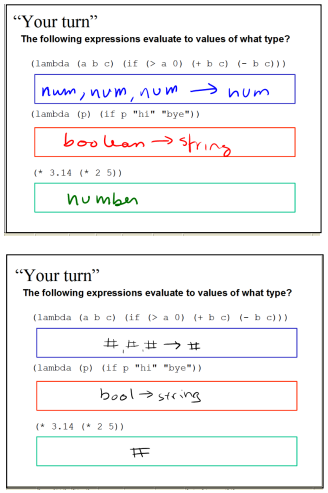
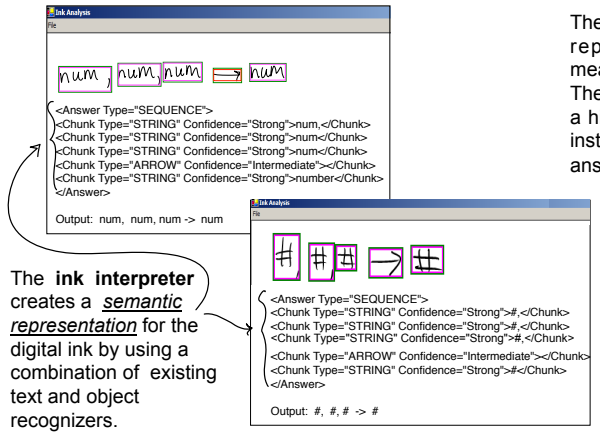


Figure 1. Student answers in Classroom Presenter

[1] Anderson, R., et. al. Experiences with a tablet-pc-based lecture presentation system in computer science courses. *Proc. of SIGCSE '04.*

Add Ink Interpretation and Aggregation



The **ink interpreter** creates a *semantic representation* for the digital ink by using a combination of existing text and object recognizers.

The **aggregator** clusters the semantic representations using similarity measures such as string distance. The resulting clusters are converted to a histogram, which is presented to the instructor, along with representative answers.