Augmented Reality Presentation Tool

CS 4900 Software Systems Development 1 Problem Statement (v1.0 1/14/19))

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Purpose

Lecture halls at Western Michigan University and at other universities in this nation are experiencing the same pressure experienced by brick & mortar stores to find purpose in the Internet world. One new purpose, as described below, is to use it in a manner that promotes using the students' technology. However, student owned technology has now exceeded the technical capabilities of current lecture halls at WMU. A major goal of this project is to implement the concept of multiview displays though the use of an augmented reality presentation tool (ARPT) that is designed to enhance the student experience in large lecture classrooms.

Engaging the student technology base

Multiview displays

At the center of the lecture hall is the display and audio system. Standard digital projectors provide a linear sequential view which typically shows a single view controlled by a presenter's laptop, such as a Powerpoint presentation. Multiview displays would offer the presenter advantages in two major ways.

1. They provide a venue of visualizing more inter-related information.
2. They fulfill more purposes such as displaying scores, example work done by students in the class who are using their technology to interact with the professor.

Secondary displays using augmented reality technology

A multiview display can be generated by employing a traditional projected display along with a secondary display generated by augmented reality (AR) technology. A concept photo illustrating the technique is illustrated in Figure 2 which shows a lecture presentation augmented by an example calculation cast in midair to the side. AR objects may also be full 3d models. Simultaneous projection (multiview) of theory and application may contribute more understanding to the viewer than sequential ordering of these elements. The secondary display is viewed through current smartphone technology using AR markers or by employing special AR glasses.

Figure 1. Concept photo of Rm D-109 Floyd Hall showing a secondary AR display

Smartphone-based augmented reality

Dr. Johnson recently applied a new web AR technology which resulted in the first practical usage of AR in the classroom -- iClicker problem templates cast to students during a lecture. Results of the first student usage of AR on the WMU campus in Rm D-109 Floyd Hall is shown in Figure 4. In the

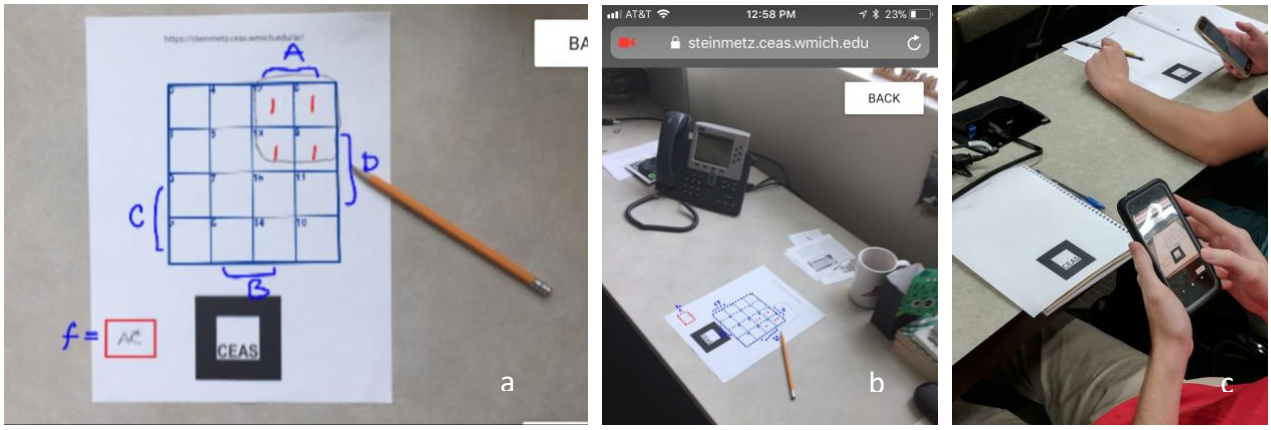

Figure 4. A problem template (a) augmented over desk (b) and during 9/28/2017 lecture (c)

system that has been already been implemented, problem templates, in the form of jpeg images are cast into space as a secondary view by uploading files to a presentation tool server using Filezilla. The system places the images near an AR marker, the position of which can be adjusted horizontally of vertically.

Statement of Work

It is desired to enhance the capabilities of the present ARPT system in the following manners:

1. Include markerless imaging of lecture presentation materials that would be able to cast variably sized images at the front of the lecture hall. (Figure 1).
2. Provide the presenter the capability of using a pen tool to perform (semi) real time imaging of hand-written scribbles on problem templates (in the same manner that a presenter can write annotations on a power point presentation slide, for example).
3. Provide all such capabilities through a laptop working with the ARPT server that can be used by a presenter in a lecture hall.