

Augmented Reality Demonstrations (August 2010)

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This collection of videos portrays experiments with the ARToolkit, in the summer of 2010.

The ARToolkit is the most popular freely available AR software development kit <http://www.hitl.washington.edu/artoolkit/>. The free version was abandoned in 2007 (circa Version 2.71.1). The free version has been used in a number of other projects discussed below.

The original developers of the ARToolkit now work commercially at ARToolworks <http://www.artoolworks.com/products/mobile/artoolkit-for-ios/>. The commercial versions (version 4.x) are up to date, higher performing, and have many features not available in the free version.

The ARToolkit implements all the logic necessary for Augmented Reality:

- Recognizing markers in the video frames
- Determining the geometry of the scene (i.e., the position and angle of the marker)
- Projecting the 3D model into the scene
- Creating the composite video frame (the view plus the 3D model in registration with the marker).

These steps are performed for each frame of the video, and must be performed fast enough for the live video to be acceptable.

The ARToolkit works with ordinary PCs and laptops equipped with inexpensive web cams.

Our project experimented with the free version of the ARToolkit on windows, linux, and mac laptops. We developed several building blocks for interactive AR, such as a module that allows an end user to transfer a graphical object from one fiducial marker to another by placing the markers in proximity with each other. This is a model for scenarios in which students interact with virtual artifacts with virtual tools. E.g., they can use a virtual trowel (that is represented in 3D graphics when the camera recognizes its fiducial marker) to "pick up" a virtual object when the trowel is sufficiently near the object. The demonstrations are summarized in Table 1. The video files accompany this document.

Table 1. Summary of exploratory AR demos

Demo	Description	Video
Switch	Switch switches which object is displayed on which marker when the markers come within a specified distance of each other.	switchv.avi
Change	Change is very similar to switch. It changes which objects are displayed when two markers come within a specified distance of each other.	changev.avi
Ordered	Ordered will only display the objects in a particular order. If the camera 'sees' a marker, but has yet to display an object that comes before the one associated with this marker, it will not display the object. Once an object has been displayed, it will always be displayed when the camera is 'seeing' that specific marker. The order that the objects are displayed in is determined by the order the markers are loaded in.	orderedv.avi
Flip_book	Placing the hiro within a specified distance of the yani marker causes the object displayed on the yani marker to change. Once again, the user cannot change the distance or the order that the objects appear in.	flip_bookv.avi
Choice	Choice assigns markers to objects to markers depending on which key is pressed. It will assign the object chosen to all markers that it recognizes at the time the key is pressed.	choicev.avi
Shovel	Shovel lets you use a marker as a shovel in order to pick up virtual objects and place them on other markers. Only one object is shown at any one time. It would be possible to add more objects, but there is a good chance that it will greatly decrease the frame rate.	shovelv.avi

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