LuminAR: A Platform for Projected Augmented Reality

Augmented Reality has been getting a great deal of press recently—mostly because of Google Glass. Google’s glasses-based tech. But glasses are a fundamentally broken interface:they isolate users and provide them with individual, rather than shared experiences. Projected AR—in which a camera and depth sensor view the world and a projector augments it—provides a shared experience and can be built cheaply with off-the-shelf hardware. Many of the most important problems have been solved: we have algorithms for object recognition, finger tracking, and gesture detection.

LuminAR is a new projected augmented reality system. It consists of a camera, depth sensor, projector, and onboard computer. The system is capable of projecting interfaces onto any surface and can recognize and respond to objects in its field of view. It combines multitouch and gestural interfaces with augmented experiences that integrate physical objects with digital information.

Lens: A Javascript SDK for Projected Augmented Reality

While there has been substantial research into AR interfaces, it is still difficult to build applications that leverage these technologies due to a lack of development tools. The missing piece needed to bring AR mainstream is applications: just like multitouch didn’t become mainstream until Apple’s iOS and the App Store, AR won’t become mainstream until developers can quickly and easily build their own applications.

Lens provides an easy-to-use, browser-based SDK for the LuminAR augmented reality platform. By abstracting away the difficult machine visions problems and focusing on giving application developers an easy-to-use set of tools for common interface patterns. Lens accelerates the pace of AR application development and gives anyone who can build a website the opportunity to explore this new medium.

The Lens Dispatcher connects to the LuminAR backend via real-time web sockets. Each individual module in Lens then uses the Dispatcher to communicate with the backend. In addition, it exposes an API that applications can use to leverage the module’s capabilities. Apps are just web pages that include the Lens library and make calls to the modules’ APIs.

Current Capabilities of Lens

Multi-Touch: Lens supports multi-touch interaction with arbitrary numbers of fingers. The API is modeled after the W3C multitouch events standard.

Markers: Lens supports tracking physical objects in as they move in three-dimensional space, given a photograph of that object.

Keyboards: Lens has an onscreen keyboard, and can use LuminAR’s networking capabilities to use the keyboard of a connected phone.

Contours: Lens can track the presence and shape of arbitrary objects within a bounding box of interest.

Snapshots: Lens allows applications to take pictures using its camera. Lens can crop these snapshots to fit page elements by using coordinate transformations to convert the reference frame of the page to the reference frame of the camera.

Components: Lens provides a number of pre-made components, including a text entry interface, a multitouch dragging interface, and a 3-finger scrolling container.

LAF: The Lens Look-and-Feel toolkit styles a page to work well with LuminAR’s touch-based interface, and adds behavior (such as bringing up an on-screen keyboard when a user taps a text box) and affordances (such as touch indicators) to improve the usability of the application.

Lens Applications and Deployments

We have developed a myriad of Lens applications for LuminAR, including augmented scrapbooking, a clone of the Pong video game, and an augmented manufacturing app that is currently deployed on a Steelcase assembly line.