Introduction
An important step in the localization chain is to display useful data to the user. Computer controlled RGB lighting exposes visible light as a viable method to display information, coded by light color and brightness. Off-the-shelf controllable RGB lights are non-invasive, immediately perceptible, and require minimal infrastructure.

Slow Visible Lighting Testbed
We construct a slow visible light communication (VLC) testbed to display information using the color and brightness channels of visible light. In contrast to fast VLC, where visible light is used to modulate information at a rate faster than the eye can perceive, slow VLC is intended to be perceived and interpreted by a human.

We place a controllable Phillips Hue A19 RGB Light at each desk in our lab. The lights connect to a common Hue Bridge. Communication to the Bridge occurs through the Phillips Hue RESTful API and allows for the brightness, power state and color of each light to be adjusted programmatically.

In addition, we place two Friends of Phillips Hue Lightstrips and two Friends of Phillips Hue Bloom flood lights in lab to provide additional communication channels in ambient room lighting.

Future Work
The correct interface to control a system of slow VLC has not yet been defined. Classic problems arise when using a single light across multiple applications, including scheduling and aliasing.

Additionally, the interface back to the human, who has the responsibility of decoding the information from the light, has not yet been defined. Basic questions, such as how to let the human know which application is currently running and what decode scheme to apply, have yet to be answered.

In addition to addressing those problems, we plan on developing the software layer to allow this testbed to be used as a visualization platform for the other on-going in-lab localization deployments.

Applications Using Localization and Behavior Data

BUSL
https://github.com/lab11/busl
BUSL takes advantage of Magic Bus, a public XML stream containing the real-time GPS location of the Michigan bus system. A user passes BUSL their current location as well as a desired stop and route. BUSL then runs as a background service and will change the color of a Hue light to reflect when the user should start walking in order to catch the bus.

Hamster
https://github.com/lab11/hamster
Hamster controls the brightness of a light based on the speed which you are typing. This allows a user to get a visual sense of their typing habits and to visibly boast to their lab mates about how hard they work.