ConspiraSee
Color Highlighting Mixed Reality Application

Carl Hawley, Adam Nixon, Zachary Rottman, Zachary Burgess, Brayden James   Advisor: Jeremy Becnel

Stephen F. Austin State University

Objective

This project was born from a desire to assist individuals affected with colorblindness differentiate specific colors in everyday life, such as organizational tasks, recreational activities, and other color-determined activities.

Function

Using Mixed Reality, we can apply a filter to an image feed and highlight colors specified by the user.

The UI will have color selectors for most common colors, and an advanced selector for selecting specific RGB values. For example, selecting the blue option will result in the software dynamically masking all blue-colored objects and images in front of you.

ConspiraSee will allows for pictures to be taken with the filter intact, allowing the user to reference previous photos and filters or multiple filters for the same image.
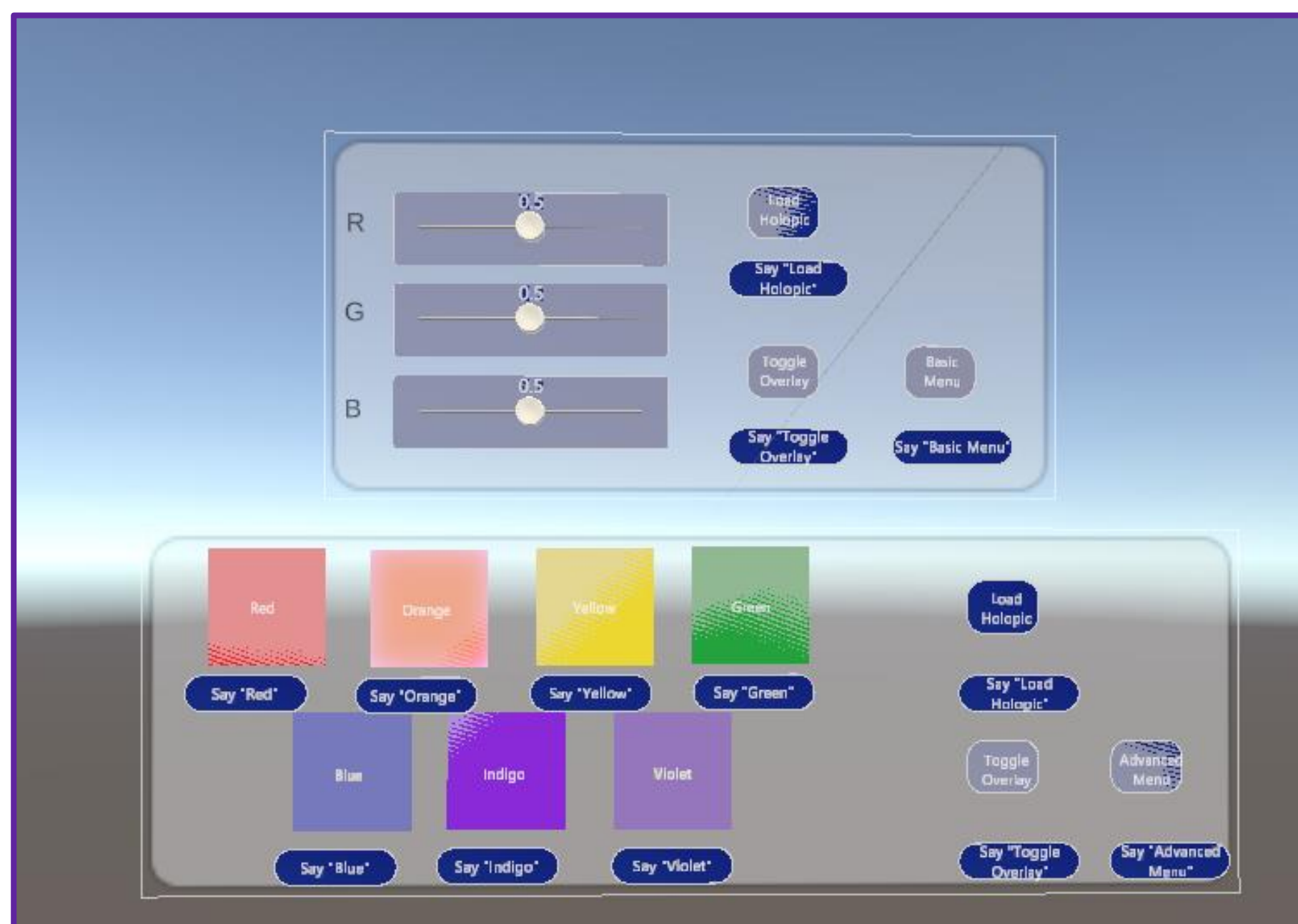

Figure 1. Alpha UI

Figure 2. HoloLens MR Headset

Algorithm

ConspiraSee's internal algorithm takes each pixel's RGB value and compares it to a value range specified by the user's color selection. The user may specify a specific value, as well, and the same value range will apply. It then takes the location of those pixels and creates a second image with the selected pixels serving as the anchor points for the filter. The filter is then layered over the image, revealing to the user where that color, and colors slightly off from it, are located in the image.
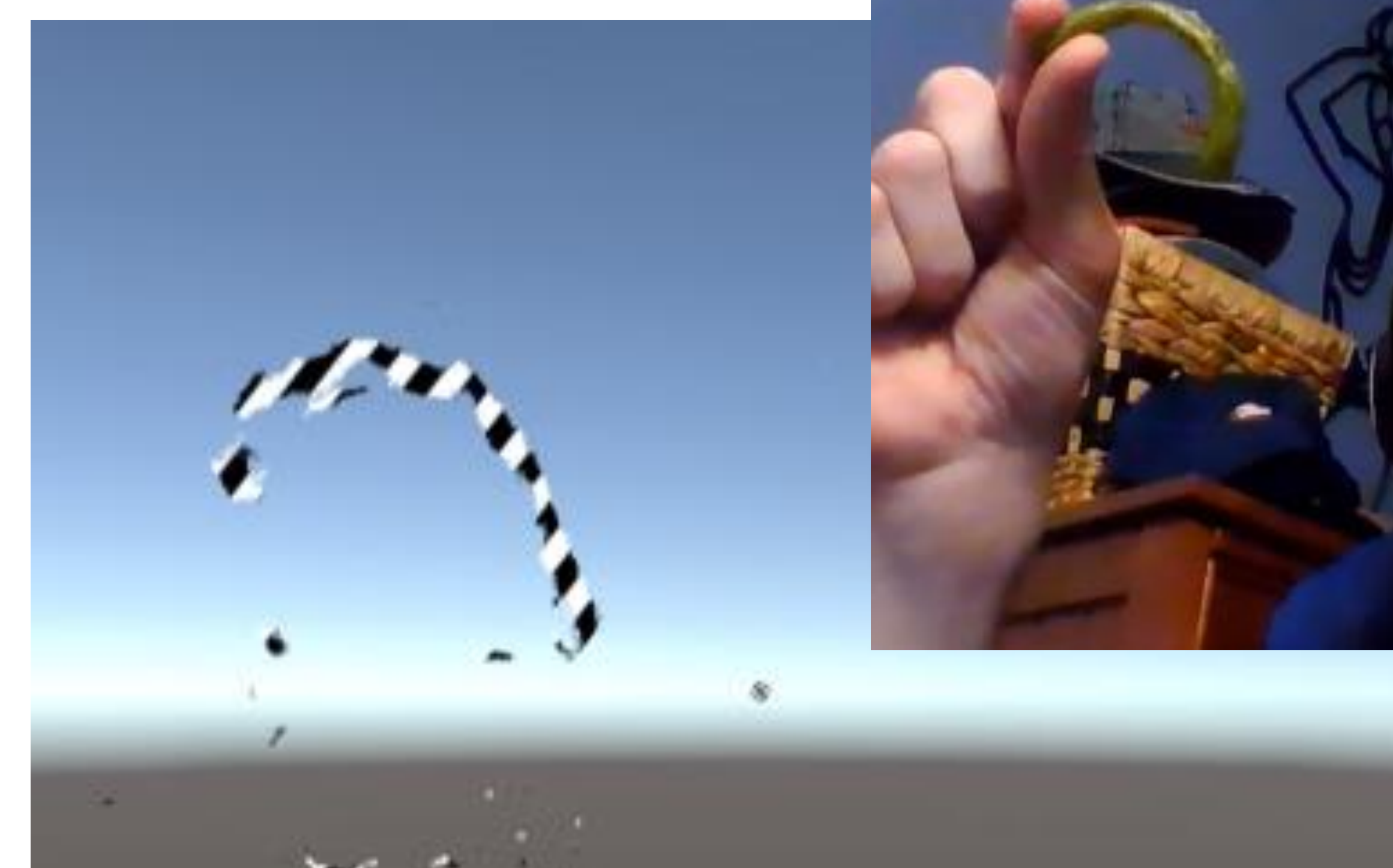
Mixed Reality (XR)

Mixed Reality is a way of allowing users to see the world around them with computer-rendered overlays, objects, or other displays that can interact with both the user and the environment they are in.

Mixed reality was our preferred medium, as normal VR can be disorienting to some users and mobile applications can be unwieldly for constant use, though mobile development is planned.

Figure 3. The filter from the user's view

Figure 5. Filter set to Green

Figure 4. Original Image

Figure 6. Filter set to Red

Colorblindness

Colorblindness or Color Vision Deficiency is an inherited trait where the eye's color receptors, the cones, misfire or fail to fire when receiving stimuli. Colorblindness comes in many forms, but the most common are[2]:
Deuteranomaly, Protanomaly – red/green confusion
Deuteranopia, Protanopia – red/green blind
Tritanomaly – blue/green & yellow/red confusion
Tritanopia – blue/green & yellow/red blindness

Most colorblind people learn early which colors they have issues with, and develop strategies and adaptations to overcome the deficiency, using context clues to determine actual color, or by using other attributes of objects such as size or shape.

For media applications, such as games or signage, color is normally used to denote other information, such as caution for yellow or information for blue. Our hope is to make a product that will allow this information to be more accessible to colorblind people and ease their difficulty in this aspect.

Long Term Plans

My team and I hope to develop a more widely accessible mobile app. With more time and experience, we may be able to reach a long-term goal of multi-color selection. Our farthest goal would be real time personalized color enhancement, akin to EnChroma glasses.

Contacts

Zachary Rottman
Stephen F Austin State University
P.O. Box 13012, SFA. Nacogdoches, TX 75962-3012
Office 936.468.6159

Braden James
bradenjames123@gmail.com
903-387-0457

Zachary Burgess
zburgess16@outlook.com
936-238-5554

Carl Hawley
carlhawley@gmail.com
713-898-5537

Adam Nixon
d.adam.nixon@gmail.com
936-219-7073

References & Acknowledgements
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