

The background is a solid purple color with a repeating pattern of stylized, light purple eyes. Each eye is composed of a dark purple iris and a white pupil, set within a light purple, almond-shaped outline. The eyes are arranged in a grid-like pattern, slightly offset from each other.

Eye Spy

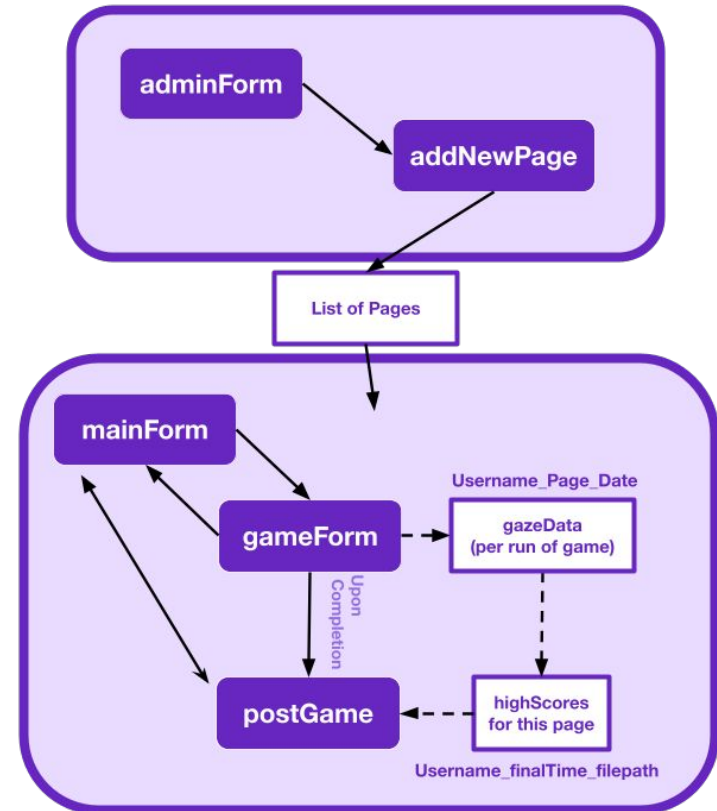
Jack Strauss

Project Description

1. Develop a game-like application in which users compete against time (and, therefore, each other) to find multiple hidden objects in an image.
2. Record the sequence of locations obtained by the eye-tracker.
3. Determine how the application knows the user has found a hidden object.
4. Alter the host image to indicate when/where a hidden object has been found.
5. Allow the use of images of various formats and sizes.
6. Allow the application to visually replay the search path of a game (this includes at some later time and different device).
7. Build an admin application to identify what/where the hidden objects are in the host image and store the necessary information.

Project Description (English)

1. Create a hidden object game (iSpy, Where's Waldo) that uses an eye-tracker
2. Replay the path where the player looked
3. Create a separate application to add new pages of various formats and sizes

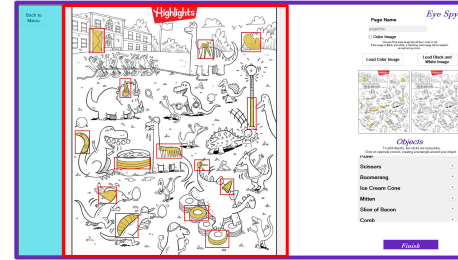


Demo

- Calibration
- Play Game
- View Replay
- Edit Page

UI Framework

- Image always in same position when object coordinates are being used
- Avoid coordinate mismatches
 - Full screen
 - 10% imgMargin
 - 50% width
 - Load object icons in a grid (Key)



Admin Page



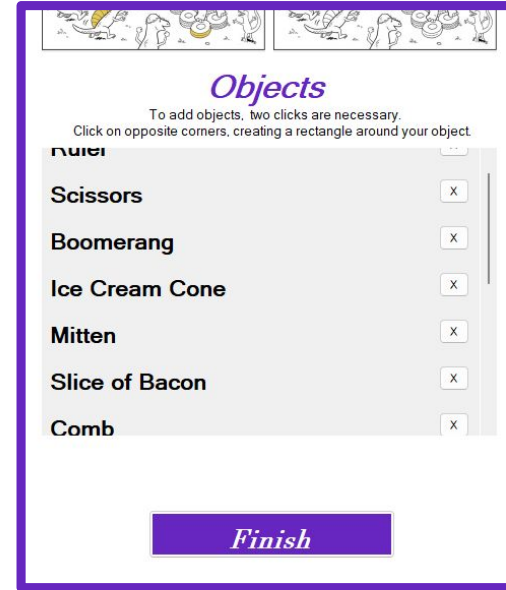
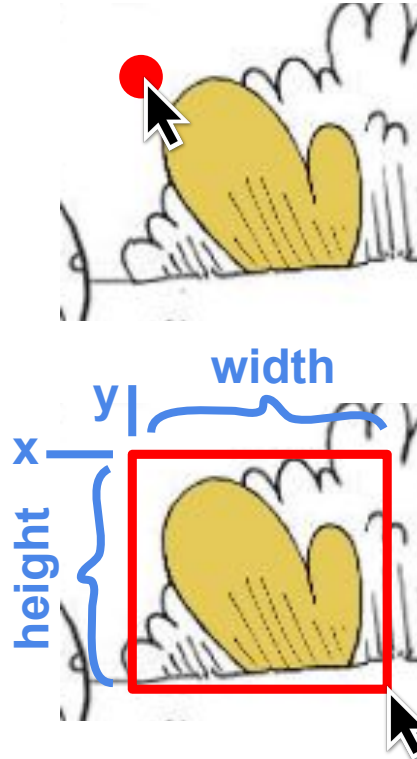
Game Page



Post Game

Adding Objects

- To add an object, click once in any corner, then click in the adjacent corner to form a rectangle.
 - X, Y, Width, Height
- Type a name
- Upload key icons
- Adds to the object list



Finished

Pagename: **Where's Waldo**

Where's Waldo,Where'sWaldo,True



pages.txt

Where'sWaldoColor.jpg



ImageFolder

List of objects,
(X, Y, Width, Height, Name)



Where'sWaldoObjects.txt

Object icons, waldo.png, etc.



ObjectFolder/Where'sWaldo

Directory helps with deletion

Main Page

Eye Spy

Page Two

PLAY

High Scores



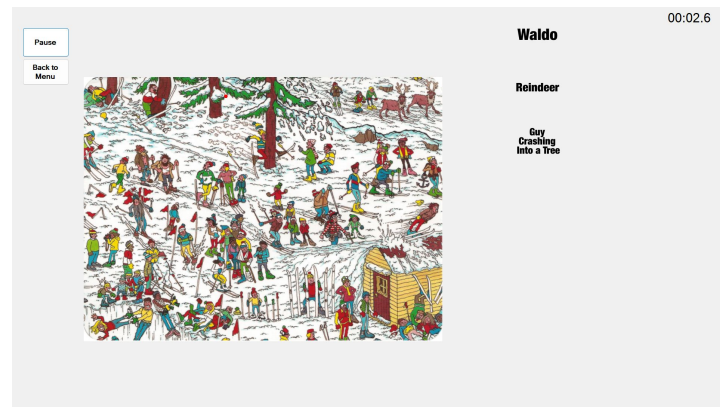
Pixelate

Nearest Neighbor
Interpolation



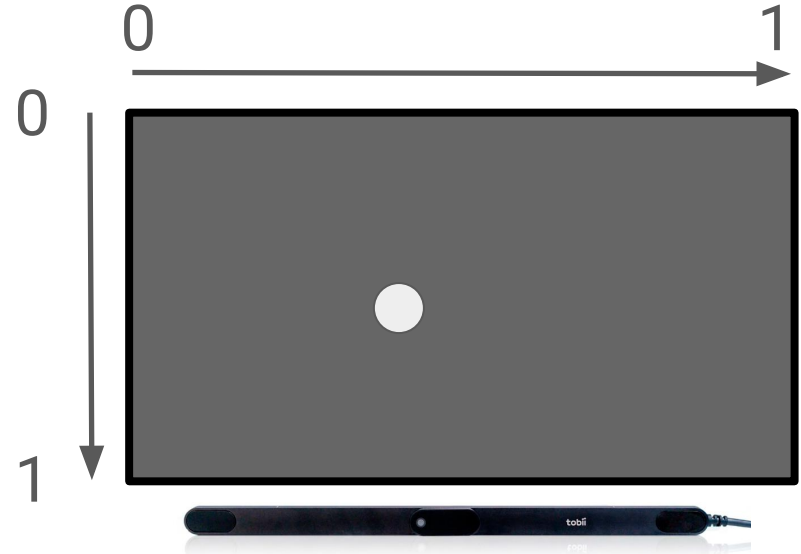
Playing the Game (setup)

- Load the eyetracker
- Ask for username
- Find images/icons with (pageName).extension
 - Draw to screen
- Start timer



Eye Tracking

- Every timer tick we get a set of coords from eye tracker (~50 per sec)
 - Come in as normalized floats
 - Relative to screen
 - X: 0.4193339 Y:0.5286691

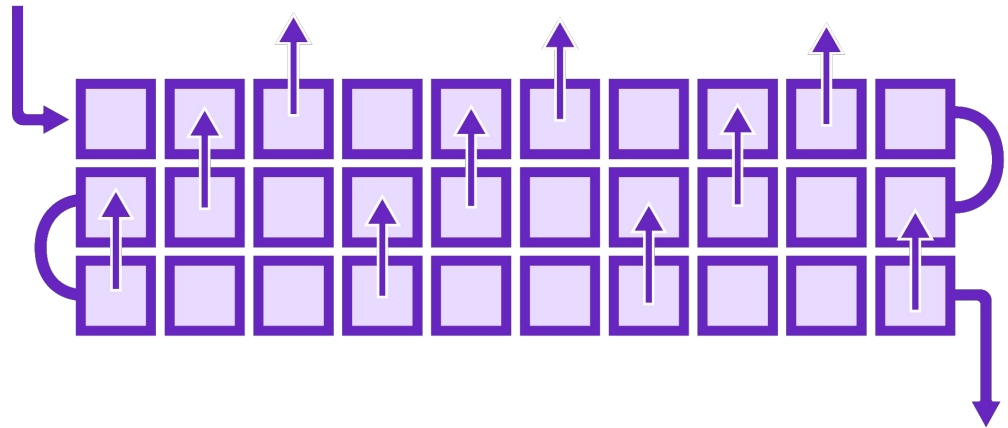


How do I know that the user has *found* an object?

- Needs to be more than a quick glance
- Contending with flicker from the tracker

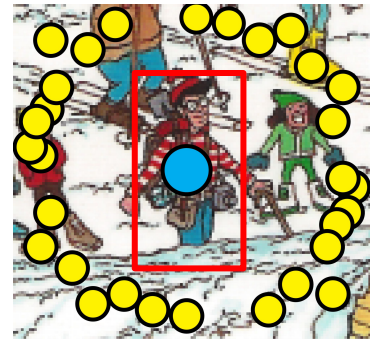
Recording Coordinates

- Keep track of the 30 previous gaze samples in a queue
- Only record one every three samples for replay

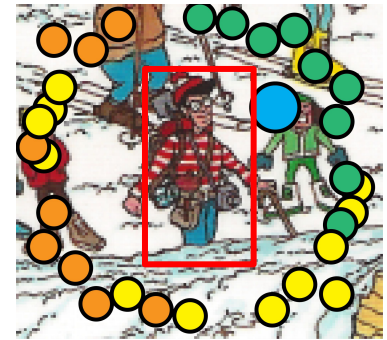


Averaging Coordinates

- Calculate the average of these 30 points every tick
 - Weighted average
 - Newest 10 make up 60% of the avg (more “gravity”)
 - Middle 10 make up 30%
 - Last 10 make up 10%
- Compare Avg. against object locations



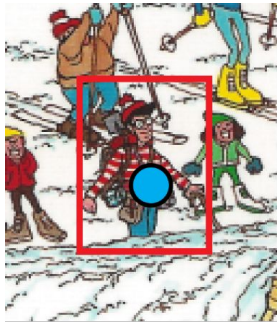
Basic Average



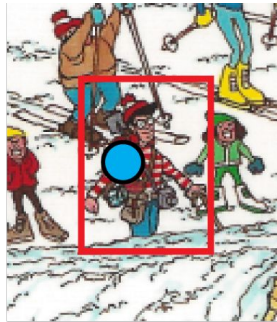
Weighted Average

Locking in on an Object

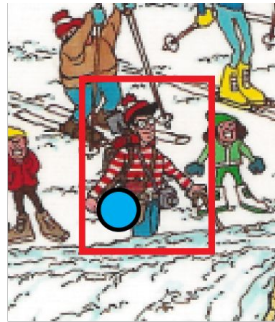
- If weighted avg. is within the bounds of an object, that objects “look counter” is increased
- If outside, counter is set to 0
- If counter reaches 15, object is considered found



Counter: **1**



Counter: **2**



Counter: **3**



Counter: **4**

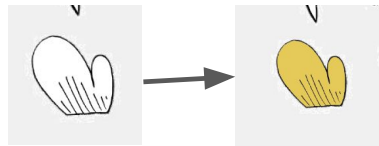
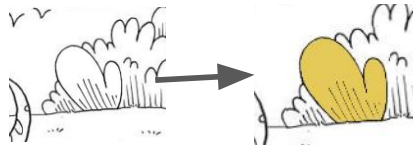


Counter: **0**

OBJECT FOUND!

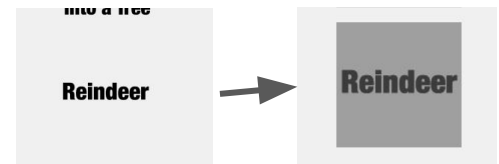
- Black and White

- Use object boundary to cut out a rectangle of the color image
- Draw it to the screen, as well as the key icon



- Color

- Draw a rectangle around the boundary
- Draw a transparent gray box on the key icon



Post Game

- Once all objects are found, game is considered over
- Gaze coordinates are written to a file
 - username_pagename_date

Jack_Where'sWaldo_2026-04-26_14-47-27

```
363,0.4192728,0.5338289
381,0.4193339,0.5286691
397,0.4202063,0.5262247
413,0.4223905,0.5282713
431,0.4230534,0.5306705
447,0.4195707,0.5288661
462,0.4218851,0.5203403
481,0.4211601,0.525958
```

Post Game

- Load top ten scores from that page's highscore file into a list
- When score is selected, their gazeData file is loaded
- Timer is started, and dots are drawn if their timestamp has passed
- Automatically load user's score if in top ten



Future Additions

- Replay additions
 - Slider for replay (like a youtube video)
 - Speed settings
 - Heatmap
 - How long/how many ticks to find each object
- Audio
 - Sound effect when object is found
 - Music

Resources

- Microsoft Learn
- Kaden/Taylor's Documentation
- Dr. McVey

Images

- Highlights Magazine
- Where's Waldo



Questions?