Tech Comm Eagle Eye-Tracking Control System

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Introduction

Eye-tracking systems are useful research tools for technical communication, marketing, and human-computer interaction. They also provide an important alternative hands-free control method. These systems, however, can be prohibitively expensive. Our research goal is to build a reliable, adaptable, eye-tracking control system using inexpensive resources.

Fig. 1. Eagle Eye-Tracking Headset, Lail, 2020.

Preliminary Results

Our eye-tracking headset, Fig. 1, tracks eye movements, including pupil location, Fig. 2, and blinking, Fig. 3. The tracking system can be used by the wearer to push buttons on a digital keyboard using only pupil movement and eye-blinking. The headset must be plugged into a laptop in order to run. The eye-tracker costs approximately $80 per headset, excluding labor.
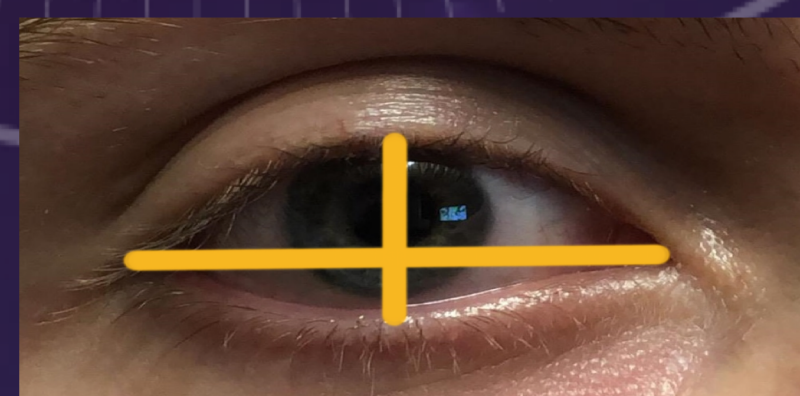

Fig. 2. Pupil Location Tracking, Smatla, 2020.

Continued Research

Our next steps include implementing a lighter casing, attaching the forward view camera for mobile eye-tracking, developing mobile data storage, and inserting an antenna and mobile power source.

Fig. 3. Closed Eye Blink Tracking, Smatla, 2020.

Methods

❑ *Materials:*

- **Logitech C270 cameras,** Fig. 4, were dismantled to remove the heavy casing.
- The camera lens, Fig. 5, was then manually opened and adjusted to focus on the pupil of the eye from approximately 1.5 inches away.
- The adjusted camera can then be attached to a lightweight plastic eyeglass frame.
- Black plastic modeling compound served as the attachment and extension arm to hold the adjusted camera at the appropriate distance from the eye.
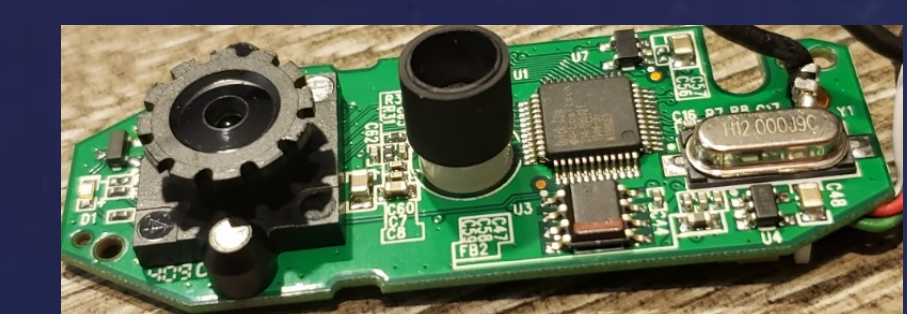

Fig. 4. Logitech *C270 HD 720p*, 2020.

Fig. 5. Adjustable Camera Lens, Lail 2020.

❑ *Software:* **In order to process the eye movement data, we used:**

- **Python** open programming language and **Pysource.**
- The **Pysource Eye Gaze** detection program, by Sergio Canu, is written in Python to determine whether the eye is open or closed and to track the pupil.
- This data is then used to trigger a command at the tracked location on a digital keyboard.

Fig. 6. Python is a free, open source, programming language & tool, 2020.