Gaze Interaction and Eye - Tracking

Welcome!
Background
Amyotrophic Lateral Sclerosis (ALS) is a condition that limits a person’s ability to control their muscles. Most patients become limited to a wheelchair, but maintain perfect control of their eyes. Through the use of specialized eye-tracking hardware/software packages, those affected by ALS can communicate and interact with the world around them.

In Fall 2015 our team began expanding the functionality of the software we inherited. We added a calibration interface, settings options, prediction optimization, and improved the user interface.

Previous Work
Previous teams implemented:
- Basic mouse (left, right, double clicks) and keyboard functionality
- 1-Gram predictive database.
Without their work, our team wouldn’t have had anything to build on.

Who We Tested
- Technical and non-technical users
- Students and professionals
- Experienced and inexperienced
- Local ALS Patient
- Ages 21-52, female and male

Results
- Fastest user averaged 28.8 seconds – twice as fast as last year
- 104% faster w/prediction

Typing: "Hello it’s quite nice out isn’t it?"
- 2016 average: 6.014 WPM
- 2015 average: 8.8
- Experienced EyeTribe users were able to beat the Tobii average

Implementation
Word-Prediction Optimization
- Learns new words and their context from imported emails.
- Utilizes N-Grams to increase accuracy of predictions.
- Balances predictions from a precompiled database and the user’s custom database.
- Can learn new words from locally saved documents.

Enhanced Keyboard and System Buttons
- “Sweep timer” effect on all keys
- Larger text box and predictive-word buttons

Integrated Calibration
- Calibration is now native to our software
- Reduces hard-clicks required to start program
- Synchronizing calibration process was a major challenge

Options Menu
- Larger buttons
- Click delay
- Word prediction import
  - Larger font and buttons than standard dialog
  - Allows users to import files to tailor the predictive database

Zoom Tool
- Acts like a magnifying glass
- Essential for selecting small elements
- Maps click from zoom-image to actual coordinates on-screen

System Dialogs
- Prevents accidental changes to settings
- Stops user from closing the program unintentionally
- Created to be used with eye-tracking (larger font and buttons than the standard OS dialogs)

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Future Work
- Include native email and file-system support.
- With a more precise sensor, our software’s performance would be closer to Tobii.
- Porting our code to C# to support improved hardware.

Glossary
- "Sweep Timer": When the mouse hovers on a button, a circle fills - indicating that a click is about to occur.
- Eye-Tracking: Using points from the eye tracker to determine where the user is looking on-screen.
- Tobii: A competing eye-tracker to the EyeTribe unit.

Thank you!
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Impact
By building an open-source alternative to expensive commercial products, we have proven that eye-tracking software can be made financially accessible for all ALS patients.

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Team Arryn