GazeVis: An Eye-Tracking Visualization Towards Predicting User Distraction

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Introduction

• GazeVis is a visualization of eye-tracking data collected from an application called GazeReader (developed in another course).

• GazeReader’s interface is able to track a user’s gaze pattern, as well as self interruptions while users are participating in a reading activity.
Motivation

• Reading tasks
  • Reading research papers for courses
  • Requires concentrated reading
  • Self-interruptions occur
• Self-interruptions
  • Switching applications (to a non-reading related activity)
  • Looking away

In order to prevent this from happening, we need to understand when is a user likely to self-interrupt.
Data Collection

- Fixations
  - Count, Duration

- Saccades
  - Duration, Length, Angle

- Tagged Interruption
  - Loss of focus of the Reader application
Predicting Self-Interruptions

1. Segment readings into Normal Reading, \( t \) seconds before an Interruption, and Invalid
2. Split Normal Reading into chunks of \( t \) seconds
3. Compare Normal chunks to Interruption chunks
Problem: **Varying Data Quality**

Solutions:
- Inspect and verify quality of data.
- Manually exclude low-quality regions
GazeVis: What can you do?

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
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<tbody>
<tr>
<td>Inspect</td>
<td>Normal Reading, t seconds before an Interruption, and Invalid time chunks</td>
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<tr>
<td>Mark</td>
<td>Interactively mark areas that are invalid</td>
</tr>
<tr>
<td>View</td>
<td>Predictions of time chunks to be classified as Normal Reading or t seconds before an Interruption</td>
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<tr>
<td>Run</td>
<td>Prediction once finished cleaning</td>
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### Analysis

<table>
<thead>
<tr>
<th>System</th>
<th>GazeVis</th>
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<tbody>
<tr>
<td>What: Data</td>
<td>Readings: Time series data of fixation events, and tagged interruptions</td>
</tr>
<tr>
<td>Why: Tasks</td>
<td>Analyze gaze pattern, Locate problematic data, Query cleansed data with prediction</td>
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<tr>
<td>How: Encode</td>
<td>Sparklines and Steplines for the fixation events, Area marks to color reading segments by type, List</td>
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<td>How: Facet</td>
<td>Partition into two views with same encoding, overview-detail.</td>
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<td>How: Reduce</td>
<td>Brush a sparkline area and zoom in</td>
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<tr>
<td>Scale</td>
<td>24 Readings, 100+ interruptions</td>
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• Improved automatic cleaning
• Additional zooming in the predict view for inspecting segments, their associated features, and classification
• Better, more advanced prediction algorithms
• Navigation tour of the interface
Questions?