Tracking Fixations and Saccades during Reading to Determine the Optimal Text Perceptual Features for Student Reading Comprehension

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Project Statement

Difficulties in reading comprehension are a common problem experienced by many students, often resulting in lower grades and lowered self esteem. Various studies have measured saccades and fixations during reading in order to understand how eye motion is related to reading comprehension. Other studies have tested how text perceptual features have affected reading comprehension. This project will use eye motion analysis to determine how text features affect reading comprehension with the goal of providing personalized optimal text features to individual participants.

Eye Movement During Reading

Fixations are pauses in eye movement during which information being read is absorbed. Saccades are movements that occur between fixations, when the eye moves through a passage. Regressions are a subset of saccades describing the eye moving in the opposite direction of a saccade, indicating a return to point of the text.

Disfluency

Disfluency characterizes the reading difficulty of a text. Fonts can be deemed disfluent, as well as other perceptual parameters, such as color, text weight, underlining, etc.

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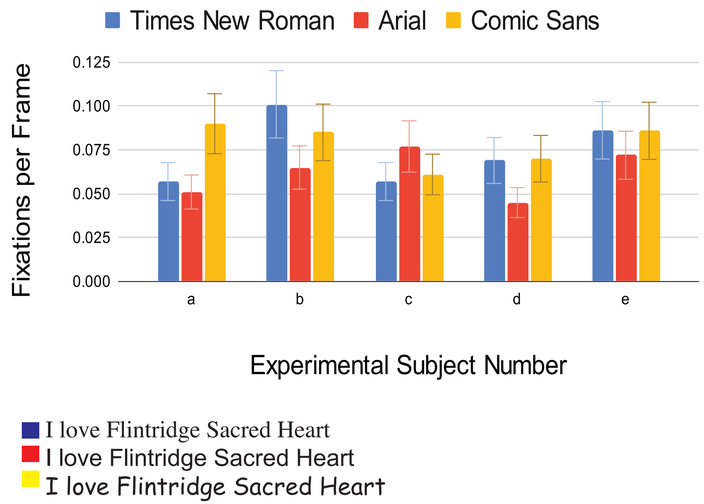
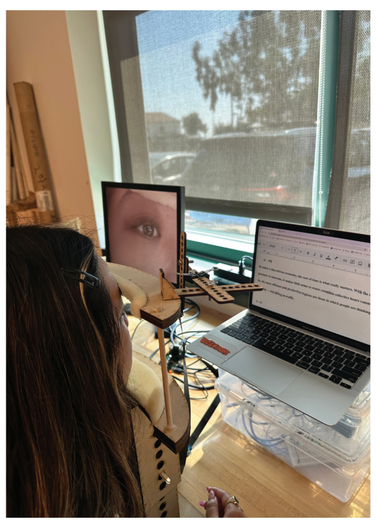
Font Choices Affect Quality of Reading

Font Test



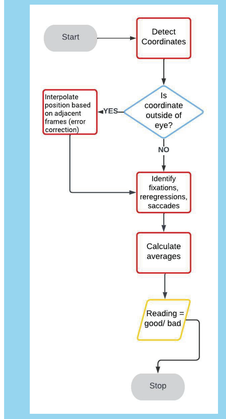
The bars in each graph show the number of fixations per frame recorded over the course of a reading test. Taller bars indicate a more disfluent font. The largest bar represents the textual parameter that proved most disfluent for each subject to read, requiring more and longer fixations on each word. In the cases where two bars are similar in height for one subject, it can be concluded that the parameters of those two tests were of equal disfluency for the subject.

Hardware Prototype

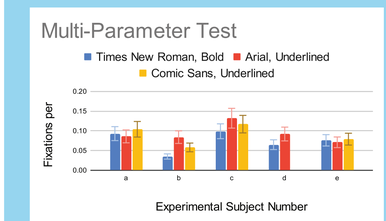


The hardware used during testing featured a head and chin rest adjustable in the y-direction. Attached to the head rest is a 3-axis adjustable leg holding a Pi camera.

Software



The software detected coordinates of the eye based on pupil position. Coordinates were corrected for frames with errors in pupil position detection by interpolating data from adjacent frames. Pupil positions were used to determine the form of eye movement that occured.



In tests with overlying parameters, it could not be determined which parameter attributed to higher levels of disfluency.

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