Detect User Confusion using Eye Tracker and Machine Learning Methods

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Abstract

Confusion is known to hinder user experience. Many researchers leverage eye tracker to discover the mental process conveyed by eye movements. This project explores the possibility of using machine learning methods to find the patterns of confusion using eye tracking, and hope to answer the question: Can eye movement reveal confusion? If so, what eye movement features are the best indicator of confusion? The hypothesis of this project is that these two patterns are possible confusion predictors: the concentration of gaze and fixation points on areas of the interface and the relative positions between the cursor and gaze points. An experiment simulating a social study is designed to collect participants’ eye data. Two versions of feature data are generated: the Euclidean distances of gaze, fixation, and cursor position. Both feature sets use the x and y coordinate data of gaze, fixation, and cursor position. Feature Set 1 uses the squared sum of the standard deviation of the x and y coordinate of the selected features, Feature Set 2 uses the Euclidean distance from the top left corner of the screen.

I applied IBk algorithm on Feature Set 1 and K* algorithm on Feature Set 2. Both algorithms are provided in WEKA. The classification accuracy using K* on Feature Set 1 is 57% with kappa statistics of 0.7. The classification accuracy using IBk on the Feature Set 2 is 60% with kappa statistics of 0.14. Although the IBk model is better than the K* model, the low kappa statistics of both models indicates that both models are insufficient enough to produce meaningful result.