Estimating the emotional content of an image from the observer's eye scan pattern

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Introduction

Human vision, moves from a point to another to seek more information about its cognitive and behavioral goals. They do not have a fixed pattern and can be broadly divided into two:

1) A rapid movement called saccade
2) A one point focus called fixation.

Do the eye movements a viewer makes while viewing an image contain information ?

If so do they differ while looking at images which invoke different emotions?

Methodology

- A head mounted eye movement tracker was used to track the eye movements of the subject.
- The subjects were made to look at the experiment dataset consisting of 200 images shuffled in a random order.
- 13 distinct features corresponding to formation of saccades, fixations and gaze path traversed by the eye were extracted.
- A random forest classifier was used to perform the classification of the results based on arousal and valence(emotional content)
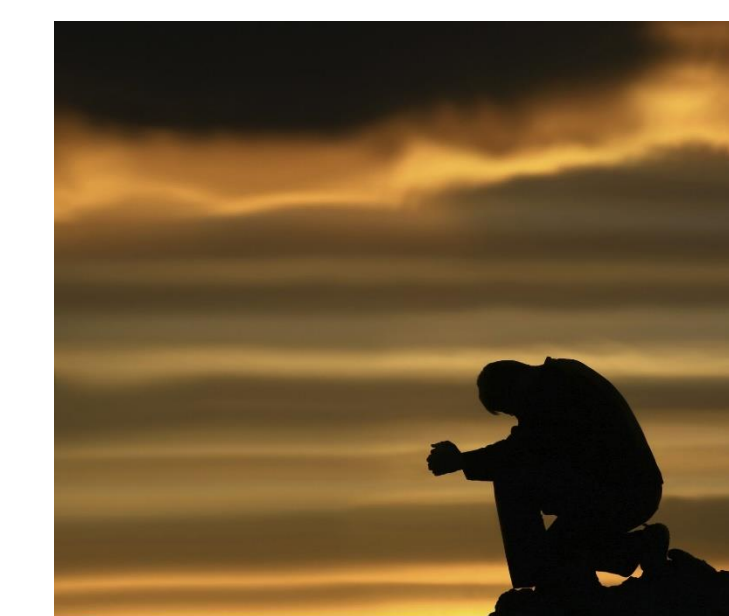
Objective

The aim of the study is to predict the emotional gist of the image, namely the level of arousal (low or high) and kind of emotion (positive or negative) that the image elicits from the pattern of eye movements
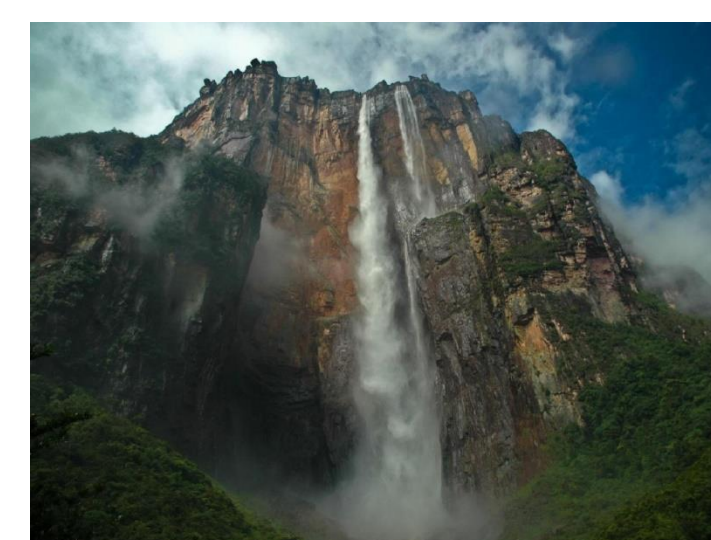
Dataset

A sample of the four types of images that were used for the experiment is shown below:

An image with Positive Emotion
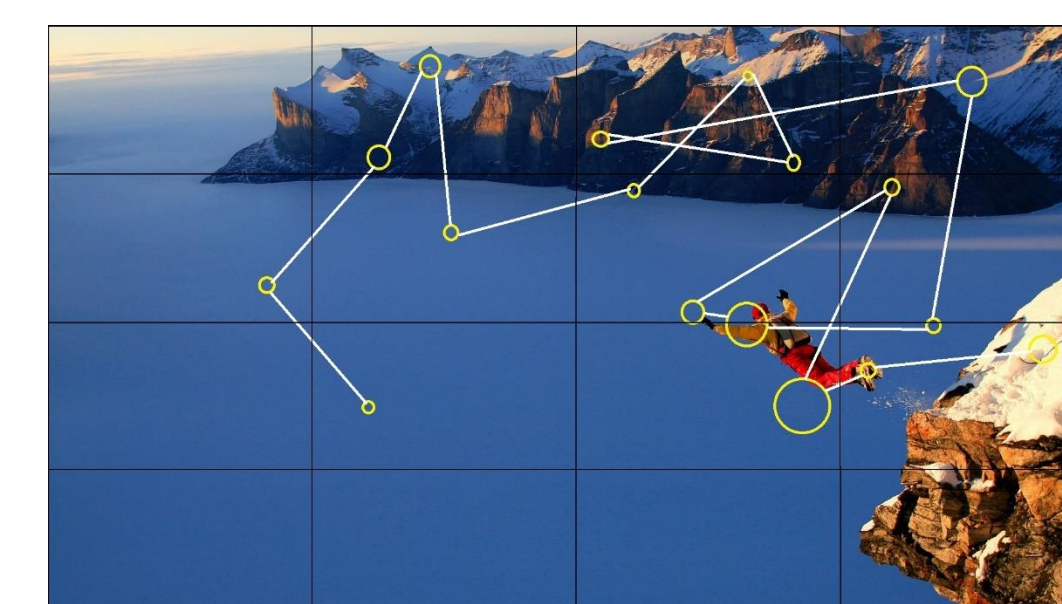

An image with Negative Emotion
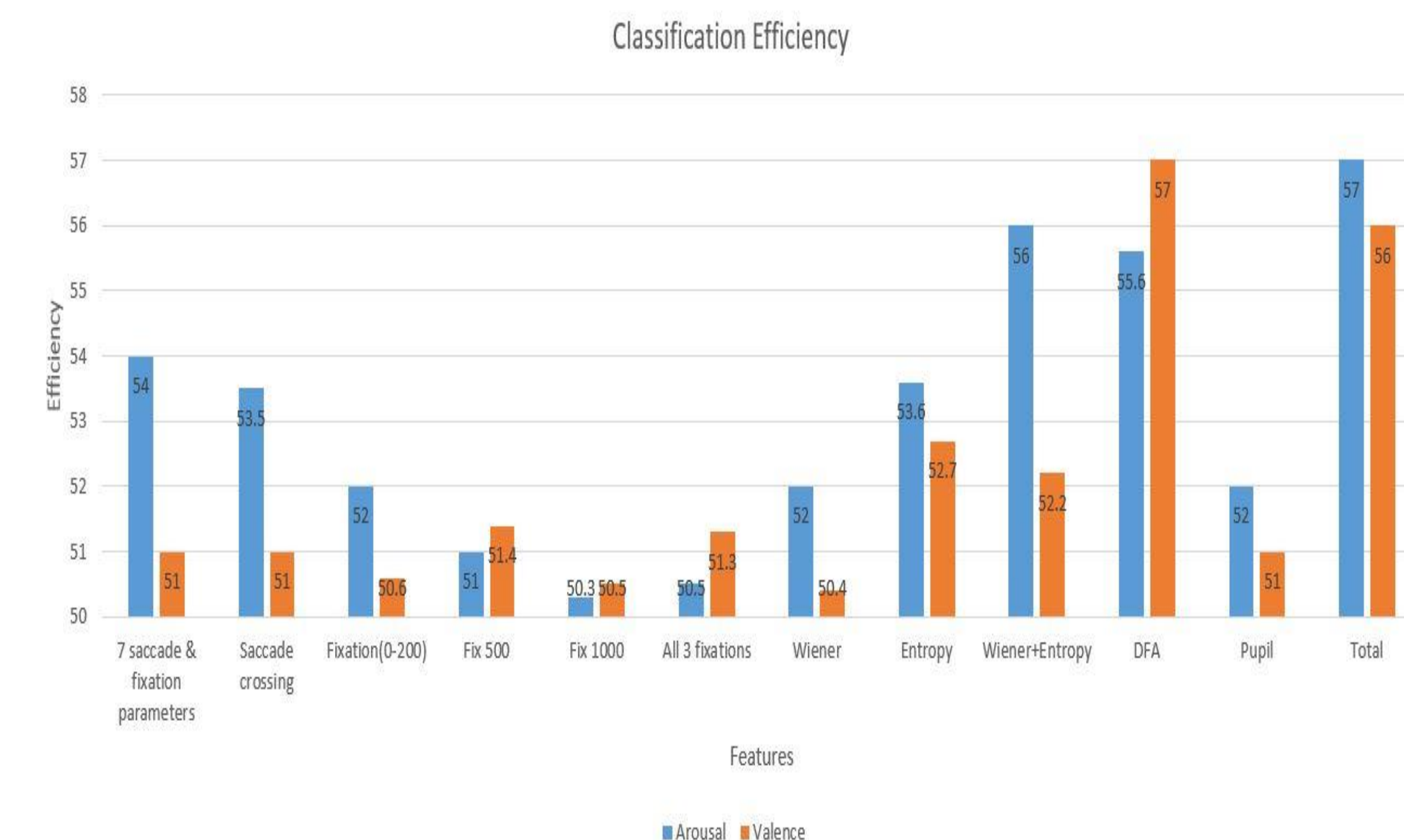

An image with High Arousal

An image with Low Arousal

Features

An image showing the fixations and saccades

Result

Conclusion

- The efficiencies obtained from the experiment were below average doing slightly better than the apriori probability of 50%.
- The classification efficiencies obtained by using non linear features like Wiener entropy, detrended fluctuation analysis were found to be better than the saccadic features.
- The next step ahead is to improve the efficiency by implementing a deep learning algorithm based classifier as well as getting a subject feedback to overcome inter subject perception differences