BEX3012 Project Report Detecting Facial Expressions in Professional Tennis Matches

Stephanie Kobakian

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1 Introduction

Facial Recognition is beginning to be explored in sports environments, this presents quality issues.

helpful for applications

2 Method

2.1 Materials

2.1.1 Image Set

A subset of faces was created specifically for emotion recognition purposes. This set contains faces that were manually annotated as players. It contains the area within the face bounding boxes found in the previous study, as well as a small border to fram the face. This resulted in images of differing sizes to be passed to the APIs. These images were hosted on Google Drive to allow for URL access from the API to the individual images.

2.1.2 Software APIs

We will consider three Emotion Recognition softwares.

Table 1: This details the capabilities we considered important in recognising emotions in images of faces.

Attribute	Google	Microsoft	Skybiometry
Batch Processing	10 per second	20 per minute	100 per hour
Emotion Output	?	Numeric Proportions, (0.0-1.0)	Confidence Value, (0-100)
Number of Emotions	4	7	7

Cost and Access	Account and Payment	Account	Account and Payment
API Access	REST	REST	REST

As can be seen above, a noticable difference between the three is the amount of times the API can be called. Skybiometry had the largest imposition on Bath Processing as it only allowed 100 API calls to be processed per hour. Microsoft also had a limit imposed, but this allowed for much more to be processed with the possibility of 1200 images to be processed within an hour, after accounting for the wait time betwwen each group of 20. Google Vision's API batch processing limit had a minimal effect.

The range of outputs from the softwares is displayed as Google provides likelihoods of an emotion occuring on a particular face. Microsoft and Skybiometry provide outputs on the same emotions[1]. However the values that they provide differ as Microsoft provide Porportions whereas Skybiometry results in a Confidence of the emotion occuring in the specified face.

```
##                                                                 file
## 706 2016_CT6_R02_MTrungelliti_ARG_vs_GDimitrov_BUL_MS210_clip.0027.png
##     joyLikelihood sorrowLikelihood angerLikelihood surpriseLikelihood
## 706 VERY_UNLIKELY    VERY_UNLIKELY   VERY_UNLIKELY      VERY_UNLIKELY
```

```
##               aname face.value face.confidence mood.value mood.confidence
## 6 face-1774-1-Go.png       TRUE              50      angry              50
##   neutral_mood.value neutral_mood.confidence anger.value anger.confidence
## 6              FALSE                       0        TRUE               50
##   disgust.value disgust.confidence fear.value fear.confidence
## 6         FALSE                 13      FALSE              13
##   happiness.value happiness.confidence sadness.value sadness.confidence
## 6           FALSE                   10         FALSE                 26
##   surprise.value surprise.confidence
## 6          FALSE                  42
```

```
##             FileName       anger    contempt     disgust     fear
## 6 face-1774-1-Go.png 0.004944629 0.000693218 0.000200967 3.18e-05
##   happiness   neutral    sadness    surprise
## 6  7.59e-05 0.9048402 0.08910409 0.000109114
```

[1]Based on Paul Ekmans emotion theories