Emotion Recognition

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EN.601.419 Cloud Computing

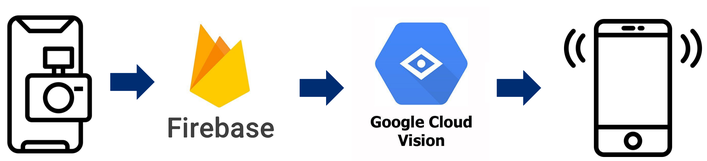
Introduction

Not everyone can easily discern facial expressions. For people with autism, reading facial expressions and emotions can be a very daunting task that takes a lot of time to learn and master. This can lead to difficulty interacting with people, especially in face-to-face social situations and with people that they do not know well. As a result, people with autism can experience added stress and anxiety in their everyday lives. Our project aims to be a proof of concept of using cloud computing and connected devices to streamline emotion recognition and incur less load on the smart device itself.

Objectives

- Create a pair of smart glasses that:
  - Display the detected emotion on the glass or tell the user the emotion through bone-conduction speakers.
  - Is inconspicuous and blends in with regular glasses to avoid unwanted extra attention.
  - Make use of Google Cloud Vision API to remove the need for powerful computing resources onboard.
  - Easy to learn, easy to use, and fast.
- However, we do not have the resources to create the hardware, so we used a smartphone as a stand-in device.

Design



Emotions Detected:

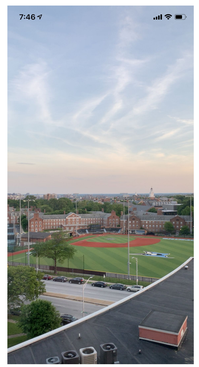
Related Work

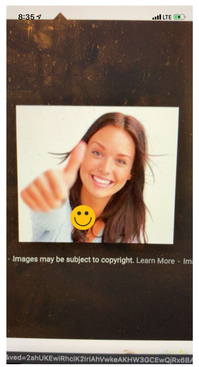
Current research at Stanford University:

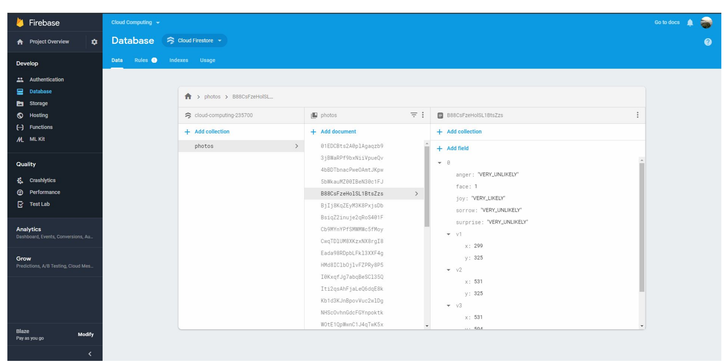
- Uses Google Glass
- Facial detection and emotion recognition is done onboard a smartphone
  - Results are relayed back to the glasses
  - Recognizes eight different basic emotions
  - Game modes to help children develop skills

After the pilot study, "the children's scores on a social-skills questionnaire indicated less-severe autism symptoms. Six participants had experienced changes in their scores large enough to move down one step in the severity of their autism classification, and 12 of the participating families reported that their kids made more eye contact." [1]

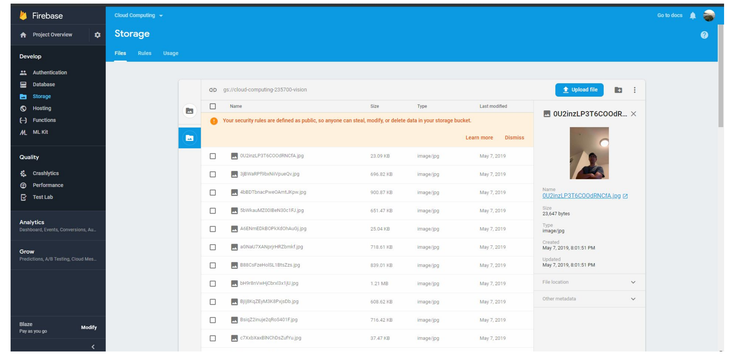
Results







Results cont.



Benefits of using Google Cloud Vision:

- Thoroughly pre-trained
- Constantly receiving feedback and improving
- Ease of integration
- 2-4 second response time on LTE and WiFi

Shortcomings of Google Cloud Vision:

- Still not completely accurate
  - Confusion between sorrow and anger
  - Some confusion between anger and joy in rare, extreme cases
- Only supports four emotions currently
- Speed is determined by the speed of your current connection

Conclusion

We found that applications of cloud computing can be successfully used in social skills therapy. In our opinion, the limiting factor of the system is the accuracy of the emotion detection itself. If emotions are incorrectly detected then it will be more difficult for the user to learn facial expressions and discern between subtle changes. Although we were unable to find statistics on the accuracy of Stanford's implementation of emotion recognition, we found that Google's implementation could be fairly inaccurate, but usually only in circumstances that had similar emotions (sorrow vs anger). We were able to achieve low response times, and further research can be done to remove the need of Firebase to improve the response time.

Acknowledgments

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References

[1] Erin Digitale. Google glass helps kids with autism understand faces, Stanford study finds, 2018.