**Class:** CMU-CS 447 AIS

**Team Member:**

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**Ứng dụng: FaceMe**

1. **CONCEIVE**
2. **Project overview**
   1. **Project Definition**

* *The ability to recognize and imitate facial expressions of emotion is crucial to establishing interpersonal connections early in life. Recognition of facial expressions is one of the primary signals used to understand the feelings and intentions of others, and it has been argued that the ability to recognize basic emotional expressions may be universal. Yet many researches have shown that some groups of autism patients display difficulties in such tasks, which usually led to their detachment from social life.*
* *The answer to this problem lies in the question itself. People with autism need a tool that can work as a translator hub between them and the non-verbal signs of the other party of a conversation. And while those signs include many such as body language, environment context, etc. facial expressions are reasonably the most important factor.*
* *That’s why in this project we will develop a mobile app that can detect the emotional change of a person in real-time and give subtle alerts to the user, assuming someone with autism, so that they can try to navigate the conversation to a positive end.* 
  1. **Business Need (phạm vi của dự án)**
* Detect change in a person’s emotion through their facial expression.
* Send an alert to the user, using the system’s capacity to notify the flow of the conversation.

1. **Prior Art**

In this section we present the SWOT analysis of our own application and some other available ones on the market.

**FaceMe**

FaceMe is a mobile application developed as a tool specifically designed to assist people with trouble recognizing facial expressions in daily life conversations.

|  |  |
| --- | --- |
| **Strengths** | **Weaknesses** |
| Use CNN model to detect emotional expression.  Useful and subtle design. | Can only help recognizing emotional expression.  Developer team is inexperienced.  Low budget. |
| **Opportunities** | **Threats** |
| There’s not much competition. | Might be treated as a breach of privacy of other people. |

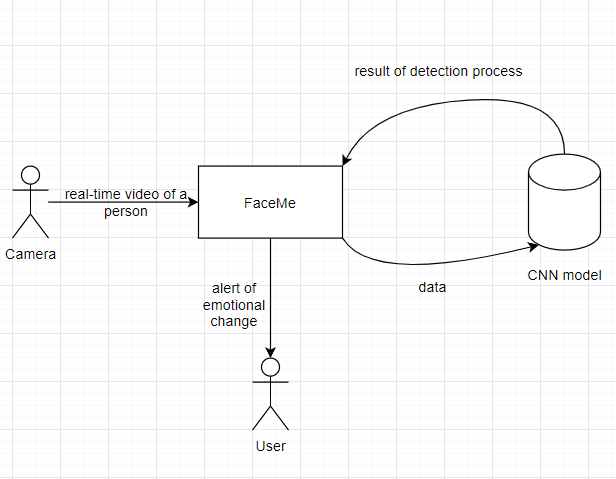
**AffdexMe**

AffdexMe demonstrates the use of Affectiva's Affdex Software Developer Kit (SDK), which lets developers emotionally-enable their apps and digital experiences.

The app analyzes and responds to facial expressions of emotion in real time using the built-in camera on your Android/iOS device. To use, simply start the app and you will see your own face on the screen with metrics at the top measuring expressions and emotions and the most likely emoji icon that matches your facial expression.

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| **Strengths** | **Weaknesses** |
| The app analyzes and responds to facial expressions of emotion in real time using the built-in camera on your Android/IOS device. | Limited emotional awareness  Most of the time emotions are wrongly classified to Joy. If teeth are visible the emotion is detected as Joy irrespective of actual real joy.  Seemingly still in development.  Accuracy is not high. |
| **Opportunities** | **Threats** |
| The first pioneer app for free.  Uses new technology. | Didn't really get the point.  Crashed many times.  Has many negative feedbacks. |

1. **System Context (Biểu đồ ngữ cảnh của ứng dụng)**



**System Context Description**

***Camera:***

*Capturing real-time video of the other party in the conversation.*

***FaceMe:***

*Receive and transfer data to the CNN model then send alerts to the user using system’s capacity such as ringtone to notify the changes.*

***CNN model:***

*Analysis and detect the emotion from the person’s emotional expression.*

*Send the result to the system.*

***User:***

*Receive notification from their device.*

* **Cost Estimate**

***Cost Person/Hour***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Resource Name*** | ***Type*** | ***Initials*** | ***Max. Units*** | ***Std. Rate*** | ***Ovt. Rate*** |
| *Nguyen Thanh Danh* | *Work* | *NTD* | *100%* | *$1.00/hr* | *$2.00/hr* |
| *Tu My Ngan* | *Work* | *TMN* | *100%* | *$1.00/hr* | *$2.00/hr* |
| *Bui Duc Duong* | *Work* | *DP* | *100%* | *$1.00/hr* | *$2.00/hr* |
| *Dang Van Phuoc* | *Work* | *DVP* | *100%* | *$1.00/hr* | *$2.00/hr* |

***Total cost estimate***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***No*** | ***Criteria*** | ***Price*** | ***Amount*** | ***Total (USD)*** |
| *1* | *Working hours* | *$1* | *421* | *$421* |
| *2* | *Other cost* | *$100* | *1* | *$100* |
| ***Total cost*** | | | | ***$521*** |

|  |  |  |
| --- | --- | --- |
| ***Description*** | ***Amount*** | ***Unit*** |
| *Number of members* | *4* | *Person* |
| *Number of working hours per day* | *4* | *Hour* |
| *Number of workdays/weeks* | *5* | *Day* |
| *The duration of the project* | *120* | *Day* |
| *The number of working hours* | *421* | *Hour* |
| *Other costs (Internet, foods, drinks, meetings, fuel…)* | *100* | *USD* |

* **Master Plan**

**Ví dụ:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***NO*** | ***Task Name*** | ***Duration*** | ***Start*** | ***Finish*** |
| ***1*** | ***Start-Up*** | ***15 days*** | ***26/08/2021*** | ***06/09/2021*** |
| *1.1* | *Project’s Kick-off   Meeting* | *2 days* | *26/08/2021* | *27/08/2021* |
| *1.2* | *Create Document* | *13 days* | *28/15/2021* | *06/09/2021* |
| ***2*** | ***Development*** | ***45 days*** | ***07/09/2021*** | ***22/10/2021*** |
| *2.1* | *Sprint 1* | *15 days* | *07/09/2021* | *21/09/2021* |
| *2.2* | *Sprint 2* | *20 days* | *22/09/2021* | *11/10/2021* |
| *2.3* | *Sprint 3* | *10 days* | *12/05/2021* | *22/05/2021* |
| ***3*** | ***Final release*** | ***1 day*** | ***23/05/2021*** | ***23/05/2021*** |

1. **Business plan (Kế hoạch kinh doanh)**

The application brings a new beginning for people with autism, helping autistic people to recognize the emotions of the opposite person through the application developed by our team. Giving a little help to someone with autism can be more fun and especially social. Because this is a project to help people with autism, our team decided to do it for a non-profit purpose with the hope that those who are suffering from the disease can have fun and mingle with everyone and especially it will be back to normal soon

1. **Công nghệ sử dụng**

*Main Programming Language:* ***Python***

*The system uses a* ***CNN (Convolutional Neural Network)*** *with* ***TensorFlow*** *to detect human emotions from facial expressions with great accuracy, then integrates that model with* ***OpenCV*** *to process real-time video.*

*The application is developed completely in python, then compile to android friendly app using* ***BeeWare*** *and* ***VOC****, which is a transpiler - it takes Python source code, compiles it to CPython Bytecode, and then transpiles that bytecode into Java-compatible bytecode. The end result is that your Python source code files are compiled directly to a Java .class file, which can be packaged into an Android application.*

|  |  |
| --- | --- |
| ***PROJECT MANAGEMENT TOOLS*** | *Trello, GitHub* |
| ***DOCUMENT TOOLS*** | *Google Docs* |
| ***UML TOOLS*** | *Astah Professional 8.2.0, Draw.io* |
| ***IDES*** | *Visual Studio Code 1.44.2, Android Studio 2.3.2, BeeWare* |
| ***DEPLOYMENT SERVER*** | *AWS S3, Heroku, MongoDB Atlas* |
| ***DBMS*** | *MongoDB Compass 1.20.5* |
| ***DATABASE*** | *MongoDB 4.2.0* |
| ***SOURCE CODE VERSION CONTROL*** | *Git 2.26 (Hosted on GitHub)* |
| ***TESTING TOOL*** | *Postman 5.5.4* |
| ***COMMUNICATION TOOLS*** | *Zoom, Facebook Messenger, Google Hangout* |

1. **Quality attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Type** | **Description** | **Solution** |
| QA1 | Performance | A conversation is usually fast and continuous, requiring the system to return detection results in the latest of 1 second to avoid bad timing and misunderstanding. | Applying CNN model. |
| QA2 | Availability | The system needs to run smoothly during a short or long period of time depending on the length of the conversation with equal precision. In case of crashing or memory overloading, reboot the system. |  |

1. **Other (importance)**

**Problem definition:** The use of an off-system camera with an unnoticeable camera serves the purpose of making the conversation seem normal. But in some cases it can be treated as a breach of privacy to the other party.

The solution to this is decided that the application will only work on real-time video records and save no aftermath data.

1. **References**

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<https://stackoverflow.com/questions/49955489/how-to-develop-android-app-completely-using-python>

3. The Development of Emotion Recognition in Individuals with Autism

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3085906/#R12>

4. Detect Emotions with Convolutional Neural Networks

<https://www.youtube.com/watch?v=ctjkZnQF_FY>

5. Detect Emotions in Real-Time with OpenCV

<https://www.youtube.com/watch?v=6KcZ9KzMLPw>