Bilkent University

Department of Computer Engineering

Senior Design Project

Emolyst

Project Specification Report

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1.Introduction

In these days, people are the fundamental interface of all businesses. People's emotion and behavior affect their vital decisions which direct the businesses. If machines can know what a person is feeling, incredible insights can be unlocked. While detecting and analyzing one's feelings and comprehending results in a smart way, computer science comes into play. With the help of trusted algorithms, collected data is processed and rational inferences can be made. Hence, the value for any business can be created in an incisive way. Concordantly, we are planning to bring this idea into our senior design project. We are planning to create an application called **Emolyst** that can detect emotion, gender, and age through the integration of several algorithms. Basically, real-time data that is collected through cameras will be analyzed. Later on, statistical results will be given to our clients to make them smart and profitable choices for their businesses. Since our application will process images for only real-time data analysis under the Code of Ethics, it certainly won't break the Law for Protection of Personal Data. When all the benefits of **Emolyst** are considered, it can be said that the "mainstreaming" of emotion, gender and age recognition of Emolyst will enable companies to engage it in a multitude of profitable uses, across industries.

1.1. Description

Emolyst is a CRM (Customer Relationship Management) application for legal entities and it provides analysis of their customers based on their emotional status and age-gender categories. Emolyst uses and integrates face detection, emotion recognition, age, and gender detection algorithms. It processes these data to provide analysis to our clients about their customers. Emolyst aims to improve customer services and quality standards of companies. For example, at a supermarket, cameras

will be inserted over each aisle with an angle which it will be able to see faces of customers. Camera records will be processed and analyzed by Emolyst. Emolyst will introduce a report to the supermarket which includes information about their customers' behaviors such as the percentage of happy, sad, bored, angry or neutral users with an option of filters with respect to their age gaps and genders. A supermarket can use time, gender, age, emotion filters to get specific information about the analysis. This project will help supermarket to get real-time reliable data about their customers and increase their customer satisfaction. Customer ratings are valuable sources to understand their satisfaction and are critical for designing better customer experiences and recommendations. Companies generally work with survey companies to measure the satisfaction level of their customers. But satisfied customers do not tend to fill or answer surveys from these companies [1]. This behavior of satisfied customers causes false results in surveys. Also getting enough data from surveys may take time. One of the most innovative and useful functions of Emolyst is providing real-time analysis. It will analyze all customers' data in the given interval. While doing this, Emolyst will not keep or use any confidential data of people and will abide by personal data protection law. Any of the faces will not be recognized or sold to third parties. Each company can only see the analysis of their customers.

1.2. Constraints

In this section, some considerations are explained. Many constraints of the Emolyst software system are listed below. All these are important for us to implement the software.

1.2.1. Implementation constraints

- Bitbucket[2,3] and Github[2,4] will be used for collaboration of code and documentation.
- The program will run on the client side.

- We will use Python and JavaScript programming languages for implementation.
- The face data will be retrieved by a camera to analyze.
- The application will not store any video or image data but results of analysis made on video streams will be kept on time-series database[5] like influxDB[6] which is preferable for real-time analysis applications.

1.2.2. Ethical constraints

- We will be working and developing our software under the ACM Code of Ethics and Professional Conduct[7].
- Image data will not be distributed to third parties.
- The application will not know who is in the image.
- All human faces that are detected by the application will be anonymous.
- Faces retrieving from the camera will not be stored in order to protect privacy.
- Our application will process images for only data analysis.
- We will process images for only application purpose.

1.2.3. Economic Constraints

- Cloud Services may be rented for model training such as Amazon AWS or Google Cloud Services.
- An external camera may be purchased for image retrieving

1.2.4. Legal Constraints

- Our application will be compliant with the Law for Protection of Personal Data of Turkey[8].

1.2.5. Social Constraints

- Our application will not recognize who the person on the footage is. It will only detect faces of a person and from this detection, the application will create non-personal data. The data will be kept anonymously.

1.2.6 Sustainability Constraints

- We will receive regular feedback from our customers to improve our functionality.
- Initial deployment of the application will primarily rely on the dataset collected from the web, however, to improve our accuracy we may include to dataset our own data that we gather from analyzes.

1.2.7. Reliability Constraints

- Our application will analyze the age, gender, and emotions of people.
- To get more accurate results, we are going to use big datasets to train our algorithms.
- We are going to use trusted and tested algorithms

1.3. Professional and Ethical Issues

As engineers, we need to consider ethical and professional aspects of development and engineering. In this project as a group, we all will work on a project under some professional and ethical principles.

1.3.1. Professional Issues

- All group members will make an equal contribution to the project.
- In all decision-making processes all members will have equal claim.
- The source code of the project will be private.
- The group members will be always kept in touch and have planned meetings at least once a week.
- Each group member will equally bear the possible expenses.
- If any possible profit will be made in the future, profit will be shared by group members by equally.

1.3.2 Ethical Issues

- The face data will not be used for biometric face identification analysis and all detected faces will be anonymous and private in our system.
- Gender and age data is collected for only making a recommendation for these demographic groups for in their favor. Our program absolutely will not have any prejudice or make discrimination based on religion, gender, race, ethnicity, ideology or worldview.
- The training face data will consist of very diverse human faces which results our program will work on various human faces for all genders, races, and ethnicities.

2. Requirements

2.1. Functional requirements

- The application will record video by using an installed camera.
- Recorded frames (not all) will be analyzed and customers' faces will be detected. After that process, the recorded frames will be deleted.
- The application will analyze the mood of customers at a moment.
- The application will also detect gender and age of a customer.

- According to the collected data, the application will generate some statistical data for products or services. These data will be created based on customers reaction to the product or service.
- The user will be able to filter collected data by its contents like age, gender, satisfaction, etc.

2.2. Non-functional requirements

- The application should be capable of the analyze multiple streaming image data simultaneously, For example, camera data coming from all posters at poster exhibition.
- Emotion recognition for application should have at least %80 accuracy for 3 three basic emotion(Like, Neutral, Dislike) and %50 for complex emotions(Anger, Disgust, Fear, Happy, Sad, Surprise) to be able to create consistent analysis.
- Age recognition for application should have maximum +- 10-year error rate for consistent analysis.
- Gender recognition for application should have at least % 80 accuracy for consistent analysis.

3. References

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