MOOD BOOSTER SYSTEM

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MOOD BOOSTER SYSTEM

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Mood Booster Media Application

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The proponents are to develop a facial expression recognizer music player desktop application using computer vision. This projects intends to evolve music players to a whole new level through Eigenface Object Recognizer and EMGUCV. The proponents chose the desktop units as the device to be used in our project because it is capable of processing large amount of data such as images unlike tablets and smartphones which have limitations. The proponents' system involves training of images in a specific facial expression. The Eigenface Object Recognizer is used to determine class-specific masks which are then applied to the image data and used to train it. The application will generate music based on the classified facial expression. The music that is generated is based on the survey that they conducted have ages ranging 16 years old to 40 years old.

Keywords: Image processing, Haarcascades, Image analysis, PCA (Principal Component Analysis), Gabor Filters, Eigenface Object Recognizer, EMGUCV

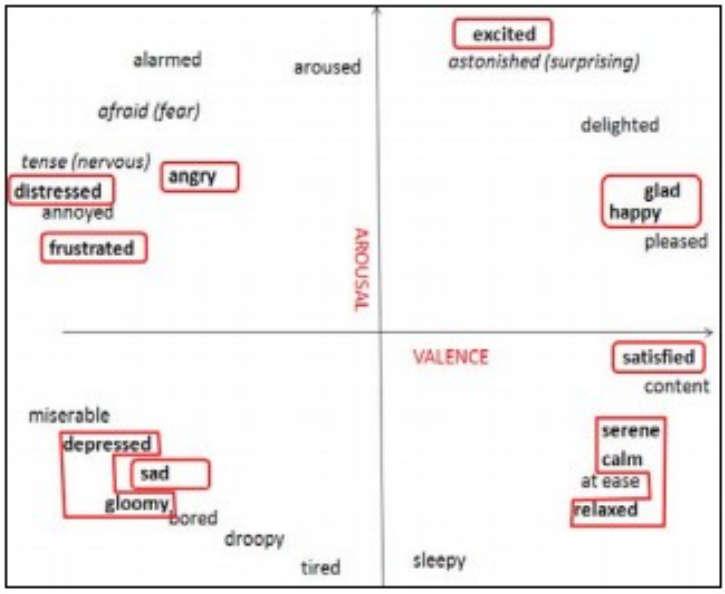
Chapter 1

1. INTRODUCTION

1.1 Background of the study

The six "universal" emotions defined by Ekman are Anger, Disgust, Fear, Happiness, Sadness, and Surprise, are well known in psychology. However, since they were designed for encoding facial expressions, some of them may not be suitable for music. According to Russell's model of mood categories (refer to fig. 1) there are selected emotions that are really suited for music and they were based from social tags of *last.fm* and were derived by category. The theory about mood is that the easiest way to express mood is through facial expression. With these data that they have researched, is it possible to change the mood of a person through music and facial expression recognition?

Figure 1. Russell's model



1.2 Objectives

The study intended to investigate on how to recognize facial expression of the user with the use of EMGUCV and improve the mood by playing music based on the classified facial expression. Specifically, the study intended to accomplish the following objectives:

(1) Train the image to a specific facial expression.
(2) Recognize facial expression using Eigenface Object Recognizer
(3) Identify the music preference by age.
(4) Plays music based on the classified facial expression and users music preference.

1.3 Significance of the study

This study would provide a new experience to musicians and music lovers in a sophisticated way and its main purpose is for entertainment. Through mood detection in image processing, adolescents would acknowledge the role of music in their mood regulation and many marketing practitioners already accepts this notion, given that music is increasingly used as a stimulus in the retail environment as well as in radio and television advertising

Music has long been considered an efficient and effective means for triggering moods and communicating nonverbally. It is therefore not surprising that music has become a major component of consumer marketing, both at the point of purchase and in advertising.

1.4 Scope and limitations

The study covers facial expression recognition using EMGUCV and Eigenface Object Recognizer. The study classifies mood in four basic emotional expressions (sadness, happiness, anger, and surprise) depends on the trained images of the user. Emotional expressions such as shame, jealous and etc. will not be recognize. The study also limits genre of the music because some genre will contradict the purpose of our application. Music genres such as Rock, Pop, Blues, and Reggae are genres that will improve the user's mood depending on the classified facial expression.

Chapter 2

2. Review of related literature

2.1 There are multiple research studies about Emotion Recognition which utilizes different emotional information or data that corresponds to the indicators humans use to perceive emotions in others. These emotional cues may come in different forms such as human voice, body posture, body temperature, and facial expressions. Among these, facial expressions is the most common source in emotion recognition.

2.2 [1]Agrawal, N. et al. developed a facial expression recognition system to address the challenge of achieving high recognition rates across multiple databases. The proponents' system involves pre-processing the image data by normalizing and applying a simple mask, extracting certain (facial) features using Principal Component Analysis (PCA) and Gabor filters and then using Support Vector Machines (SVM) for classification and recognition of expressions. They used Eigenfaces to determine class-specific masks which are then applied to the image data and used to train multiple, one against the rest, SVMs.

2.3 [2]A new emotion detection algorithm was developed by Kim, M. H. et al. The researchers' algorithm is composed of three stages: image processing stage, facial feature extraction stage, and emotion detection stage. In the image processing stage, they used the facial image algorithm for

emotion detection. They used a new feature extraction method in facial feature extraction stage. This method consists of three features regions: eye region, mouth region, and auxiliary region. In each face region, they extracted each feature by comparing geometric and shape information. The fuzzy classifier is adopted in the emotion detection stage to overcome vague patterns that are given as the input of system in emotion recognition problem. It is identified by the linear matrix inequality (LMI) optimization method. The proponents came up with good results in detecting emotion.

2.4 [3]A 'Detection and Recognition of Facial Emotion' study was conducted by Yong-Hwan Lee to research on the effects of facial landmark and to implement an efficient recognition algorithm of facial emotion using a still image. The proposed recognition algorithm involves 2 major steps. The first step is the detection and analysis of the facial areas in the still image using skin color segmentation and the feature-map calculation of both the eyes and the mouth. Next is the verification of the facial emotion with the use of the Bezier curve and the Hausdorff distance. The experimental results indicates the good performance with an average performance of 78.8%.

2.5 According to *The Journal of Positive Psychology,* people can successfully improve their moods
And boost their overall happiness simply by listening to mood-boosting music. Researchers from McGill University in Montreal said the response to music comes from the chemical dopamine. Correlating increased levels of dopamine in the brain to corresponding music proves that humans obtain pleasure from listening to music. Blues music can slow your heart rate a little and calm you down. Rock and Pop music are energetic styles of music can boost your mood levels if you let it. If

---

1 Agrawal, N., Cosgriff, R., Mood Detection: Implementing A Facial Expression Recognition System.

2 Kim, M. H., Joo, Y. H., Park, J. B. 2005. Emotion Detection Algorithm Using Frontal Face Image.

3 Lee, Y. H. Detection and Recognition of Facial Emotion.

you enjoy it, rock and punk music can give you an adrenaline and energy boost. Reggae one of the types of music genres that can organically chill you out. Some say reggae music is based on the rhythm of the healthy human heart at rest[4].

Chapter 3

3. Methodology

3.1 Research

The proponents researched about face recognition, music tags solutions and music genres which best suited for the proposed project. In implementing the Image processing, EMGUCV platform has been applied to conduct the face detection. In facial expression recognition, the proponents used Eigen Object Recognizer to classify facial expression based on the trained images. In music genre implementation, the proponents chosen the genres that can improve the user's mood. Blues music can slow the user's heart rate and can calm the user's down. Rock and Pop music are energetic kind of music, it will give the users adrenalin and energy boost. Reggae music can manage anger issues, this type of music can chill the users out, and some of this kind of music is based on the rhythm of healthy human heart at rest. The proponents used Id3Lib in order to read the length of the music.

3.2 Data Gathering

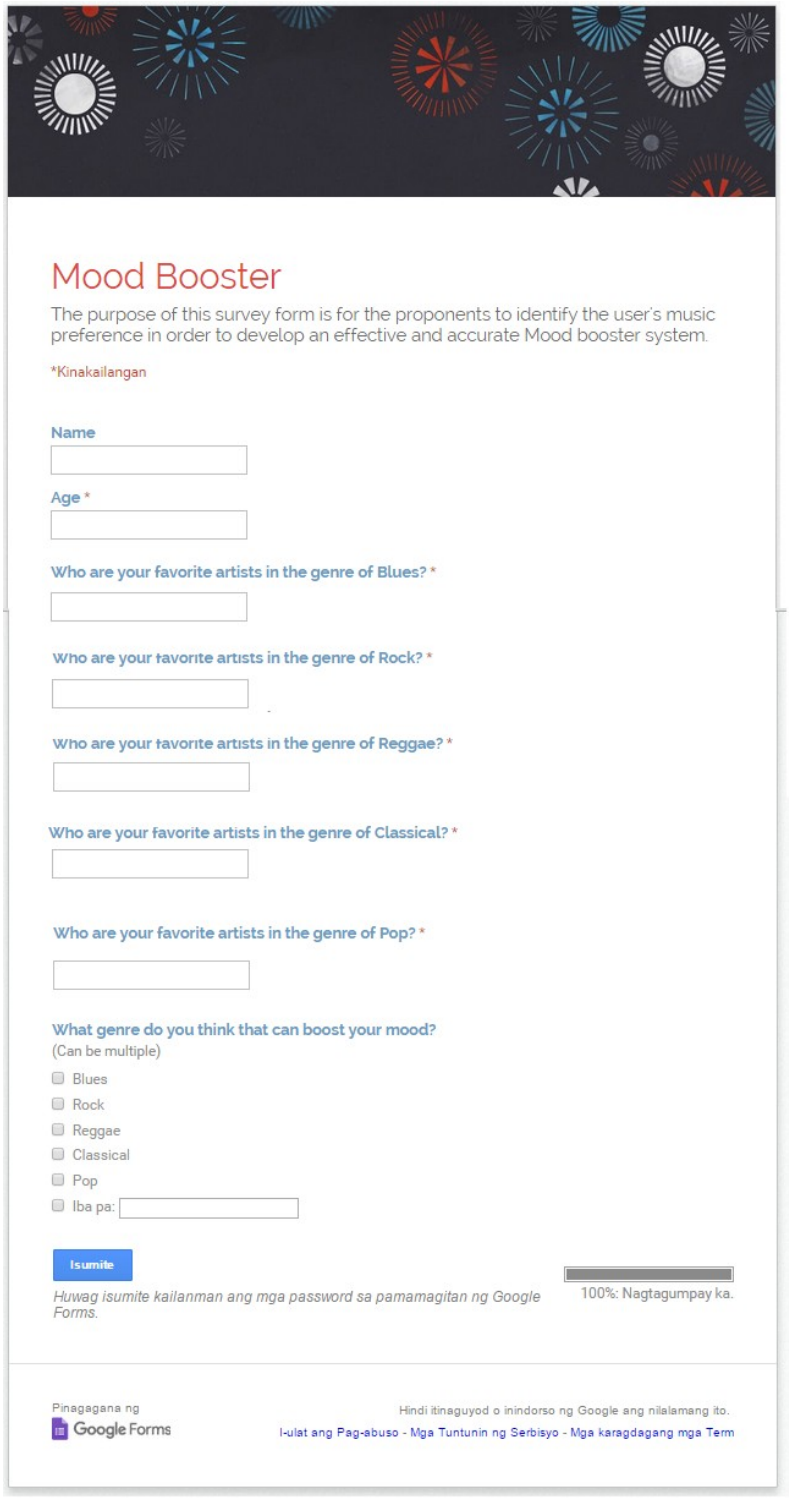
The proponents surveyed people age ranging 16-20, 21-30, and 31-40 years old in order to gather data about the possible user's music preference. The table below shows their favorite artist in 4 genres and their preferred music genres.

---

4 Mamiverse Team, 2014: Music Genre that can make or break your mood.

The Proponents surveyed 50 people in all, they have an online survey and hand-out surveys. This is the actual online survey form used to gather data: http://goo.gl/forms/C5gldK977x

Screenshot:



Mood Booster

The purpose of this survey form is for the proponents to identify the user's music preference in order to develop an effective and accurate Mood booster system.

*Kinakailangan

Name

Age *

Who are your favorite artists in the genre of Blues? *

Who are your favorite artists in the genre of Rock? *

Who are your favorite artists in the genre of Reggae? *

Who are your favorite artists in the genre of Classical? *

Who are your favorite artists in the genre of Pop? *

What genre do you think that can boost your mood?
(Can be multiple)

- Blues
- Rock
- Reggae
- Classical
- Pop
- Iba pa:

Isumite

Huwag isumite kailanman ang mga password sa pamamagitan ng Google Forms.

100%: Nagtagumpay ka.

Pinagagana ng Google Forms

Hindi itinaguyod o inindorso ng Google ang nilalamang ito.
I-ulat ang Pag-abuso - Mga Tuntunin ng Serbisyo - Mga karagdagang mga Term

This is the table of the results from the data gathering:

AGE	BLUES	ROCK	POP	REGGAE	PREFERRED GENRE
16-20	Up Dharma Down	Mayday Parade	Sam Smith	Magic	Blues
	Michael Buble	Fall Out Boy	One Republic	Bob Marley	Rock
	Sitti	Cold Play	Lady Gaga	Rebolution	Reggae
		Green Day	Taylor Swift	J Boog	Pop
		Maroon 5	Ariana Grande	Kalohekai	Rock
		Linkin Park	Beyonce		
		Rocky	Selena Gomez		
		Jourey	Lucy Hale		
		Guns N' Roses	Jessie J		
		Red Jumpsuit Apparatus	Michael Jackson		
		Bamboo	Ed Sheeran		
		Simple Plan	Justin Beiber		
		Imagine Dragons	Paramore		
		Slapshock	Maroon 5		
		My Chemical Romance	Sarah Geronimo		
		Jackson 5	The Script		
		Kamikazee			

		Parokya ni Edgar			
AGE	**BLUES**	**ROCK**	**POP**	**REGGAE**	**PREFERRED GENRE**
21-30	Up Dharma Down	Fall Out Boys	Taylor Swift	Bob Marley	Rock
		30 Seconds to Mars	Rihanna	Bassilyo	
		Linkin Park	Chris Brown		
		Imagine Dragons	Neyo		
			Mariah Carey		
			Michael Jackson		
			Up Dharma Down		
AGE	**BLUES**	**ROCK**	**POP**	**REGGAE**	**PREFERRED GENRE**
31-40	Bruno Mars	Guns N' Roses	Sarah Geronimo	Bob Marley	Blues

3.3 Creation of Mood Booster Media Application

3.3.1 Formulating the Face Detection and Facial expression recognition

In formulating face detection, the proponents used the built in functions from the EMGUCV, the Haarcascades. Haarcascades is used to detect different region of the face, by this function, the application is able to detect not just one but multiple faces. The trained images will be stored in the application's startup path, the folder where the trained images is stored will act as a database. Using EigenObjecRecognizer class the application is able to classified user's facial expression by comparing the user's current captured image to the labeled trained images. The EigenObjecRecognizer class can

recognize the most similar object in an image given the trained images, allowing the application to classify what facial expression does the current captured image of the user belong.

3.3.2 Music Library

The music are stored in the folder, acting as the music database. The music are separated into genres and age range allowing the application to locate the right music based on the user's age and classified facial expression. Using Id3Lib, a library that allow the application to identify the tags of the music, the application are able to identify the length of the music. The proponents used the timer function in order to control the change of music. When the application classifies the user current captured image it will send the classified facial expression to the function "playMusic" where the application get the right music. The timer will control the sending of the classified facial expression to the "playMusic" function to avoid audio mess. The music length will serves as the timer's time for the application will accurately change the music.

Chapter 4

4. Technology Background

4.1 Eigenface Object Recognizer

This will be used to determine class-specific masks which are then applied to the image data.

4.2 PCA (Principal Component Analysis)

The Principal Component Analysis (PCA) is one of the most successful techniques that have been used in image recognition and compression. The jobs that PCA can do are prediction, redundancy removal, feature extraction, data compression.

4.23 Gabor Filters

This method will adjusts the representation of the image and used as edge detection which will improve the texture and quality of the image and normalizing the pixel intensities. It will be used to generate a bank of filters across multiple spatial frequencies and orientations. The outputs would be concatenated and down sampling or PCA is often use to reduce dimensionality

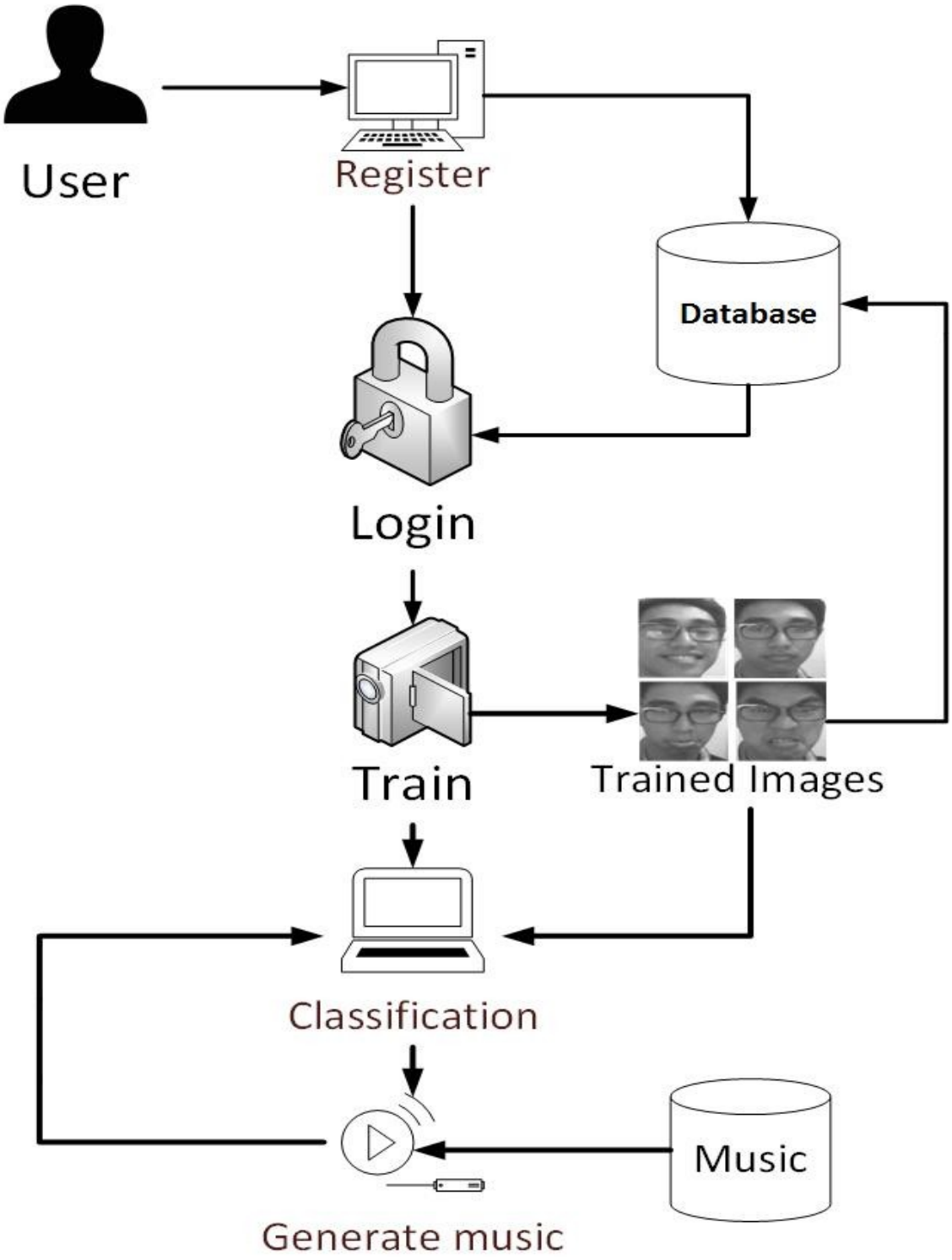
Chapter 5

5. Operational Framework

5.1 Operational Framework

The implementation of the application starts in creating the user account. The registration get the users information such as name, sex, and age. The information is then save to the database. The user login the application using the registered account. The application will ask the user to create training images by starting the camera then making the face of the desired facial expression clicking the facial expression icon. The trained images will be saved to the database and the application can recognized the facial expression of the user based on the trained images. The music will be played depending on the user's age and classified facial expression. When the music is done playing the application will again classified the facial expression and generate music based on the classified facial expression.

5.2 Operational Framework Diagram


User
Register
Database
Login
Train
Trained Images
Classification
Music
Generate music

Chapter 6

6.0 Results and discussion

6.1 Using EMGUCV Library

```
using Emgu.CV;
using Emgu.CV.Structure;
using Emgu.CV.CvEnum;
```

6.2 Face Detector

Using the built in function of the EMGUCV, the HaarCascades the application is able to detect faces of the user.

```
MCvAvgComp[][] facesDetected = gray.DetectHaarCascade(
            face,
            1.2,
            10,
            Emgu.CV.CvEnum.HAAR_DETECTION_TYPE.DO_CANNY_PRUNING,
            new Size(20, 20));
```

6.3 Capturing the Current Frame

```
foreach (MCvAvgComp f in facesDetected[0])
            {
               TrainedFace = currentFrame.Copy(f.rect).Convert<Gray, byte>();
               break;
            }
```

6.4 Resizing and Adding the Image into Image Array

```
TrainedFace = result.Resize(100, 100, Emgu.CV.CvEnum.INTER.CV_INTER_CUBIC);
            trainingImages.Add(TrainedFace);
```

6.5. Saving the Images into Database

```
for (int i = 1; i < trainingImages.ToArray().Length + 1; i++)
            {
               trainingImages.ToArray()[i - 1].Save(Application.StartupPath + "/Users/" + namaiwa
+ "/face" + i + ".bmp");
               File.AppendAllText(Application.StartupPath + "/Users/" + namaiwa +
"/TrainedLabels.txt", labels.ToArray()[i - 1] + "%");
            }
```

6.6 Frame Grabber

This function will grab the current frame, resizing it, the same size with the training images for the easily comparison. The current frame will be deliver into the EigenObjectRecognizer class initialized using the training images (image array) for the classification.

6.6.1 EigenObjectRecognizer Initialization

```
EigenObjectRecognizer recognizer = new EigenObjectRecognizer(
```

```
trainingImages.ToArray(),
labels.ToArray(),
3000,
ref termCrit);
```

6.6.2 Passing the Current Frame for Comparison

```
expression = recognizer.Recognize(result);
```

6.7 EigenObjectRecognizer

EigenObjectRecognizer is a class, the function below is responsible for identifying which is the most similar image from the training images comparing it to the current frame.

```
public String Recognize(Image<Gray, Byte> image)
    {
      int index;
      float eigenDistance;
      String label;
      FindMostSimilarObject(image, out index, out eigenDistance, out label);

      return (_eigenDistanceThreshold <= 0 || eigenDistance < _eigenDistanceThreshold )  ?
_labels[index] : String.Empty;
    }
```

6.8 Passing the Classified Facial Expression

```
playMusic(expressions);
```

6.9 Music Classification

6.9.1 Fetching Files

```
string[] files = Directory.GetFiles(path);
```

6.9.2 Selecting Random File

```
string addThisItem = yolo[rand.Next(0, files.Length)];
```

6.9.3 Mp3 Initialization

```
Mp3Lib.Mp3File mp3 = new Mp3Lib.Mp3File(addThisItem);
```

6.9.4 Fetching Mp3 Duration

```
mp3Length = (int)Math.Ceiling(mp3.Audio.Duration);
```

6.9.4 Adding Music to the Player

```
axWindowsMediaPlayer1.URL = addThisItem;
```

Chapter 7

7.0 Conclusion

The study is focused on whether music can change a mood of a person. In conducting the survey for music preferences they conclude that a person's age is important for determining the music preference of a person. The research also aimed of to identify which certain music genre is the most effective in boosting the mood of a person in the different music age and in the process they identified music genres that are effective based on testing and Related Literatures about music preference. There are effective music and there are not because it will really depend on the person's music preference by age and by genre.

7.1 Testing Trained Images by User

The proponents gathered sample users with the different age ranges in order to test the application. The purpose of the testing is to calculate the accuracy in detecting face, recognizing facial expression, and suitability of music based on the user's age. The table below shows the accuracy percentage of the application.

User Name "altsitsi"

User Name "Andee"

User Name "brix"

User Name “dennis”

User Name “Edward”

User Name “Gerald”

User Name “iceCloud12”

User Name “kenn”

User Name “perkeen”

User Name “Rhonskei”

User Name “yuki”

7.2 Accuracy table

The proponents also have conducted an evaluation and testing of the actual technical output. The proponents made a table for the evaluation form which rates the user’s experience of the system. The table below is an actual sample of the evaluation form.

Mood Booster Media Application Evaluation The purpose of this evaluation is to identify how accurate our system in detecting facial expression and if our system is enable to improve the mood of the user 5 = Excellent 4 = Very good 3 = Good 2 = Poor 1 = Very Poor	**5**	**4**	**3**	**2**	**1**
1. Accuracy in face recognition.					
2. Accuracy in facial expression recognition.					
3. Suitability of music based on your age					
4. Does the application improved your mood? (rate)					

5. How do you rate your overall experience?					

And here is the percentage of the results of the evaluation form. The proponents have gathered 25 responses from the evaluation process and they took the percentage of it per category. They only chose the main three objective to be evaluated which can be seen in the table below.

Accuracy in face recognition	92%
Accuracy in facial expression recognition	85%
Suitability of music based on age	95%

The main purpose of the proponents in creating this application is to improve the user's mood, based on the recognized facial expression. In testing the application 95% of the sample users claimed that the application is able to improved their mood and 90% of the sample users also claimed that they had a great experience in using the application.

Chapter 8

8.0 Recommendation of the future work

The research that has been undertaken for this thesis has highlighted a number of topics on which further research would be beneficial and also other areas for further development, and applications for the work undertaken in this thesis.

(1) The accuracy of facial expression recognition

- The accuracy is based on how you train the image properly but poor training means poor accuracy it needs further research and the best solution would be an automatic facial expression recognition.

(2) The Music preference

- The proponents have chosen a suitable related literature work for the music preference and they also have a supporting survey for it but still it is not enough to make the majority of the users of this system to approve the taste of music they have chosen because people have different taste in music therefore it needs more research and information.

(3) Training images

- In training the images the users can freely make their own facial expression but the disadvantage of this is that it is prone to errors such as poor training of images (ex. Happy but the user trained it to Sad). A solution for this is that the system should have a database of pre-trained images that checks if the user is training the images correctly or not.

(4) Analyze the sequence of emotion

- The proponents should explore more on the pattern on how the emotions are being manipulated. There should be an analyzer that will control the process of the system on how the emotions are being used

(5) Identifying music genre based from music frequency

- Since the proponents used path file folders to hold the music data and it is also where the Genre and Age are being separated, there should be a music frequency analyzer that automatically identifying the type of genre of the music based from its frequency so that the music manipulation will be fast and convenient.

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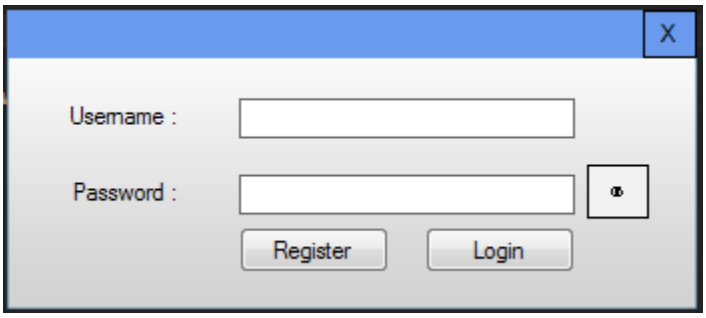
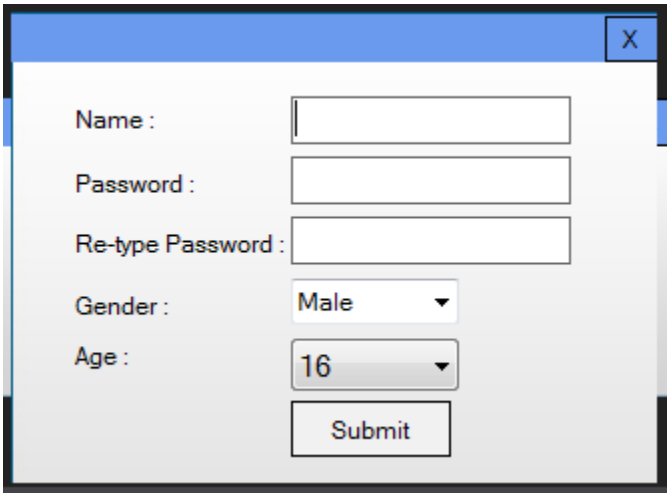
Appendix:

Login Form – This is the first form that the users will see it is where the users will input their account credentials and it is also where the user can click the button to login and to register an account.



Register Form – This is the second form where the users can create their account, you can access this form by clicking the register button from the login form.



Main Form: This is the final and the main form. It is where the users can use the main purpose of the system which is to train images, detect recognized face, detect facial expression, and play music that can boost the mood of the person. The user's information can also be seen on top of the interface which are the name, age and the status of the user's mood.