



EMOTION DETECTION



Contents

Team Members	2
Project Idea	2
Purpose	2
Block Diagram.....	2
Algorithms	3
1) Skin Detection	3
2) Haar Cascade	3
3) SVM (RBF)	3
Experiment results	4
1) Skin Detection	4
2) Haar Cascade	4
3) Model Training	4
Levels Of Variety	5
System Analysis.....	5
Work Division.....	5
References.....	6

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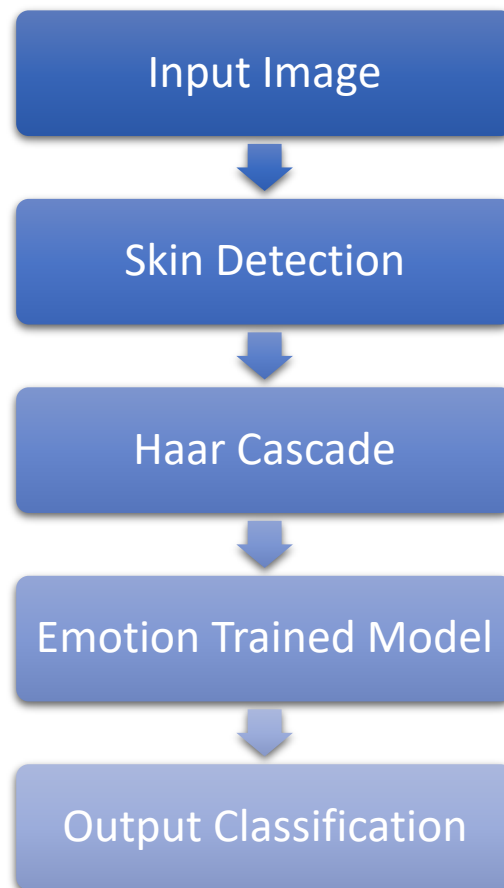
Project Idea

Face detection and specification of its emotion whether it's [Happy - Sad - Surprised]

Purpose

To help Autistic people to communicate with the outer world.

Block Diagram



Algorithms

1) Skin Detection

Skin detection algorithms typically involve color thresholding in specific color spaces, We combined HSV and YCbCr results. The algorithm identifies pixels with color values within a predefined range that corresponds to skin tones.

2) Haar Cascade

The Haar Cascade algorithm is a machine learning-based object detection method used to identify objects or features in images. It employs a cascade of simple classifiers trained on positive and negative samples. The algorithm evaluates image regions at multiple scales and resolutions, using Haar-like features to distinguish between the object and the background. Training involves adjusting weights for these features. While widely used for face detection, Haar Cascade can be trained for various objects, making it versatile in applications like security surveillance and robotics.

3) SVM (RBF)

Support Vector Machines (SVM) with Radial Basis Function (RBF) kernel is a popular machine learning algorithm used for classification and regression tasks. The RBF kernel allows SVM to handle non-linear relationships between input features. The SVM with RBF kernel is particularly effective in capturing complex patterns and is widely used in image recognition due to its ability to handle diverse and non-linear data.

Experiment results

1) Skin Detection

- As it is a color thresholding algorithm, relying solely on color information, it is not highly accurate in distinguishing skin tones from similar colors found in non-human skin-like objects, such as beaches or yellowish items.
- In order to detect the human face, we must get the biggest contour and has to be a square-like.

2) Haar Cascade

- Different size of images was used as an input to the algorithm. We discovered that the less resolution the image is the more accurate the classification is.
- Trying different widths and heights of features and different number of classifiers, we found that the best number of classifiers is 3 and for the dimensions of features to be limited to (10 x 10) to get the best results in a reasonable training time.
- With: -
 - o Training set of 26k positive images and 13k negative images
 - o 3 Strong classifiers
 - o 2000 photos for faces test
 - o 500 photos for non faces test.
 - o Faces accuracy: 75%
 - o Non faces accuracy: 50 %

3) Model Training

In the first We started discard some model trainers such as SVM by sigmoid as we need more than two classes while sigmoid function classifies between only 2 classes. We started as first step by data preprocessing or data cleaning. Then we start with 7 classes to classify but there are some emotions that may cause conflicts with others so we tried to decrease the number of classes to increase the validation accuracy the emotions that conflicts like sad and disgusted decreases the accuracy of model we chosen only three emotions (Happy – Sad – Surprised) and we trained using SVM with RBF kernel why this kernel because as mentioned it allows SVM to handle non-linear relationships and of course the emotions are non linear We tried other model trainers but it was in vain because the accuracy were very horrible.

One of challenges that faces us were the low accuracy as the total accuracy were 66.89% which can be divided into: -

Happy accuracy = 80.38%

Sad accuracy = 59.74%

Surprised accuracy = 60.53%

And this is the best accuracy that we got.

The model takes an image of shape (48,48).

Levels Of Variety

The test samples were classified into different categories depending on: -

- 1) Illumination (Dark - Light)
- 2) Gender (Male – Female)
- 3) Orientation.

System Analysis

Our emotion detector is used to help people in communication. It can classify three types of emotions (happy, sad, surprised). After testing the system, we found that the accuracy can reach up to 70%

Strengths:

- Differentiate the human skin.
- Selection of human faces
- Detecting the emotions correctly
- Working with images with different backgrounds

Weaknesses:

- Skin detection can't correctly differentiate skinned-like objects.
- Poker face is hard to be classified.

Work Division

Member Name	Member Name
Ahmed Samy	Emotion Model
Kareem Samy	Skin Detection
Nancy Ayman	Haar Cascade
Yara Hisham	Haar Cascade
All Members	GUI

References

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