

ON THE FRONTIERS OF BASIC AND COMPOUND EMOTION

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The undersigned hereby certify that they have read and recommend to the faculty of post Graduate Studies for acceptance a thesis entitled “**On the frontiers of basic and compound emotion**” by **Saira Naz(F2016114019)** in partial fulfillment of the requirements for the degree of **Master of Science** in Software Engineering.

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Dedicated to
My family

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Declaration

I, Ms. **Saira Naz D/O Muhammad Ilyas**, hereby declare that the matter printed in this thesis is my original work. This thesis does not contain any material that has been submitted for the award of any other degree in any university and to the best of my knowledge, neither does this thesis contain any material published nor written previously by any other person, except due reference is made in the text of this thesis.

Saira Naz

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Acronyms

BCED :	Basic and Compound Emotion Detection
FACS :	Facial Action Coding System
AU :	Action Units
AAM :	Active Appearance Model
HMM :	Hidden Markov Model
DNN :	Deep Neural Network
DCNN :	Deep Convolutional Neural Networks
SVM :	Support Vector Machines
BPNN :	Back Propagation Neural Networks
PCA :	Principle Component Analysis
IFN :	Iterative Feature Normalization
LSTMR:	Long Short Term Memory Recurrent
CCRF :	Continuous Conditional Random Fields
RBFC :	Relative Bin Frequency Coefficients
RSI :	Relative Sub Image
DTPM :	Discriminant Temporal Pyramid Matching
GMM :	Gaussian Mixture Models
MCC :	Maximum Correlation Classifier
FAP :	Facial Animation Parameters
LDA :	Linear Discriminant Analysis
CSM :	Cosine Similarity Measure
NMF :	Non-negative Matrix Factorization
LNMF :	Local Non-negative Matrix Factorization
QDC :	Quadratic Discriminant Classifier
NBC :	Naive Bayesian Classifier
SVC :	Support Vector Classifier
kNN :	k-Nearest Neighborhood
NA :	Not Available

Abstract

Automatic facial recognition is a challenging task due to the various categories of emotions. It has gained a lot of attention by researchers in multimedia retrieval and human computer interaction and related disciplines. The human face is the natural way of non-verbal communication for human interaction. In real life scenario, facial expressions and emotions are nothing but responses to the external and internal events of human being. Although, for the last decades, there has been immense development and mining of static images and dynamic images techniques for basic emotion and compound emotions detection but still, more work needs to be done. Every technique has its own uniqueness, performance and limitations. A lot of researches have been done regarding basic emotion and compound emotion detection that needs to be reviewed and summarized.

This thesis is consisted of four main parts. The first is the encapsulation of the research papers of basic and compound emotion detection according to different algorithms & techniques. Second is the distribution of research papers of basic and compound emotion detection in the form of different eras. Third it discusses the data-sets that are used in different research papers. Fourth is the proposed methodology to detect and recognized the basic and compound emotions with the help of geometric features. Boosted classifiers are used for classification.

human computer interaction , emotion detection , facial expressions

Chapter 1

Introduction

Emotions have a significant role in human communication. In order to extend its role towards the human-machine interaction, it is desirable for the computers to have some built-in abilities for recognizing the different states of emotions in a human {Atanu,2017}. With the revolution of technology in the recent years, more intelligent interaction between humans machines is desired that have a positive influence on human life.This emphasizes to develop an intelligent machine techniques that are more human friendly.

Research studies have provided evidence that human emotions influence the decision making process to a certain extent {D. Hekimoglu,2017}. It needs to make real time applications that can immediately and accurately track the human activities from the videos, images and speech. One such area is realizing and tracking the human face expression and emotions recognition's from the video streaming and images with an objective of different purpose such as physical fatigue detection. In human-to-human conversation, the sound of mental, emotional, and even physical state is used in the conversations about important information. In addition to pronounce a communication channel and facial expressions in its simplest form is a more subtle happy or angry thoughts, feelings or absorption.

Faces are much more than keys to individual identity. They play a major role in communication and interaction that makes machine understanding, perception, and modeling of human expression, an important problem in computer vision {C. Frith,2009}. There is a significant amount of research on facial expressions in computer vision and computer graphics. Perhaps the most fundamental problem in this area is how to categorize active and spontaneous facial expressions to extract information about the underlying emotional states. Although a large body of work dealing with human perception of facial motions exists, there have been few attempt to develop objective methods for quantifying facial movements. As computer vision is one of the largest areas which utilizes machine learning and tries to reproduce human ability in order to