

CHAPTER 1

INTRODUCTION

1.1 Background

Automatic recognition of human facial expression has been the main motivation of a large body of research in affective computing. Affective computing refers to a study of human emotion recognitions by computer ^[1]. Traditionally, research in affective computing is focused on recognizing some prominent facial expression such as: happy, sad, angry, surprise, etc. as proposed by Psychologist ^[2].

Recognizing human facial expression is not a very difficult task for humans but become a very difficult problem for computer programs. The difficulties are due to many factors such as uncontrolled imaging conditions, face occlusions, and gap between low-level visual feature and interpretative facial expression perceived by human.

Given a human facial image, affective computing system can classify category of the respected human facial expression. The output of facial expression categorization is very useful to many applications such as validating information given by someone under interrogation, autism treatment, getting non-textual information from interview, and many more. Although a vast number of published works on affective computing can be found in literature but little

has been said on how affective computing is applied in e-learning system which support a wide range of students.

An e-learning system typically provides several functions that are normally implemented by class teacher including: providing learning material, evaluation, monitoring learning process and take any necessary response to facilitate learning progress. Although many researchers found that a class teacher can not be replaced completely by a computer-based system, many efforts have been implemented to address the need of education administrator to achieve high achievement of learning process. One of the remaining open problem is how to recognize learning process of the learners and provide necessary response to the respective learners.

One key information that is used by an e-learning system to recognize learning process in face-to-face class session is learner facial expression. Recognizing facial expressions, whether they are really understand, half understand, or maybe not understand at all surely can leverage effectiveness of support provided by e-learning system. Such information can be used by the system as input in providing automatic feedback from the e-learning system notifying which course materials are unable to be understood by majority of the learners. Although recognizing face expression is an easy problem for human, it remains an open problem to solve by computer.

1.2 Scope

This research is focusing on developing a supervised trained classifier to classify human facial images. The training dataset comprises of a set of learner facial image and corresponding category of learning process. The machine-learning classifiers to be explored are Artificial Neural Network and Support Vector Machine.

The scope of the study:

1. Propose categories of facial expression that corresponds to learning process.
2. Develop classifier that can classify learner face image into the proposed category.
3. Compare image feature performance between Color-based feature extraction, Arithmetic mean edge feature extraction and combination of both.
4. Compare classifier performance between Artificial Neural Network and Support Vector Machine classifier.

1.3 Aims and Benefits

The objective of the study is to develop classifier that can be used to automatically classify facial image of student face during learning process which reflects learning progress. Two methods will be used in this research: Artificial Neural Network and Support Vector Machine methods, comparison between the results of the two methods will also delivered.

The study is expected to provide some key information to support learning administrator by providing ways to detect student facial expression using computer. The effectiveness of learning process will be improved when the learning administrator can detect whether a student understand or not in their study. Using computer to do this classifying will resulted in more efficient process rather than manually done by learning administrator especially with a large number of students.

1.4 Structures

This thesis is organized as follows.

CHAPTER 1 INTRODUCTION

This chapter describes the background, scope, aim and benefits of the classifying learner facial-expression using artificial neural network and support vector machine research.

CHAPTER 2 THEORETICAL FOUNDATION

This chapter explains the theoretical foundation. It includes description of affective computing, e-learning, artificial neural network, support vector machine, and comparison of both methods.

CHAPTER 3 RESEARCH METHODOLOGY

This chapter explains the general methodology of the research and the lab experiment work-flow.

CHAPTER 4 SOLUTION DESIGN

This chapter explains the features extraction and classifications method design.

CHAPTER 5 RESULT FINDINGS AND ANALYSIS

This chapter provides the result found from the training process of ANN and SVM. The result is also analyzed in this chapter.

CHAPTER 6 EVALUATION

This chapter compares and evaluates the performance measurement of ANN and SVM based on the result in chapter 4. Obstacles that are faced by the author, research limitation, and research significant also discussed in this chapter.

CHAPTER 7 CONCLUSION AND RECOMMENDATION

This chapter discusses the conclusion, recommendation and future works of the thesis.