Facial Expression Recognition using Support Vector Machines

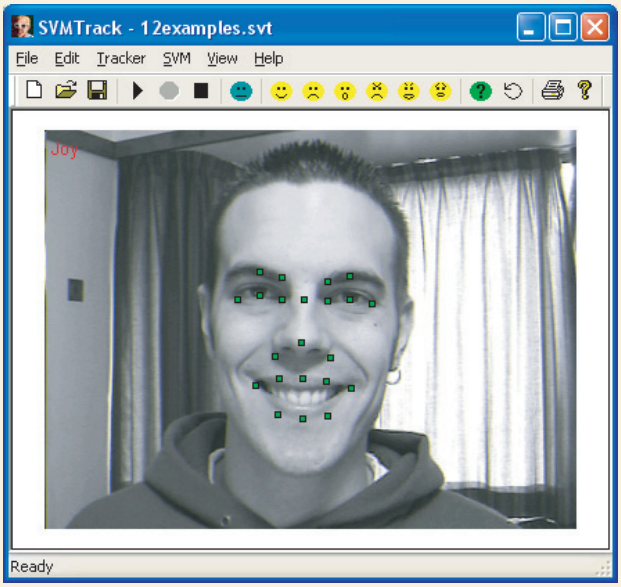
Philipp Michel & Rana El Kaliouby

UNIVERSITY OF CAMBRIDGE
Computer Laboratory

Introduction

Human beings naturally and intuitively use facial expression as an important and powerful modality to communicate their emotions and to interact socially. There has been continued research interest in enabling computer systems to recognise expressions and to use the emotive information embedded in them in human-machine interfaces.

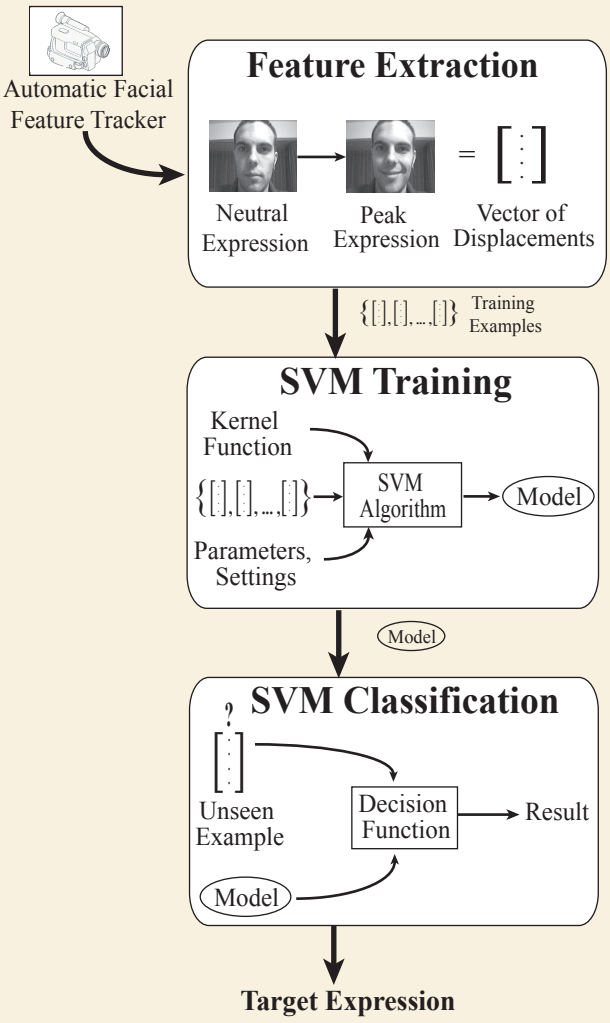
This poster presents the application of the machine learning system of support vector machines (SVMs) to the recognition and classification of facial expressions in both still images and live video.



Screenshot of the video-based classification application

Implementation Overview

To perform automated expression recognition, our system needs to deal with the issues of face localisation, facial feature extraction and the training as well as the classification stages of the SVM.



William Gates Building
15 JJ Thomson Avenue
Cambridge CB3 0FD
http://www.cl.cam.ac.uk/~re227/

Facial Expression Recognition using Support Vector Machines

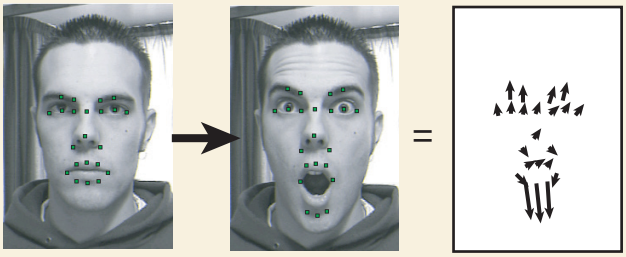
Philipp Michel & Rana El Kaliouby

UNIVERSITY OF CAMBRIDGE
Computer Laboratory

Feature Extraction

We employ an automatic facial feature tracker to locate 22 facial landmarks in video and to track their position over subsequent frames.

For each expression, a vector of displacements is calculated by taking the euclidean distance between landmark locations in a neutral and a peak frame representative of the expression.



Training & Classification

The labelled vector of displacements of each example expression supplied is used as input to an SVM classifier, resulting in a model of the training data, which is subsequently used to dynamically classify unseen feature displacements. The result is then returned to the user.

SVMs are maximal margin hyperplane classifiers that exhibit high classification accuracy for small training sets and good generalisation performance on very variable and difficult to separate data.

This makes them particularly suitable to expression recognition in video.

Evaluation

During a number of interactive sessions with various users, we evaluated our system by considering classification performance for the six basic emotions.

Our approach makes no assumptions about the specific emotions used for training or classification and works for arbitrary, user-defined emotion categories.

Emotion	Accuracy
Anger	84.1%
Disgust	83.9%
Fear	76.2%
Joy	95.3%
Sorrow	89.4%
Surprise	98.8%

Total accuracy: 87.9%

Our results demonstrate the suitability of an SVM approach to fully automatic, unobtrusive expression recognition in live video.

RAINBOW RESEARCH GROUP

William Gates Building
15 JJ Thomson Avenue
Cambridge CB3 0FD
http://www.cl.cam.ac.uk/~re227/