Subtle Facial Expression Recognition using Motion Magnification

Nitish Gupta
Rahul Maji

Advisor: Dr. Amitabha Mukerjee
Motivation

• Facial Expression Recognition
  o active area of research
  o has wide applications
  o conveys the emotional state of an individual
  o used to detect lies and in various fields of psychology
  o challenging task for machines

• Why Motion Magnification?
  o Inability to identify subtle facial expressions using current techniques

  o Motion Magnification will help in detecting subtle facial expressions
Introduction

What is Motion Magnification?

- Human visual system has limited sensitivity to temporal variations.
- Motion Magnification amplifies these variations to reveal certain hidden information.

E.g. subtle facial expressions, breathing of an infant, motions of blood vessels from blood flow, etc.
Introduction..

Examples for different Magnifications expression
Steps to Implement

1. Training Data shall consist of images each depicting various facial expressions in the exaggerated form, along with shape vectors of the faces and their labels.

The shape vector is set of \((x,y)\) coordinates of the feature points of the face.

- Images from Source[2]
Example of Test Data

- Subtle Happy
- Subtle Surprise

Images from Source [5]
The AAM Fitting algorithm uses the coordinates of the landmarks (shape vectors) provided in the training phase to build the shape vector for the test image.

Test 1.

- Use **Active Appearance Model (AAM) Fitting** to find the shape vector of the face in all the frames of the test video.
Now, we will magnify the expression using the following method:

- Consider the shape vector at time ‘t’, to be ‘\( s(t) \)’
- After a short period of time, it is ‘\( s(t+1) \)’.
- The magnified shape vector at time, ‘\( t+1 \)’ will be given by,

\[
\text{s}_{\text{mag}}(t+1) = s(t) + \beta [s(t+1) - s(t)]
\]

(\( \beta \): Magnification Factor)

Images from Source [1]
Image at time $t$  

Image at time $t+1$

(a) Neutral Expression
(b) Subtle Surprise Expression
(c) Result of Flow vector

Images from [1]
Hence, we will classify the subtle facial expression using Motion Magnification.

- Classify the magnified shape vectors into different expressions using a multi-SVM classifier.
References and Dataset

[1] Sungsoo Park, Daijin Kim, **Subtle Facial Expression Recognition using Motion Magnification** [2009]


[3] Iain Matthews, Simon Baker, **Active Appearance Models Revisited** [2002]

[4] Generated using Code for **ICAAM** by Luca Vezzaro. We will be using this code also for the project.

[5] **Facial Expressions and Emotion Database, FEED, Interactive Systems Group.** This will also be our DATASET for the project.
THANK YOU!!

QUESTIONS ?