Subtle Facial Expression Recognition using Motion Magnification

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Motivation

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

- Why Motion Magnification?
  - Inability to identify subtle facial expressions using current techniques
  - Motion Magnification will help in detecting subtle facial expressions

Introduction

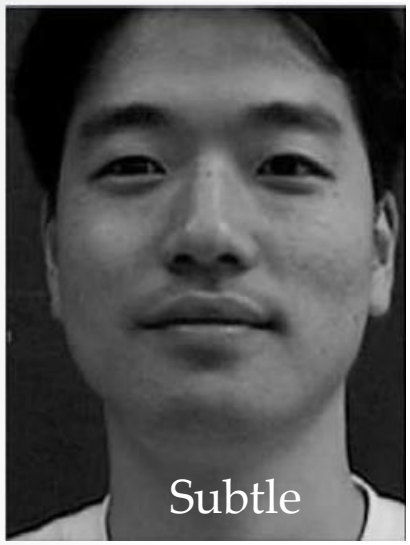
What is Motion Magnification?

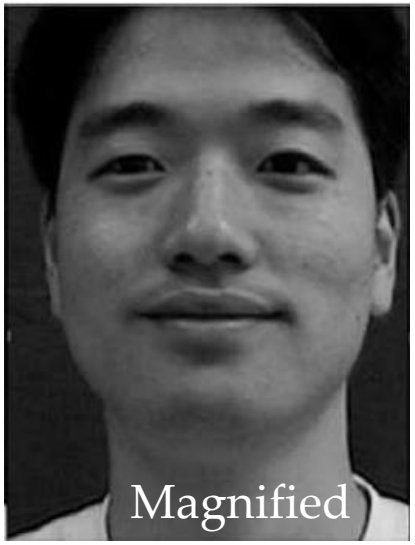
- Human visual system has limited sensitivity to temporal variations.

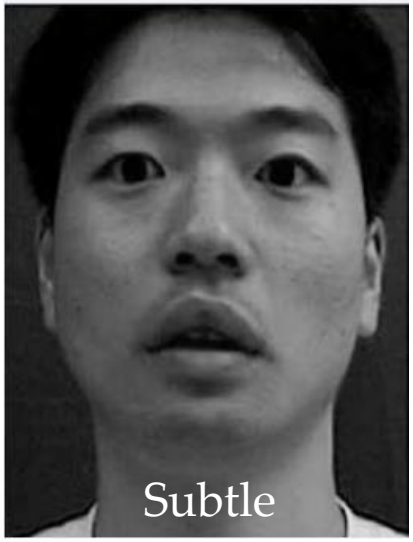
- Motion Magnification amplifies theses variations to reveal certain hidden information.

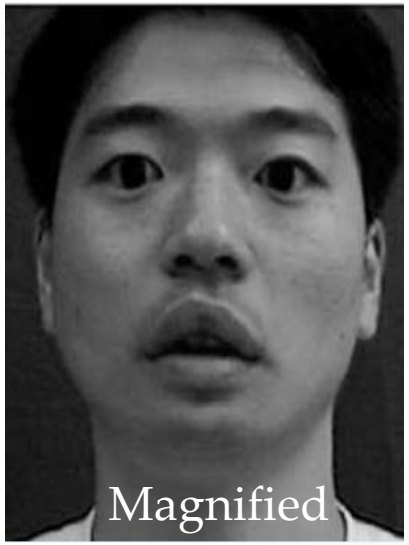
  E.g. subtle facial expressions, breathing of an infant, motions of blood vessels from blood flow, etc.

Introduction..









Examples for different Magnifications expression

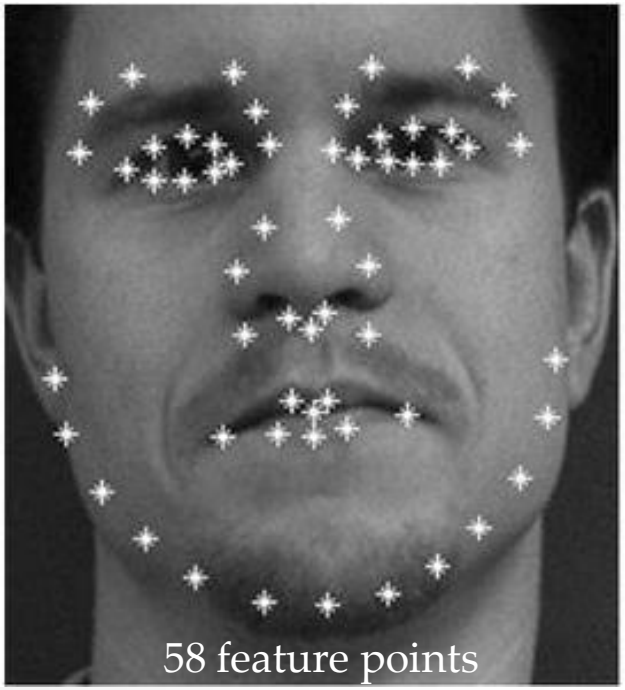
- Images from Source [1]

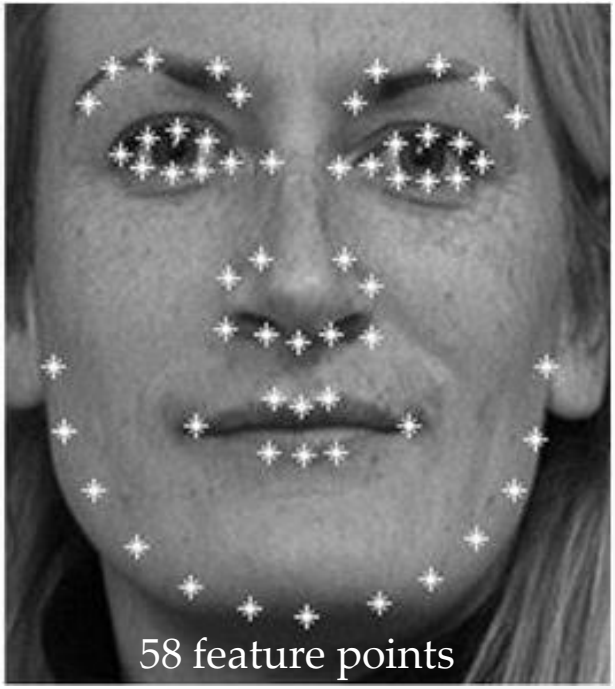
Steps to Implement

Train
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

Subtle Happy

- Images from Source [5]

Test 1.

- Use **Active Appearance Model (AAM) Fitting** to find the shape vector of the face in all the frames of the test video.

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.

Images from Source[4]

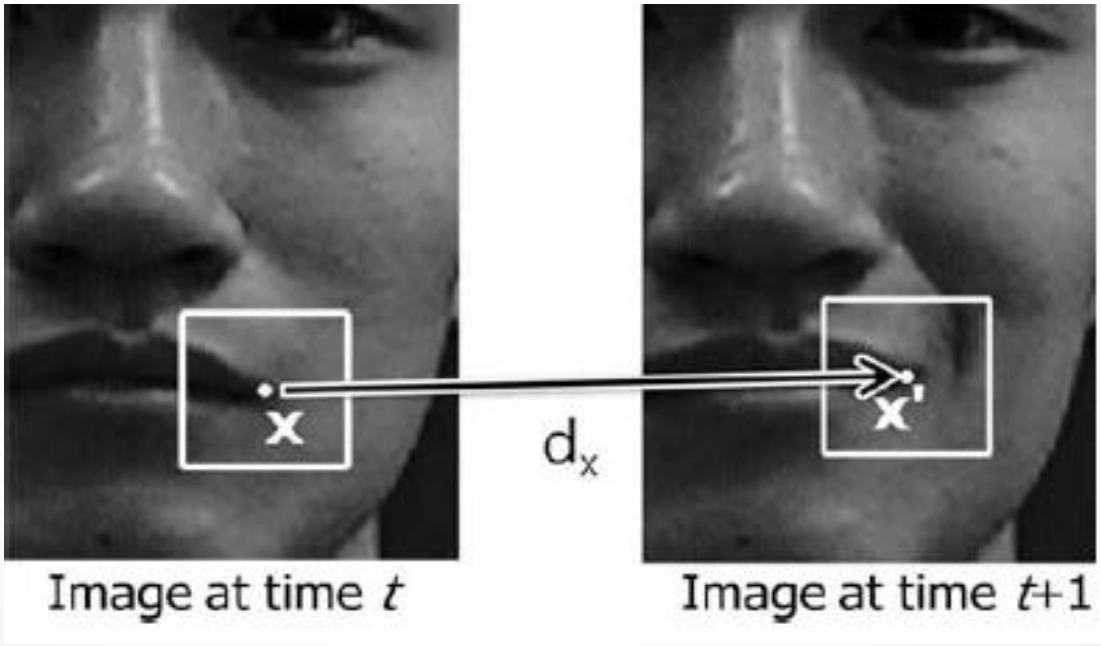
2.

- Using the shape vectors of the test images got in the previous step we will **magnify** the facial expression.

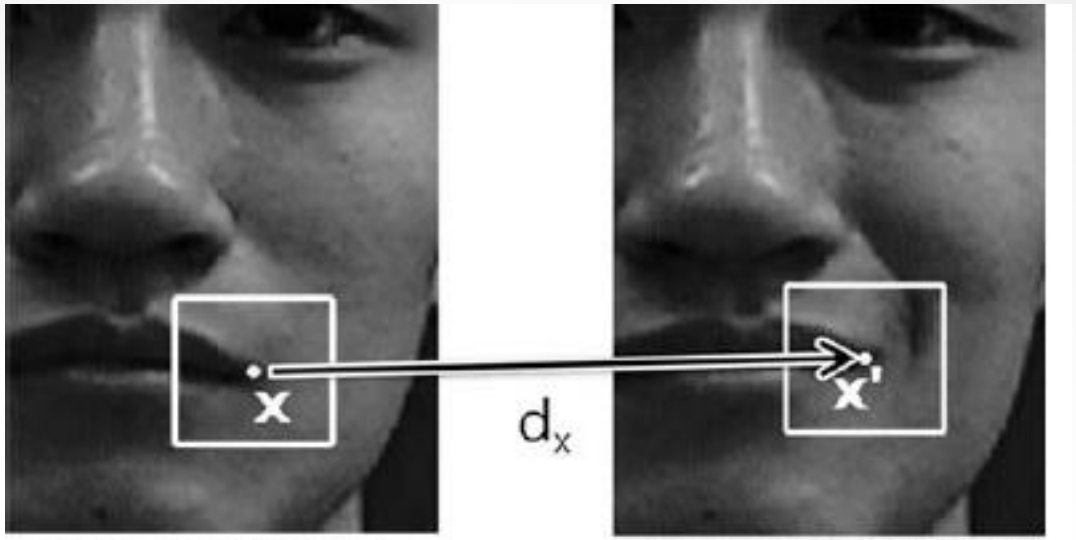
Now, we will magnify the expression using the following method:

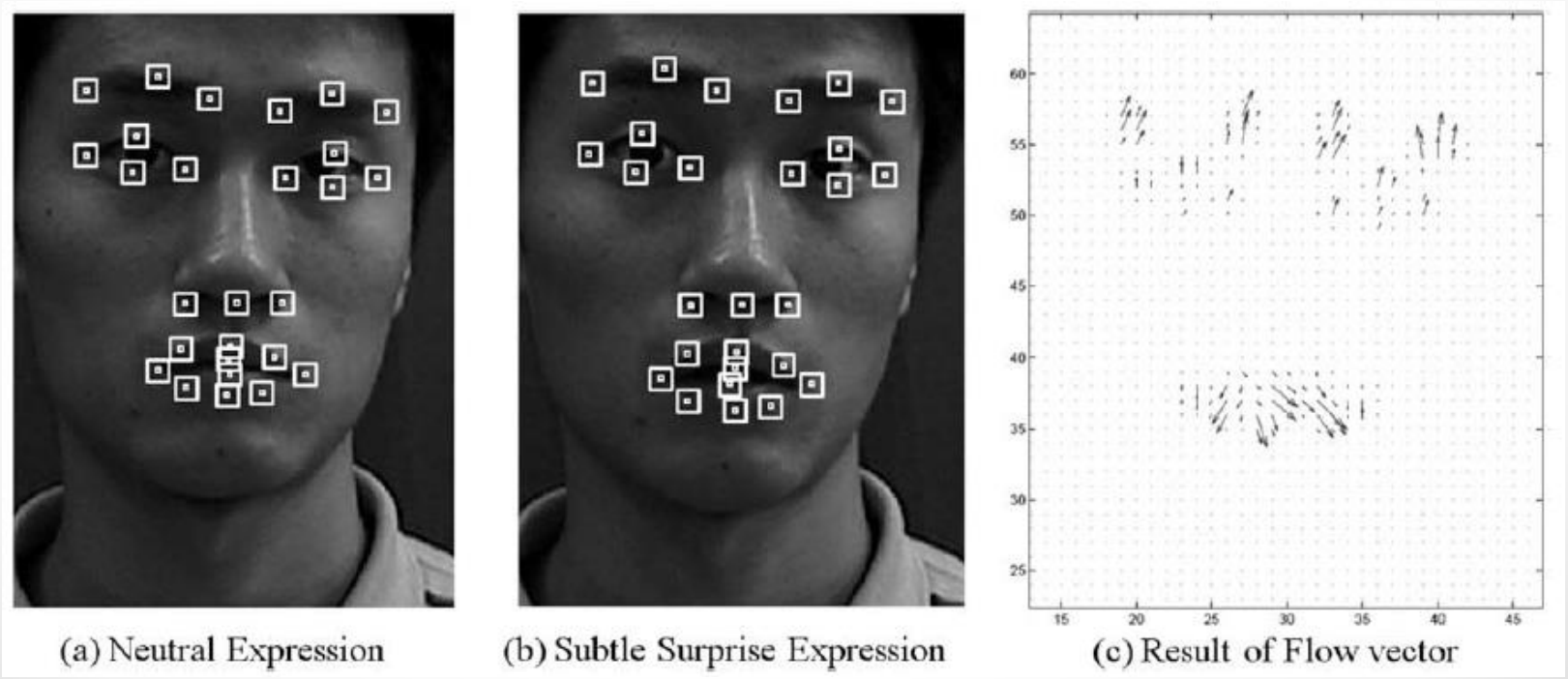
- Consider the shape vector at time 't', to be '**s(t)**'
- After a short period of time, it is '**s(t+1)**'.
- The magnified shape vector at time, '**t+1**' will be given by,

$$s_{mag}(t+1) = s(t) + \beta*[s(t+1) - s(t)]$$ (β: Magnification Factor)



Images from Source [1]

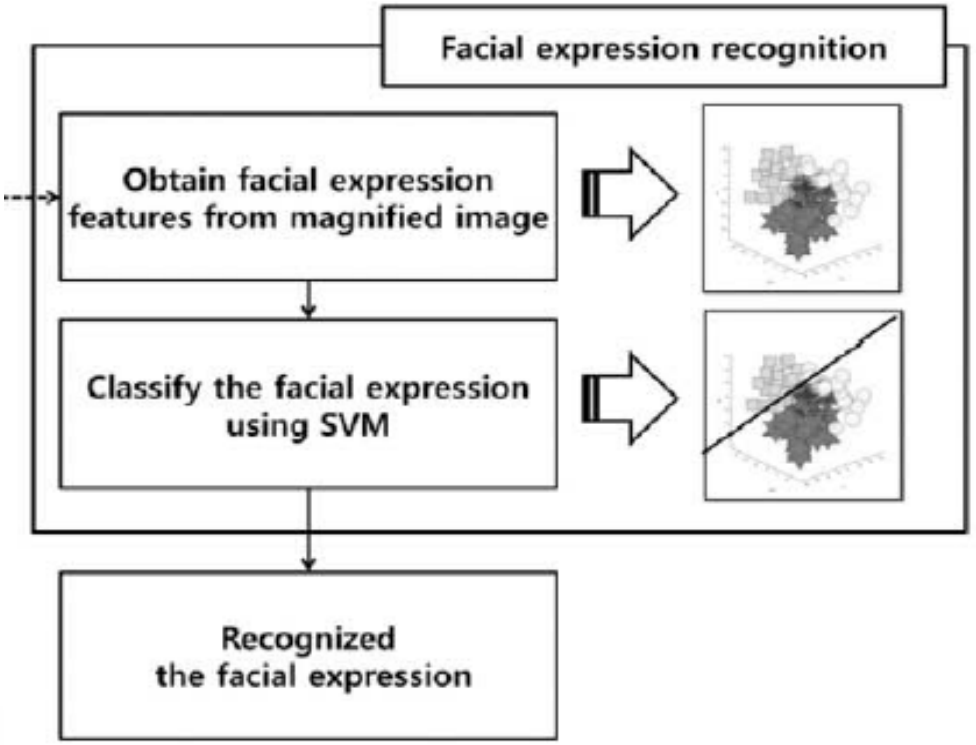




- Images from [1]

3.

- **Classify** the magnified shape vectors into different expressions using a multi-SVM classifier.



Hence, we will classify the subtle facial expression using Motion Magnification.

Images from Source[1]

References and Dataset

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

[2] T.F. Cootes, G.J. Edwards, C.J. Taylor, **Active Appearance Models** [1998]

[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] **F**acial **E**xpressions and **E**motion **D**atabase, **FEED, Interactive Systems Group.** This will also be our DATASET for the project.

THANK YOU!!

QUESTIONS ?