

# Subtle Facial Expression Recognition based on Eulerian Motion Magnification

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## 1. Introduction

Facial expressions are the positions of the facial muscles, which communicates the information about the emotional state of mind of the individual. Analysis of facial expressions had led to the birth of the field Facial Expression Recognition and Classification, which has been an active area of research for many years now. Also Motion Magnification has been a recent area of research and many techniques have been applied to do so.

## 2. Motivation

Our project is motivated from Eulerian Video Magnification which has been recently developed in the CSAIL Lab of MIT<sup>[1]</sup>. We propose to extend the Eulerian Motion Magnification to recognize and classify subtle facial expressions that are not possible without motion magnification. It has a lot of uses, mainly in detecting the emotional state of mind, or the subtle changes in facial features during lie detection tests or during a game of poker where subtle facial changes reveal a lot of information.

## 3. Relevant Work Done

Major work in the field of Eulerian Motion Magnification started out in the CSAIL Lab of MIT by Dr. William T. Freeman et al. and they published their work in 2012<sup>[1]</sup>.

Also work in the field of subtle facial expression recognition using motion magnification was done and published by Dr. Sungsoo Park and Dr. Daijin Kim of POSTECH, Korea in 2009<sup>[2]</sup>.

## 4. Methodology

First, we will magnify the input video sequence using Eulerian Motion Magnification, which applies spatial decomposition using Laplacian pyramids, followed by temporal filtering to the frames of the video. The resulting frames are now amplified to reveal small hidden motions in the video<sup>[1]</sup>.

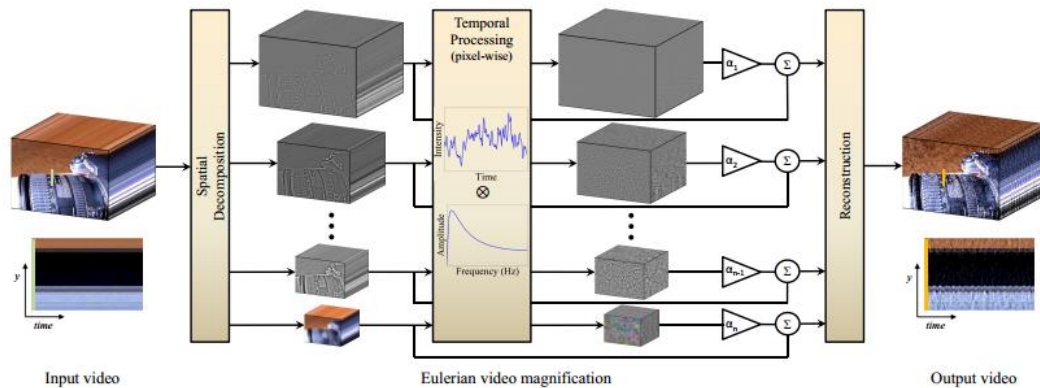


Figure 1 (Source: [1])

We will then use AAM Fitting<sup>[3]</sup> to obtain shape and appearance parameters from which we will extract the facial expression features. The magnified facial expressions have a nonlinear distribution in the facial feature space, so a nonlinear classifier is needed to classify them<sup>[2]</sup>. Therefore the extracted facial expression features are classified using Multi-SVM classifier.

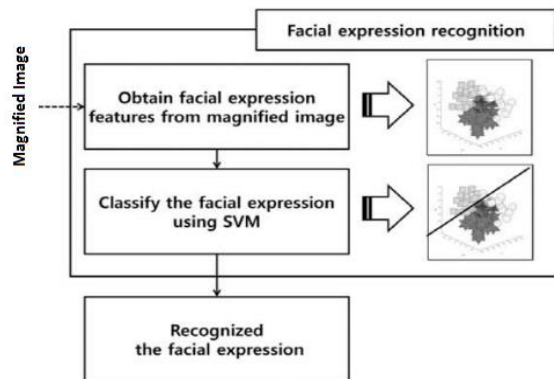


Figure 2 (Source: [2])

## 5. Dataset

We will use our own dataset which will consist of a set of videos of various persons exhibiting different facial expressions like smile, anger, surprise, etc.

## 6. References

[1] Eulerian Video Magnification for Revealing Subtle Changes in the World, Hao-Yu Wu, Michael Rubinstein, Eugene Shih, John Guttag, Frédo Durand, William T. Freeman, MIT CSAIL, Quanta Research Cambridge, Inc., 2012.

[2] Subtle Facial Expression Recognition using Motion Magnification, Sungsoo Park, Daijin Kim, Department of Computer Science and Engineering, Pohang University of Science and Technology, 2009

[3] Active Appearance Models Revisited, Iain Matthews, Simon Baker, CMU-RI-TR-03-02