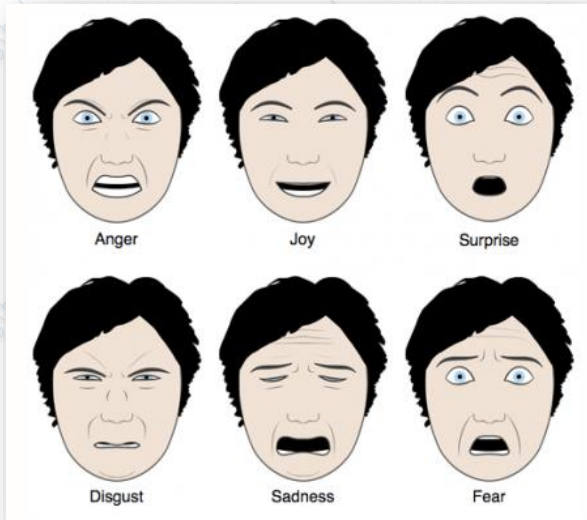


Perception-based Facial Micro-Expressions Signature



Communication Involves Three Components:



1. Verbal Messages - the words we choose
2. Paraverbal Messages - how we say the words
3. Nonverbal Messages - our body language



From a study of [Albert Mehrabian](#) (*Non-verbal communication*, 1972):

- **Non verbal:** Body movement (in particular face) 55%
- **Paraverbal** (to speak more rapidly, at a higher pitch etc.) 38%
- **Verbal:** words selection 7%



The problem

Facial micro expressions (MEs):

key role in non verbal communications as they reveal the actual internal emotional state and subject intentions

ME definition:

"very brief, subtle, and involuntary facial expressions which normally occur when a person either deliberately or unconsciously conceals his or her genuine emotions"

ME duration:

1/25 to 1/5 of a second (maximum duration: 1/2 second)

ME pros and cons

spontaneous and very *informative*: minute muscle movements reflect the true emotions of a person

hard to detect: due to the short duration and low intensity, they are very difficult to perceive and to correctly understand



ME Spotting

ME recognition

SPOTTING

Temporal evolution



Accurate motion estimation



Neutral

Apex

Neutral



Onset

Offset

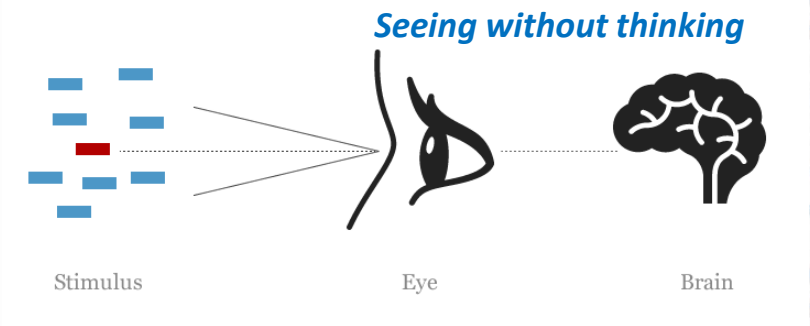
Goal: to speed up the detection process

Method: ME perceptual features

ME definition: characterized by a very short duration ranging from 40 ms to 200 ms

Pre-attentive vision: phenomenon that occurs in the brain's low-level visual system during the first 200 ms

what jumps out in subject mind



ME as
unconscious response of the subject to an external source
and
a stimulus that is *unconsciously perceived* by the observer

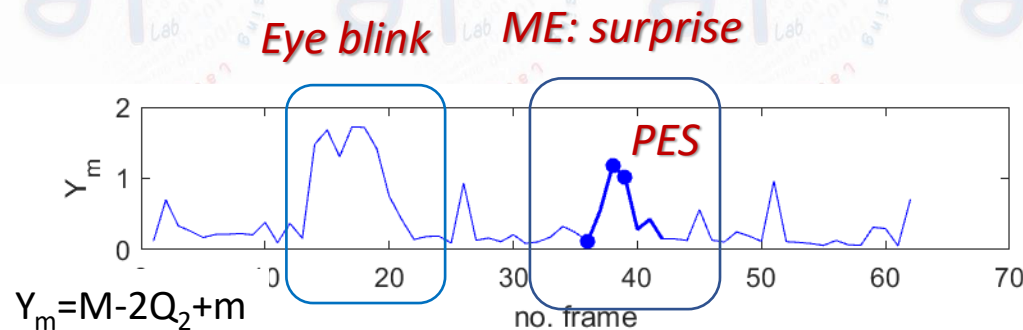
ME as
unconscious response of the subject to an external source
and
a stimulus that is *unconsciously perceived* by the observer

ME visual fingerprint

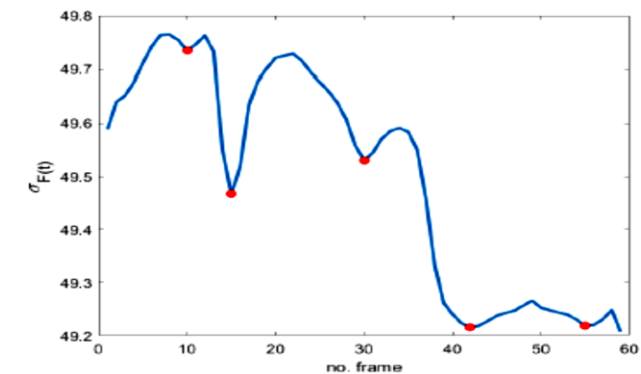
visual discontinuity

Perceptual Expression Signature (PES)

visual warning (hidden emotion)
Frozen frames



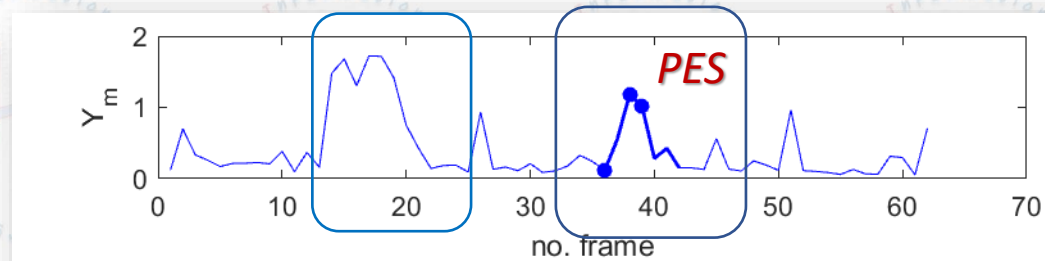
temporal evolution of SSIM asymmetry index



Low-pass motion energy

DV TV

Eye blink ME: surprise



temporal evolution of SSIM asymmetry index



Neutral

Onset

Apex

Offset

Neutral

contempt

