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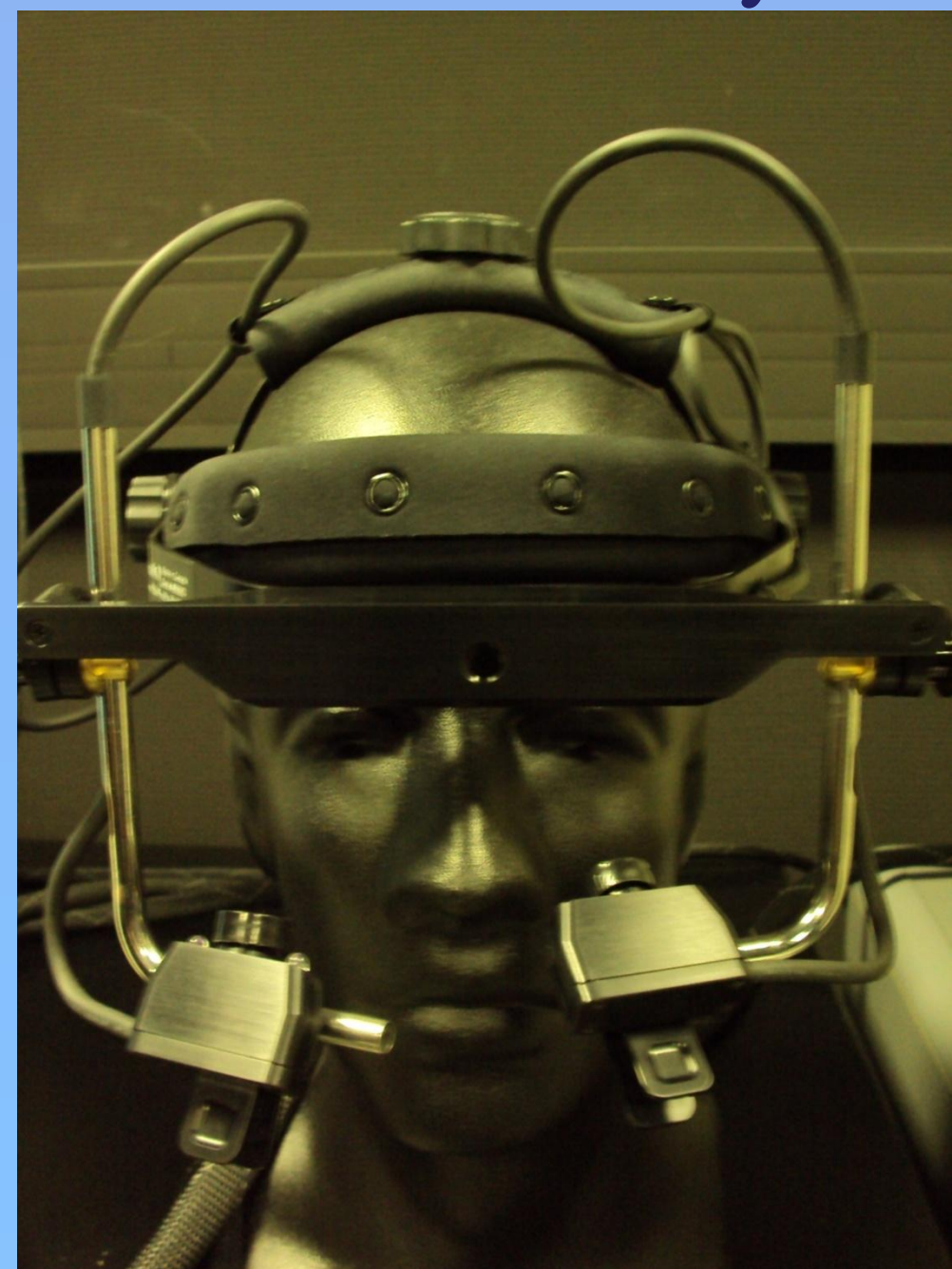
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Motivation: Our work is motivated by the fact that human visual system (HVS) analyzes complex scenes in real time by selecting visual inputs from “salient regions”. We argue that, in the same manner the task of automatic facial expressions recognition can also be completed in real time by processing some facial region(s). We have taken help of HVS in order to identify salient or most important facial region(s) for six universal facial expressions i.e. anger, disgust, fear, happiness, sadness and surprise.

Eye-Tracking Equipment and stimuli

➤ We used video based eye-tracker (Eyelink II system from SR Research, Canada) to record eye movements of fifteen human observers. The system consists of:



- Three miniature infrared cameras (with infrared illuminator)
 - One mounted on a comfortable leather padded headband for head motion compensation.
 - Two mounted on arms attached to headband for tracking both eyes.
 - System allows determination and tracking of subject's dominant eye without any mechanical configuration.
- 54 videos from Cohn-Kanade facial expression database.

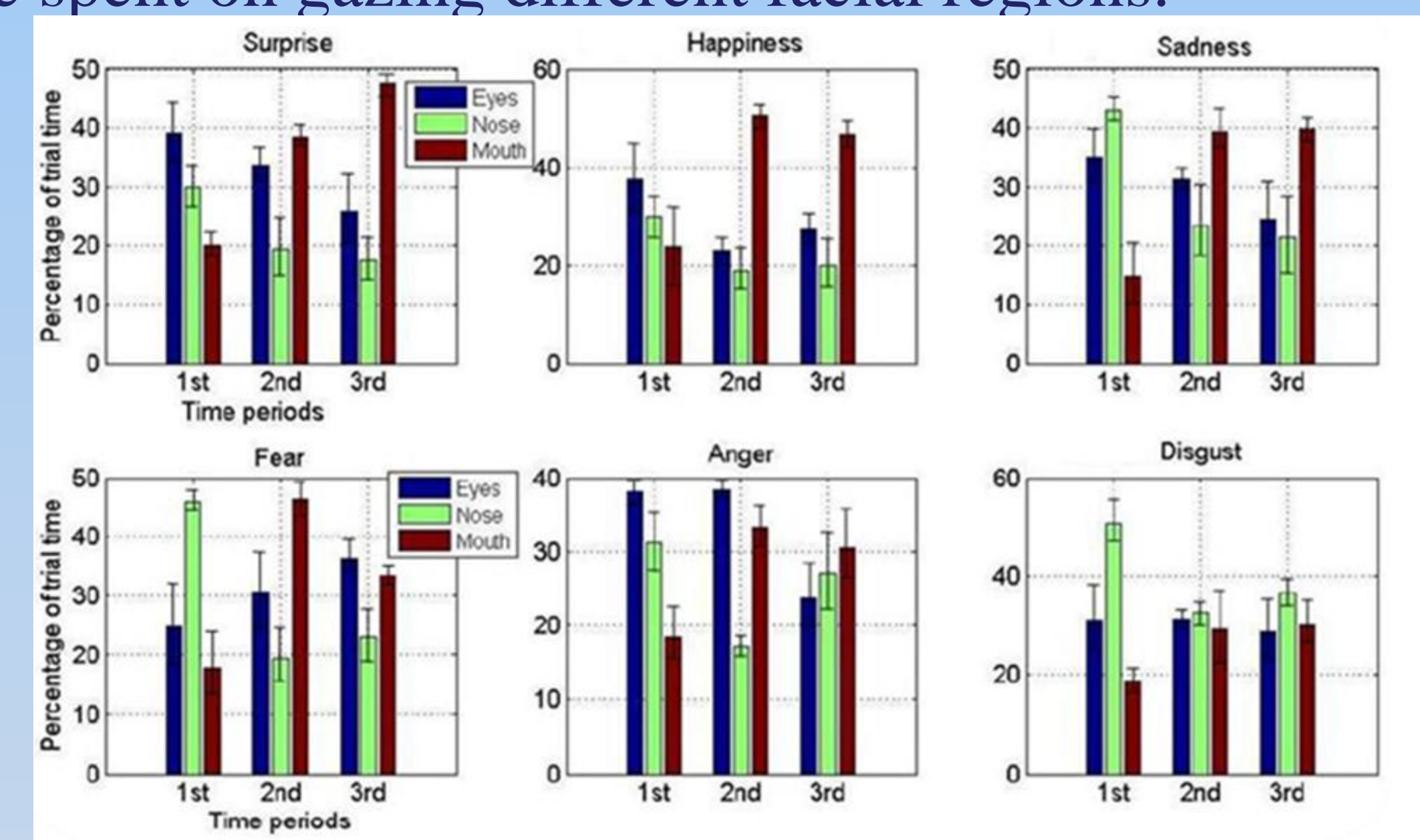
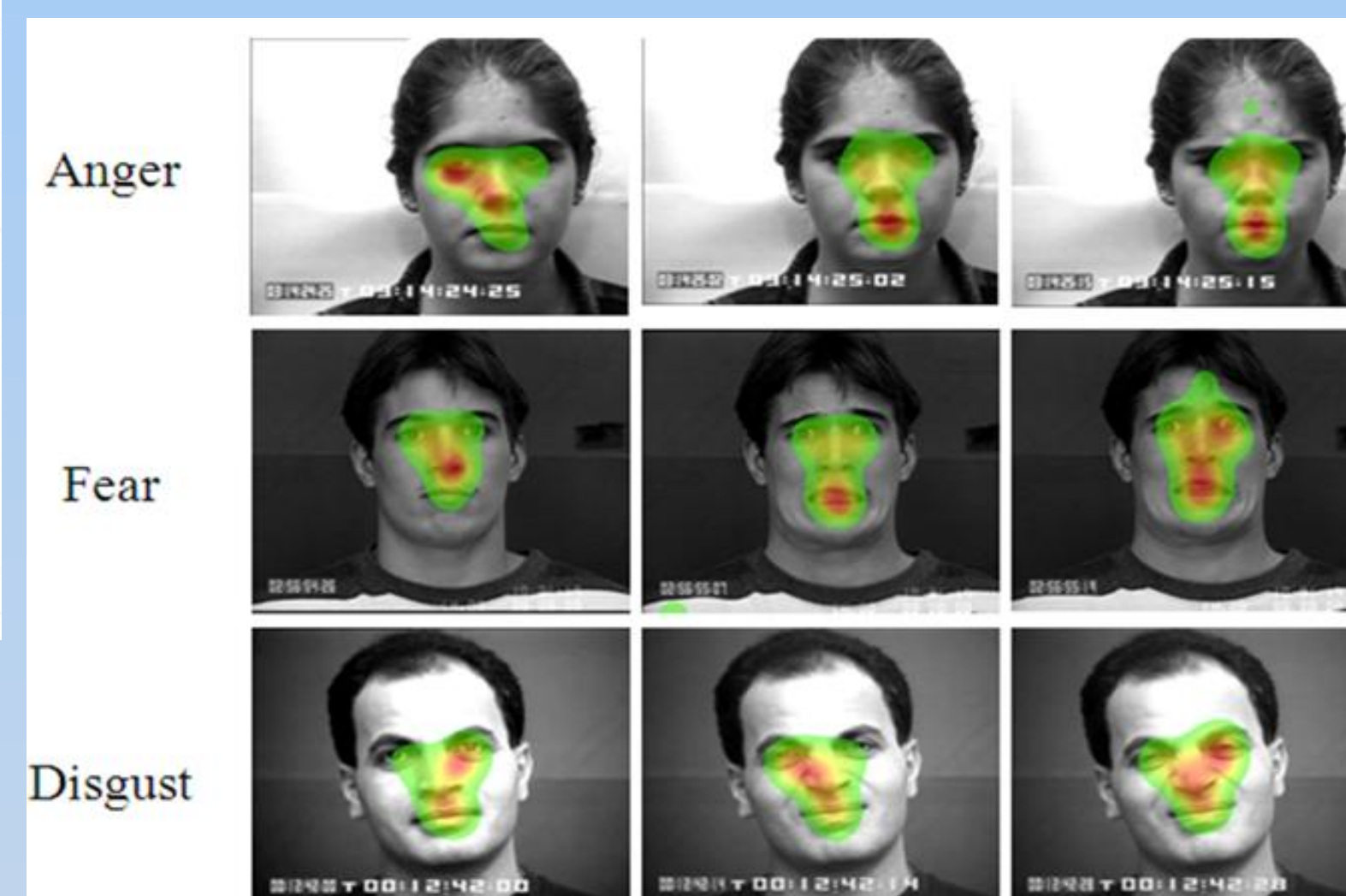


Results and Discussion

To analyze the gaze trend across one video sequence we have divided each video sequence in three mutually exclusive time periods. First time period: prelude, second time period: onset of expression and third time period: climax of expression.

➤ Gaze maps show that for all the six expressions humans tend to fixate their gazes mostly at three facial regions i.e. eyes, nose and mouth.

➤ In order to statistically identify that which facial region is perceptually more attractive for specific expression, we have calculated the average percentage of trial time observers have spent on gazing different facial regions.



Expression	Happiness	Surprise	Sadness	Fear	Anger	Disgust
Salient region(s)	Mouth	Mouth	Mouth and eyes (biased towards mouth)	Eyes and mouth	Mouth, nose and eyes	Mouth, nose and eyes

Verification of the idea: Two experiments were conducted first with the Cohn-Kanade (CK) facial expression database and second with the MMI facial expression database. In both the experiments PHOG features were extracted only from the salient facial regions.

➤95.3 % correct classification for six universal expressions*



Cohn-Kanade (CK) facial expression database

➤93.2 % correct classification for six universal expressions



MMI facial expression database

* Details of algorithm are presented in our paper: R. A. Khan, A. Meyer, H. Konik, and S. Bouakaz. Human vision inspired framework for facial expressions recognition. In IEEE International Conference on Image Processing (ICIP), 2012.