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Assessment of spontaneous emotional facial expressions using optical flow analysis

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Statement of the Problem: Investigations on emotion manifested through facial expressions has valuable applications in predictive behavioral studies. This has piqued interest towards developing intelligent visual surveillance for facial expression analysis. The idea is perpetuated by its immediate utility in closed circuit television (CCTV) surveillance and the growing belief that the subjective experience and emotion reflect one's facial expression changes. A facial recognition program tailored to evaluating facial expression for forensic and surveillance purposes can be met if patterns of facial emotions can be detected. The purpose of this study was to induce emotions in individuals to determine if specific facial movements during different expressions could be detected by optical flow analysis.

Methodology: Individuals were videotaped while watching three emotion inducing short films. The films were shown with the intention of inducing one of three emotions: amusement, sadness and fear. Skin conductance (SC) was measured along with a nine-point Likert scale (self-reported emotional assessment) questionnaire to establish the type and extent of emotion felt. This allowed for still facial images representative of neutral and peak of emotional expressions to be extracted from recorded footage. Optical flow analysis was performed on the image sets using the MATLAB software to quantify the magnitude and direction of facial activity between neutral and peak emotional states.

Results: Optical flow analysis produced vector maps depicting global velocity vectors of facial movement. When summarizing this information derived from the vector maps of amusement, sadness and fear, we observed similar trends and patterns of activity with a greater magnitude for the expression of amusement compared to sadness and fear.

Conclusion and significance: Optical flow analysis shows potential in the discrimination of emotional facial expressions. However, further data analysis is necessary to confirm if different types of emotion can be identified clearly using optical flow or other such techniques.

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