Automatic Thermal Monitoring System (ATHEMOS) for Deception Detection

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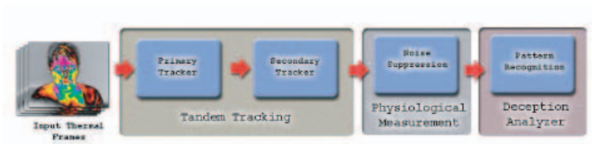

Fig. 1
SYSTEM ARCHITECTURE

DESCRIPTION

Previous work has demonstrated the correlation of periorbital perfusion and stress levels in human beings. It has also been suggested that periorbital perfusion can be quantified through processing of thermal video. The idea has been based on the fact that skin temperature is heavily modulated by superficial blood perfusion. Proof of this concept was established for two different types of stress inducing experiments: startle and mock-crime polygraph interrogations. However, the polygraph interrogation scenarios were simplistic and highly constrained. In the present video, we report results on a large and realistic mock-crime interrogation experiment. The interrogation is free flowing and no restrictions have been placed on the subjects. We propose a new methodology to compute the average periorbital temperature signal. The present approach addresses the deficiencies of the earlier methodology and is capable of coping with the challenges posed by the realistic setting. Specifically, it features a tandem condensation tracker to register the periorbital area in the context of a moving face. It operates on the raw temperature signal and tries to improve the information content by suppressing the noise level instead of amplifying the signal as a whole. Finally, a pattern recognition method classifies stressful (Deceptive) from non-stressful (Non-Deceptive) subjects based on a comparative measure between the interrogation signal (baseline) and portions thereof (transient response). Figure 1 depicts the overall system architecture. The successful classification rate is 87.2% for 39 subjects. This is in par with the success rate achieved by highly trained psychophysiological experts and opens the way for automating lie detection in realistic settings.

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