Literature Review of Sensor's Technical Aspects

Sensors	Software & Specifications	Parameters	Models	Details of Models
Eye Tracking (Pupil Labs Core)	Pupil Capture Software - Technology: Dark pupil technique + 3D model - Calibration: 5 points - Resolutions: 1080p @30 Hz, 720p @60 Hz, 480p @120 Hz	- Fixation Duration - Gaze Point - Saccades - Blinks - Pupil Size - Eye Movements	- Time-series analysis - Regression Analysis - Graph-Based Analysis	- Time-series analysis: Examining the temporal sequences of fixations, saccades, and other eye movement parameters to uncover patterns, trends, and relationships over time (Meo et al., 2024). - Regression Analysis: Examining how changes in independent variables, such as stimulus characteristics or task demands, relate to changes in dependent variables, such as fixation durations or gaze points, helping to identify factors that influence visual attention (Dimigen et al., 2021). Graph-Based Analysis: Representing eye movement data as graphs/networks can facilitate the analysis of spatial and temporal relationships between fixations and saccades (Lan et al., 2020).
Face Movements (Camera AXIS P1275, P1245)	OpenFace Software - Resolution: HDTV 1080p - Capture: WDR – Forensic	- Facial Landmarks - Facial Expressions - Facial Action Units - Head Pose - Gaze Direction	Facial Action Coding System (FACS)	- Facial Action Coding System (FACS) is a way to analyze human facial expressions by dissecting them into individual muscle movements (Khan et al., 2024).

	- Field of view: 53°-99° horizontal & 111° horizontal			
Skin Conductance (TEA GSR)	CAPTIV Software - Sampling rate: 32 hz - Compact and Lightweight: 20g - Long Battery Life: 8 hrs.	- Sample Rate - Filtering - Skin Conductance Level (SCL) - Skin Conductance Response (SCR)	- Time-Series Analysis - Correlation and Regression Analysis	- Time-Series Analysis: Skin conductance data can be treated as a time series, and techniques such as autoregressive modeling, spectral analysis, and wavelet analysis can be used to examine temporal patterns, oscillations, and dynamics in the data (Dean et al., 2013). - Correlation and Regression Analysis: Correlation and regression analysis can be used to explore relationships between skin conductance and other variables of interest, such as self-reported measures of emotion, cognitive processes, or physiological parameters (Basarkod et al., 2024).
HRV (Polar H10+, Moofit HW401)	Polar Flow Software - Microprocessor speed: 64 MHz - Sensors: ECG	Time-Domain Parameters - Standard Deviation of Normal RR Intervals (SDNN) - Root Mean Square of Successive Differences (RMSSD) - Percentage of NN Intervals Differing by More Than 50 Milliseconds (pNN50) Frequency-Domain Parameters - Low-Frequency (LF) - High-Frequency (HF) - LF/HF ratio	- Linear Regression - Classification Algorithms	- Linear Regression: This is used to assess how different factors (age, fitness level, etc.) influence HRV parameters. It helps identify relationships between variables (Burma et al., 2024). - Classification Algorithms: These models, like Support Vector Machines (SVM) or Random Forests, are trained to categorize HRV data based on specific conditions. For example, classifying between stressed and relaxed states (Ihianle et al., 2024).

Eye Tracking Parameters

Fixation Duration: The length of time the eye remains still on a specific point during visual processing.

Gaze Point: The specific location in space where the eyes are directed at any given moment.

Saccades: Rapid movements of the eyes between fixation points during visual exploration.

Blinks: The temporary closure of the eyelids, interrupting visual input momentarily.

Pupil Size: The diameter of the pupil, which can vary in response to changes in light or cognitive factors.

Eye Movements: Various patterns of motion executed by the eyes, including saccades, smooth pursuit, and vestibulo-ocular reflex movements.

Face Movements Parameters

Facial Landmarks: Points on the face representing specific features such as eyes, nose, and mouth.

Facial Expressions: Dynamic changes in the face reflecting emotions or intentions.

Facial Action Units: Specific muscle movements or combinations that create facial expressions.

Head Pose: Orientation of the head in three-dimensional space.

Gaze Direction: Direction in which the eyes are focused.

Skin Conductance Parameters

Sample Rate: This refers to how often SC is measured, typically in Hertz (Hz). It determines the level of detail captured in the data. Higher rates (1 kHz) capture faster fluctuations but require more processing power. Lower rates (16 Hz) are sufficient for slower changes.

Filtering: Raw SC data can be noisy. Filtering helps isolate the relevant signal by removing unwanted frequencies. High-pass filters eliminate slow drifts, while low-pass filters remove high-frequency noise.

Skin Conductance Level (SCL): This reflects the baseline level of SC activity, influenced by factors like sweat gland activity and skin temperature.

Skin Conductance Response (SCR): These are transient changes in SC caused by emotional or physiological arousal. SCRs are usually measured relative to the SCL.

HRV Parameters

Standard Deviation of Normal RR Intervals (SDNN): This reflects the overall variability of heart rate and is considered a global index of HRV.

Root Mean Square of Successive Differences (RMSSD): This reflects the beat-to-beat variability of heart rate and is thought to be primarily influenced by parasympathetic nervous system activity.

Percentage of NN Intervals Differing by More Than 50 Milliseconds (pNN50): This reflects the percentage of heartbeats that differ by more than 50 milliseconds from the preceding heartbeat, another measure of parasympathetic activity.

Low-Frequency (LF) power: This is thought to reflect the combined influence of both sympathetic and parasympathetic nervous system activity.

High-Frequency (HF) power: This is thought to reflect parasympathetic nervous system activity.

LF/HF ratio: This is the ratio of LF power to HF power and can provide an estimate of the balance between sympathetic and parasympathetic nervous system activity.

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