emteq labs

OCOsense™

The world's first eyewear for behaviour analytics & wellbeing

for real-word and XR

Features

Our system provides a simple, **all-in-one wireless solution** to track, timestamp and annotate user responses to content.

- Proprietary **OCO™ Optomyography (OMG) sensors** detect high-resolution facial activations at key muscle locations
- Smart 9-axis inertial measurement unit (IMU) and an altimeter for behavioural understanding
- Detachable external camera to synchronise context to responses (coming soon)
- Realtime streaming of data to mobile app

The Science

Emteq Labs' key innovation is the **OCO™ sensor** for tracking facial muscle activation. At its core an array of **OCO™ sensor** that map facial skin movement in **3 dimensions** combined with AI to control for movement artifacts, enabling wearable expression and emotion sensing.

It has two main use cases:

- Expression as output: emotion analytics for wellbeing /health (people analytics), content analytics.
- Expression as input: interact with physical and digital world intuitively (with gestures and expressions).

The patented **OCO™ sensors** provide mapping of facial skin movement in 3 dimensions enabling different use cases.

Applications

The platform also **enables third-parties** to investigate human experiences **upon request**. There are many applications for the use of facial biofeedback in medicine, training, gaming, and research.

Academic and Clinical Research

Gather high quality biometric data, with real-time quality supervision, without complex wiring and preparation.

Response Testing

Understand how your users really feel about your product. Examine collective emotional responses, moment by moment, step by step.

Wellbeing

Learn how to relax facial muscles and improve the symmetry of expression. Use biometrics as an integral part of the experience; integrate emotion management into wellbeing and mental health applications.

Soft Skills Acquisition

Validate performance-enhancing training scenarios, from presentation skills to resilience training, with stress and expression insights.

Measure

- Measure **valence** based on the profile of the individual, and dynamic context.
- Measure context, inferred from activity, posture, and interactions.

Compare

- Evaluate how people respond to different types of content.
- Compare how a group of individuals differ in their responses to the same experience.

Manage

- Enable scientific research, through the measurement of valence and context.
- Test simulations via expression feedback.

Emotion in motion

The OCOsense glasses can be worn just like regular glasses, streaming high resolution sensor data completely wirelessly using BLE technology.

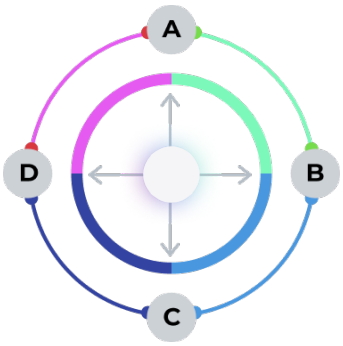
Interpreted Data Signals

- Intensity of expression
- Valence
- Asymmetry of expressions
- Movement
- Activity
- Engagement
- Sound detection

Raw Data Signals

- Multi-channel optomyography (OMG) data
- 9-axis inertial measurement Unit (IMU)
- Altimeter
- Signal quality monitoring

The Dimensional Model



- **A** High Arousal (exciting, agitating)
- **B** Positive Valence (happy, approving)
- **C** Low Arousal (soothing, calming)
- **D** Negative Valence (unhappy, disapproving)

The experience of emotion or more accurately, 'affect', can be described by plotting the user's state as continuous vectors on a dimensional model. The primary axes of affect are Valence and Arousal. Valence refers to how positive or negative the emotional response is - how much we 'liked' it.

Rather than categorising expressions, we apply the same validated approach as used for facial electromyography. Muscle activation is used to infer emotional valence.

Arousal refers to how 'exciting' or calming an event is, literally, how it arouses us. This analysis, based on recent theories, provides a deeper understanding of the user's emotional journey and overall experience.

Collect

Save data on the go. Build and run studies using our data collection mobile app. Label data segments, objects and events of interest to analyse responses later and/ or use the biofeedback* to drive your applications.

*** Requires SDK access**

Monitor

View data in real-time via mobile app and observe patterns in the wearers behaviour and activity.

Annotate

Tag important events that occur during the experience either in real-time or offline. Accelerate analysis by measuring what matters.

Analyse

Collect time-synchronised data, both raw and interpreted, as well as video and annotations.

Develop

Use data to develop new algorithms and behavioural insights.

SENSOR DATA

- **Optomyography (OMG)** – provides optical, non-contact, micrometer accurate, low latency measurement of facial skin movement in three dimensions to capture facial expressions and to understand the wearers response.
- **Inertial Measurement Unit (IMU)** - provides measurement of head orientation and movement using multi-modal sensor data to determine the wearer's gesture (standing, sitting, reclining), activity (walking, running, climbing stairs), and context.
- **Altimeter** – measures the user altitude to enhance the capabilities of the IMU and to provide more information about the user's activity (e.g. sitting vs. standing), and location (e.g. upstairs vs. downstairs).
- **Sound detection sensor** - detection of sound without recording any spoken content, to provide extra context to the users emotional state (valence).

PHYSIOLOGICAL DATA

- **Facial movement/expression**
- **Head movement/physical activity**

AFFECT DATA

- **Engagement**
- **Valence**

FEATURES

HARDWARE

- **Completely untethered system:** Stream data via Bluetooth to the OCOsense™ with up to 4 hours of battery life
- **User notifications:** RGB peripheral vision LED and haptic vibrations

OCOsense™ IOS app and cloud services

- **Real-time expression recognition:** Detect and visualise expressions and valence in real time
- **Real-time activity recognition:** Detect and visualise activities and visualise head orientation in real time
- **Data insights linked to user experience:** Automatic annotation of affective videos with the users emotion state and engagement
- **Fast calibration:** Calibrate the expression engine for new users in minutes
- **Diagnostics:** Visualise raw sensor data in real time to easily diagnose common problems such as glasses fit/sizing
- **Complete off-line functionality:** All the features of the OCOsense™ app including machine learning algorithms for activity and valence can run locally without the need for cloud connectivity
- **Cloud services:** Data storage and secure user accounts
- **Data analysis:** Access sensor data as well as interpreted data

Technical Specifications

OCOsense

Hardware

Battery capacity: Up to 4 hours of run time depending on performance mode

One size, many faces: Adjustable nose bridge and support strap for wearer comfort

Weight:
83g

Software

Operating System:
- **Apple IOS and macOS,**
- **Android** (coming soon)

SDK (coming soon to C++ and Python)

Regulatory Compliance:
CE marking

Biosensing

- 6 x OCO™ sensors for facial OMG, providing <5µm resolution skin movement measurements in 3-dimensions
- 1 x 9-axis IMU sensor (accelerometer, gyroscope and magnetometer)
- 1 x Altimeter
- 50Hz sampling frequency only 4kb/s total data rate
- Sound detection microphone

Publications validating our facial expression sensing for emotion science, and activity detection for future wearable health-care interventions

Our technology builds on decades of work using facial EMG to evaluate emotional and cognitive responses. For a full list of studies validating the measurement of valence and arousal using facial muscle activity, please see the Emteq Labs website. Unlike other methods of measuring facial expressions, OCOsense measures physical activities and context. OCOsense has been validated by peer-reviewed scientific research. Please see our website for the most recent articles.

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