

SPIDERS+: A Light-Weight, Wireless, and Low-Cost Glasses-Based Wearable Platform for Emotion Sensing and Bio-Signal Acquisition



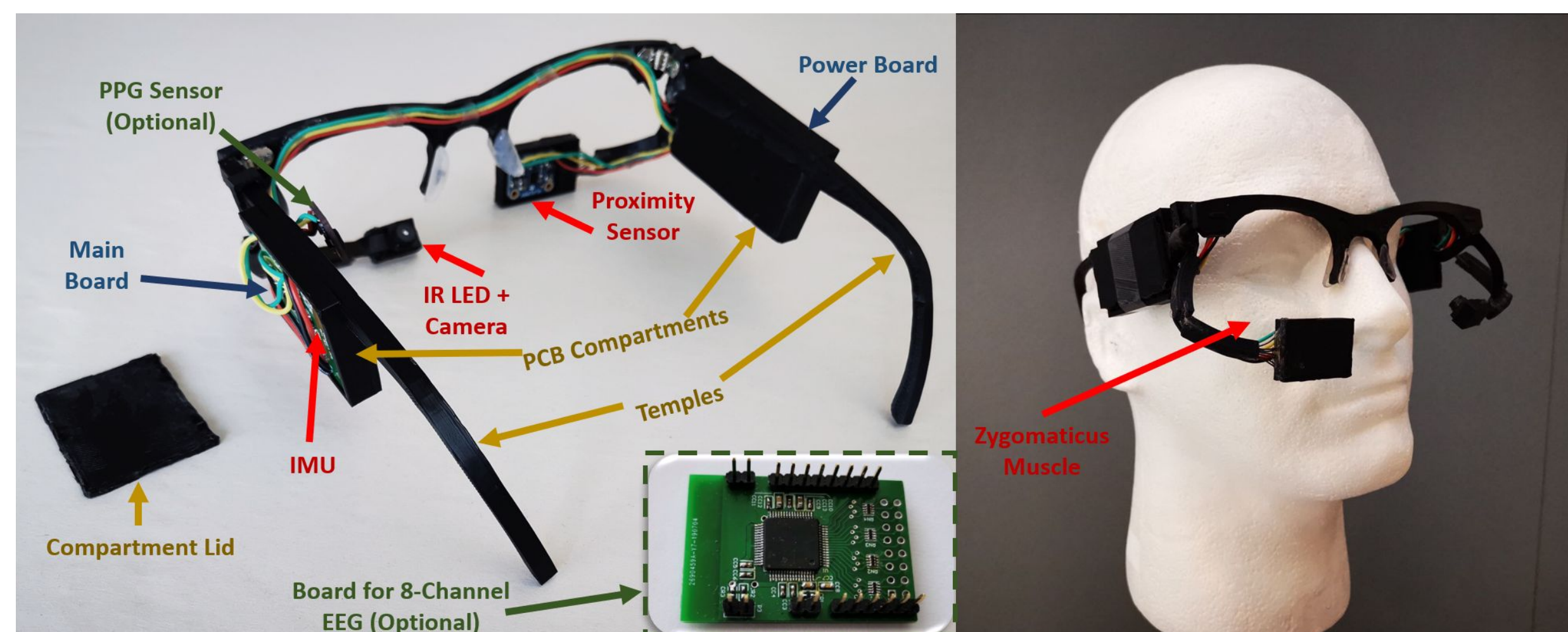
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Motivation and Introduction

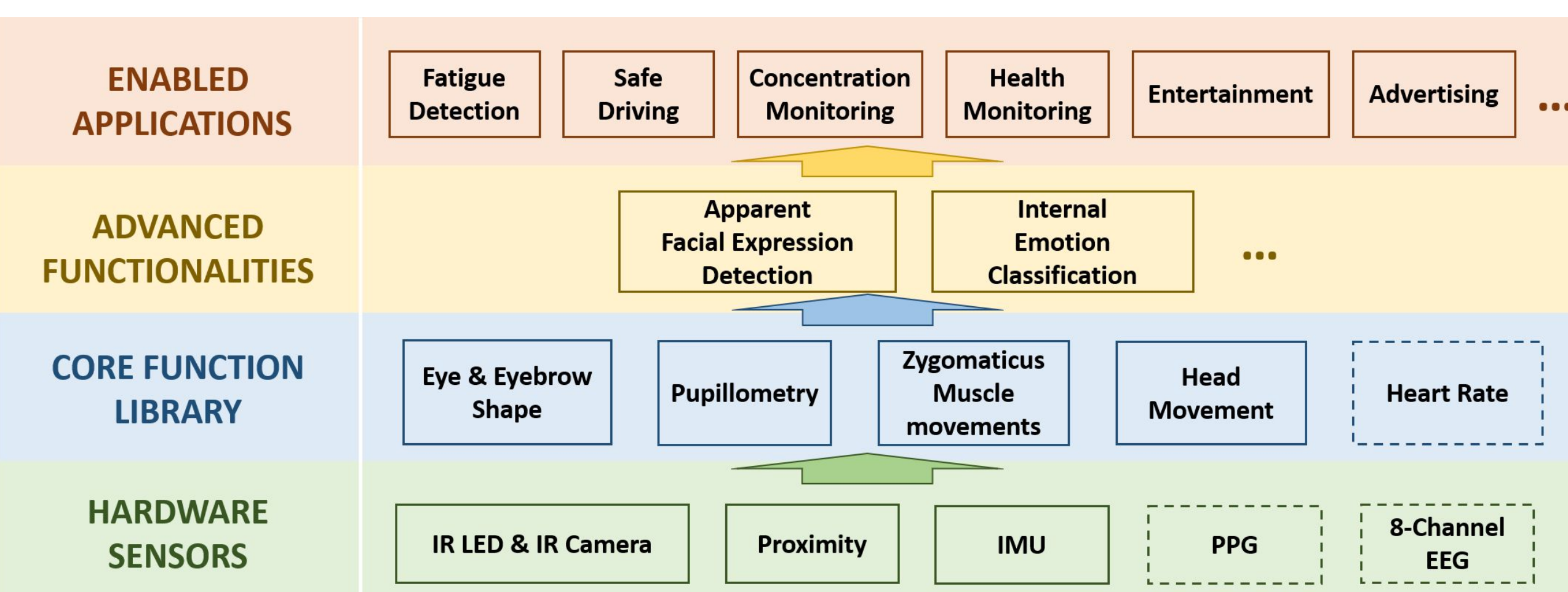
Emotion monitoring systems will play an important role in improving the mental health conditions of the general public. A low-cost, lightweight and compact wearable platform that can monitor human emotions will benefit a wide area of research and applications.

We present a **S**ystem of **P**rocessing **I**n-situ **B**io-signal **D**ata for **E**motion **R**ecognition and **S**ensing (SPIDERS) – a low-cost, wireless, glasses-based platform for continuous in-situ monitoring of user's facial expressions and real emotions.



System Architecture

- Hardware Sensors
- Core Function Library
- Advanced Functionalities
- Enabled Applications

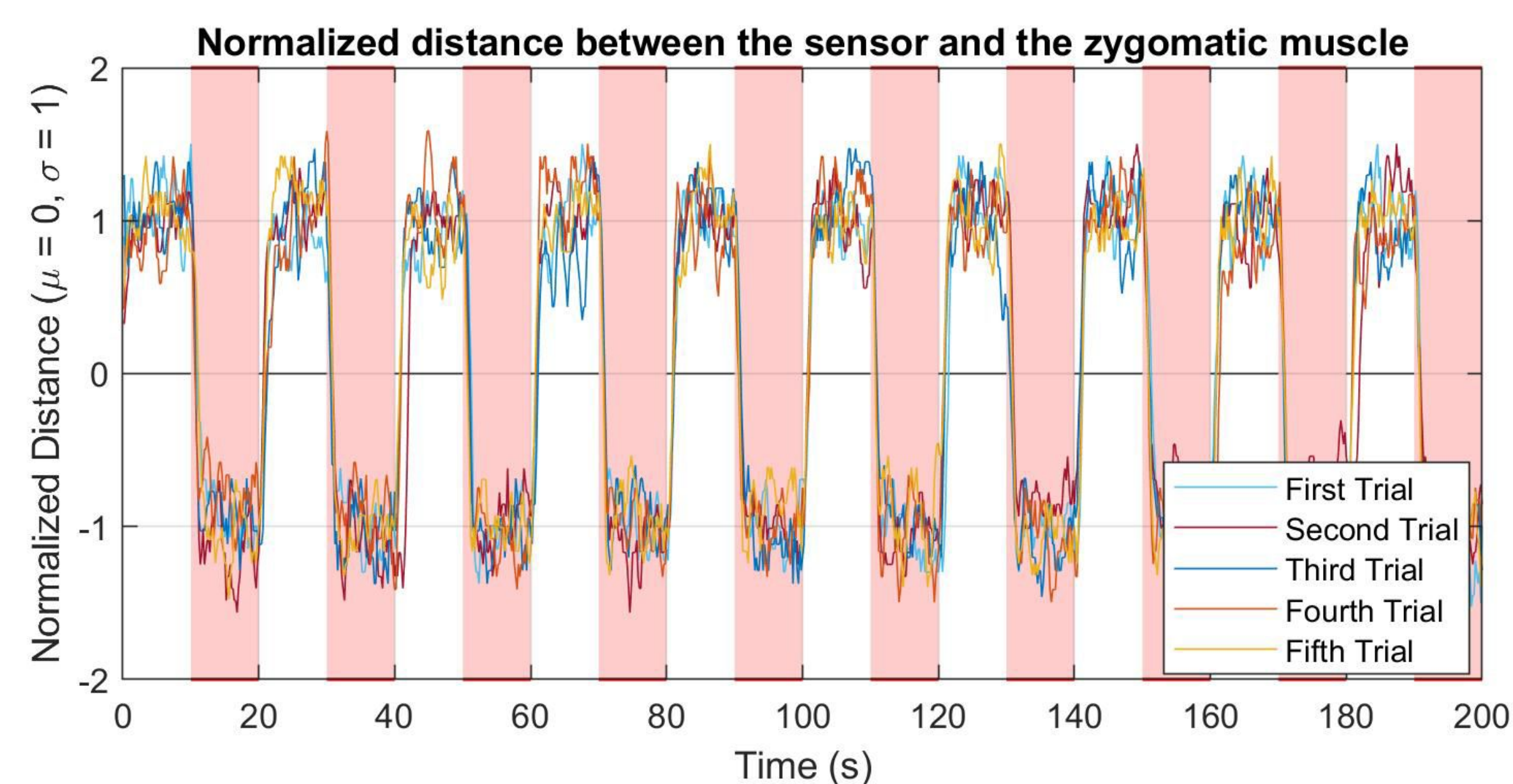
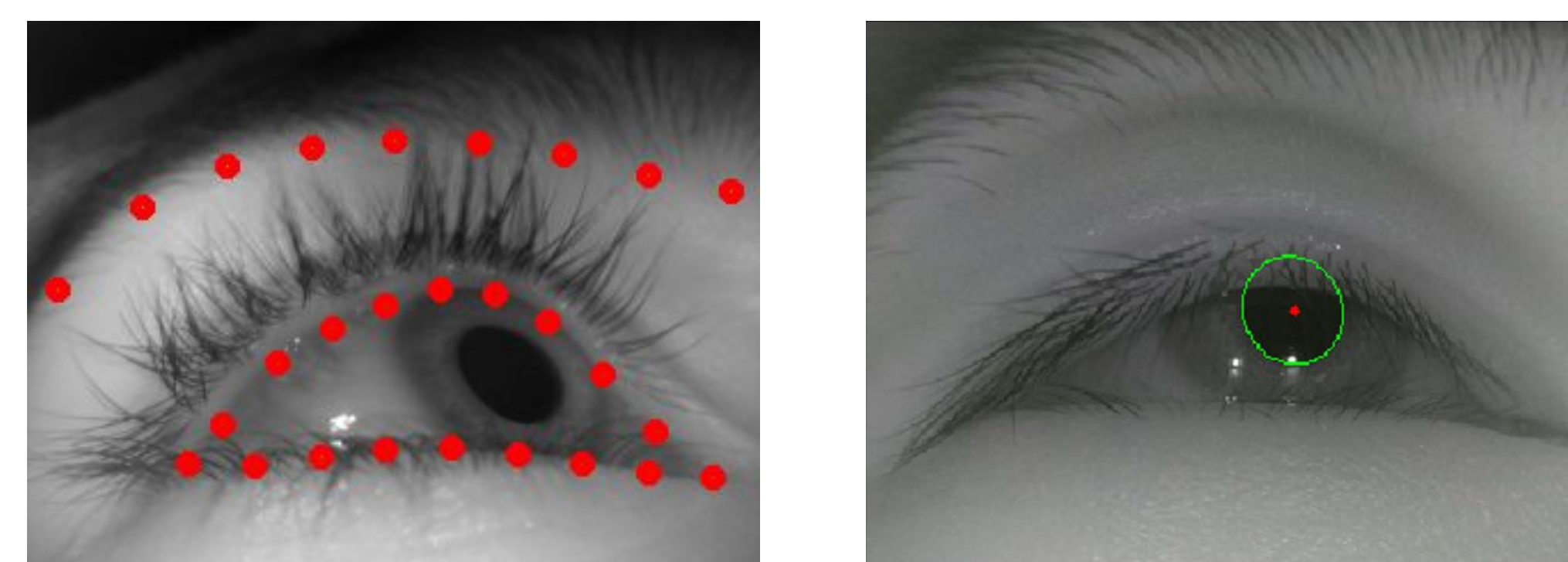


Hardware Platform

- Wireless Microcontroller: ESP-32
- Inertial Measuring Unit (IMU): MPU-6050
- Proximity Sensor: VL6180X
- Camera Module: OV2640
- 2000 mAh Battery and Voltage Regulator
- WiFi Transmission to Laptop/Smartphone
- Low-cost, Lightweight and Compact
- Run Continuously for 9 Hours.

Core Function Library

- Landmark Generator for Eye and Eyebrow Shape
- Pupilometry: Size and Location
- Zygomaticus Muscle Movements

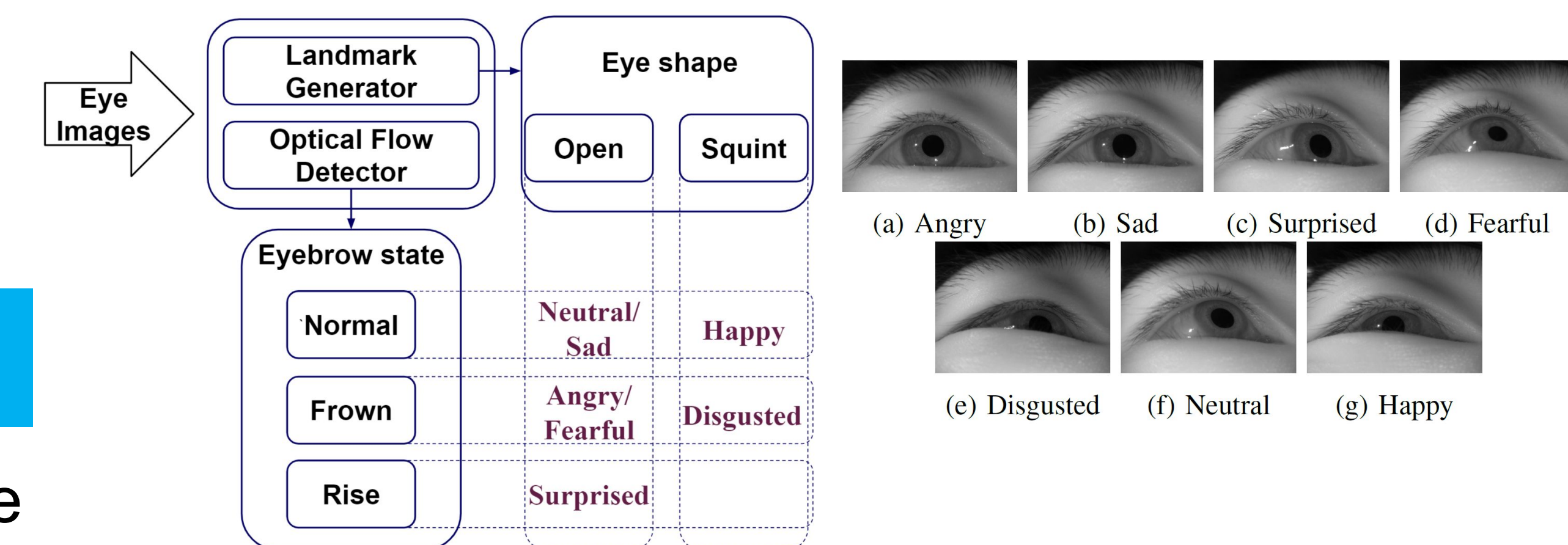


Real Emotion Detection

- 12 Adult Volunteer Test Subjects
- Emotional Pictures and Sounds Are Shown
- Subjects Give Self-rated Emotional States
- Emotional States: Arousal and Valence.
- SVM Classifier

Facial Expression Detection

- Eye Shapes: Landmarks on the Eyelids
- Eyebrow Movements: PWC-Net
- Classification Logic: Combining Two Features
- 5 Classes of Facial Expressions



Enabled Applications

- Fatigue Detection
- Mental Health Monitoring
- Desktop and Smartphone Applications



Acknowledgement

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