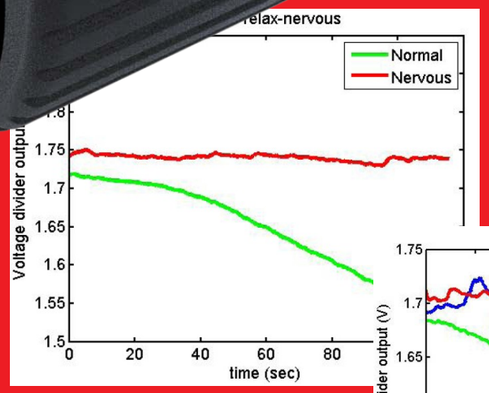
AKIRA

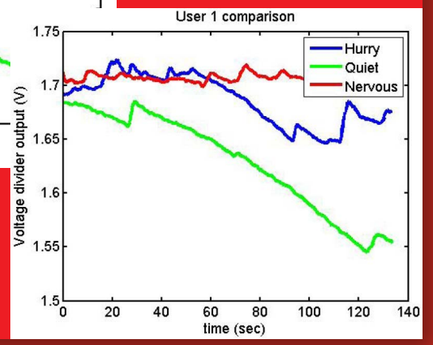
industries

2019

AKIRA INDUSTRIES IS RESEARCH AND DEVELOPMENT COMPANY DEDICATED TO PROVIDING CUSTOM SOLUTIONS IN AND AROUND INTERNET OF THINGS ECOSYSTEM

SCHOOL.





https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3386730/pdf/sensors-12-06075.pdf

Status: **Protoype**

Competitors:
PlayAttention

Location Based Services

Biometric Sensors

Various misc Sensors

WiFi Connection

Realtime Statistics

Scheduling Services

Watertight Case

Schools don't have to be stressful place for students and teachers alike

School, for most students is a stressful place. School consists mostly of tests, quizzes, and interaction with other students and adults each with different goal in mind.

SCHOOL. uses GSR or Galvanic Skin Response to measure the level of stress, nervousness or general alertness of students. The GSR approach to stress detection device have shown ability to detects whether there has been an effort or a different situation from being relaxed with a success rate of 90.97%. To supplement detection temperature, accelerometer and heart rate sensor can be added.

SCHOOL. is a arm band type device that presents it self and functions like a smart watch to students. Device is primarily low power bluetooth device that is set up to automatically connect to predetermine bluetooth access points making each classroom isolated from each other and making device itself protected from intrusion.

Device provides information in real-time or near real time (depending on desired resolution and battery options) to teachers about state of attention for each student in class and enabling them to dedicate more time for specific student or if specific topic needs more time to be properly adopted by students.

SCHOOL. enables students to enhance their cognitive capabilities such as focus, ability to ignore distractions, minimizing impuslivity. There is significant percentage of students that are dealing with mental health issues like ADHD, autism, dyslexia and other. This technology can help them significantly diminish their symptoms

This results in reducing the symptoms of ADHD, autism, dyslexia or stress.

Electronic Design considerations:
- **Battery Life**
- **Connectivity:**
  - **LTE Bluetooth**
  - **Low / High power WiFi**
- **OLED or eInk Screen - optional**

Key components
- **Main MCU: ESP3212**
- **Operational Amplifiers:**
  - **LM324D**
  - **AD8603UJ**
- **Charging management controller:**
  - **MCP73831**
- **USB-TO-UART bridge:**
  - **CP2104**
- **3-Axis Accelerometer:**
  - **MMA7660FC**

Current status:
- **Proof of concept of DC exosomatic EDA reading**
- **Base functional components selected**
- **printed circuit board schematic**

Further development:
- **AC and endosomatic EDA reading**
- **Filtering ECG data**
- **printed circuit board optimization and production**
- **testing of EDA filtering methods**

Desired outcome:
- **AC/DC and DC EDA sensor (endosomatic and exosomatic)**
- **ECG sensor**
- **EMG Sensor**
- **UV Sensor**
- **Temperature sensor (body/enviroment)**
- **Pedometer**
- **fall or inactivity alert**

- **1 to 2 days operational range without charging (no screen)**

The design and development of wearable biosensor for health monitoring has garnered lots of attention in the industry during the last years. Mainly motivated by increasing healthcare costs and propelled by recent technological advances in miniature biosensing devices, smart textiles. The continuous advance of wearable sensor-based systems will potentially transform the future of healthcare by enabling proactive personal health management and ubiquitous monitoring. These systems can comprise various types of small physiological sensors, transmission modules and processing capabilities, and can thus facilitate low-cost wearable unobtrusive solutions for continuous all-day and any-place health, mental and activity status monitoring.

Electrodermal activity (EDA) is a sensitive index of sympathetic nervous system activity. As an index of sympathetic nervous system activity, EDA offers important insight into a broad spectrum of psychological and neurological disorders.

EDA is noisy, as it contains many artefacts due to movement and other varous causes. Another drawback is the high variability between individuals. Apart from arausal and stress, EDA is also influenced by other physiological processes and external factors such as ambient temperature thus a baseline needs to be established per individual after a short period of observation.

EDA measures sweat gland activity. There are two methods:

- Endosomatic method which uses no external current and is difficult to filter.
- Exosomatic method uses external reference constant current and is easier to filter as baseline current exists.

EDA consists of two components:

- Skin Conductance Response - also known as Phasic component.
- Skin Conductance Level - also known as Tonic component

Skin contact plates are recommended to be made out of Ag/AgCl and with diameter of 10mm.

Constant current to be applied without damage to skin is less than 10uA/cm3.

When measuring EDA with DC current, if voltage is kept constant EDA is recorded directly in skin conductance (SC) units, while skin resistance (SR) units are obtained when current is kept constant.

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