biosignalsplux
wearable body sensing platform

ACQUIRE BIOSIGNALS AT REAL TIME & SIMULTANEOUSLY

RELIABLE HIGH IMPACT DATA

DESCRIPTION

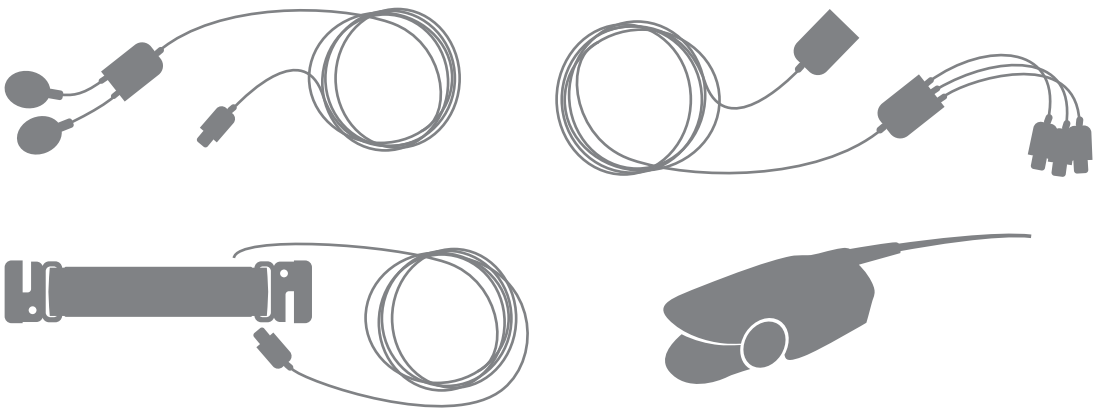
biosignalsplux has been designed specifically to enable top researchers to accelerate their research. It is a wireless system which acquires physiological data from miniaturized sensors placed on the body, showing and processing them.

biosignalsplux integrates up to 20 miniaturized sensors for visualization offline or at real time (EMG, ECG, EDA, Force, Acceleration, etc).

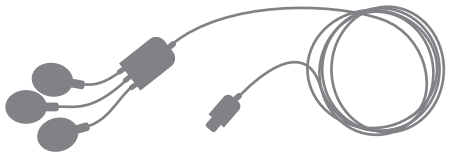
signal processing plugins are in constant development for the analysis of different biosignals.

SPECIFICATIONS

- 8 ANALOG CHANNELS
  (16BIT) SAMPLING DATA RATE OF 1000Hz
- SENSOR
  AUTO-DETECTION
- ACQUISITION SESSION SCHEDULING
  REAL-TIME CLOCK
- INTERNAL MEMORY
  8GB
- USB FAST DATA TRANSFER
  GALVANIC ISOLATION
- BLUETOOTH ®
  CONNECTIVITY
- 1 DIGITAL I / O PORT
  1BIT / I^2C
- VIDEO
  SYNCHRONIZATION



ECG



DESCRIPTION

Conduction of action potentials through the heart generates electrical currents that can be picked up by electrodes placed on the skin. A recording of the electrical changes that accompany the heartbeat is called an electrocardiogram (ECG). Variations in the size and duration of the waves of an ECG are useful in diagnosing abnormal cardiac rhythms and conduction patterns.

Low-noise ECG triodes are specially designed for local differential placement and make ground for unobtrusive signal acquisition. Its state-of-the-art design maximizes the sensor performance providing high resolution signals particularly suited for fine detail analysis. The ECG works mostly by detecting and amplifying the tiny electrical changes on the skin that are caused during the heart muscle cycle during each heart beat.

APPLICATIONS

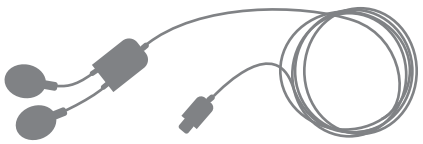
The most important applications of ECG sensor focus on wellness of the patient and include heart rate and stress monitoring, biometric verification and life monitoring.

PUBLICATIONS

R. Chorão, J. Sousa, T. Araújo and H. Gamboa. A New Tool for the Analysis of Heart Rate Variability of Long Duration Records. SIGMAP 2012 : International Conference on Signal Processing and Multimedia Applications, Rome, Italy, 2012.

R. Simões, J. Sousa, C. Nogueira-Silva, H. Gamboa. Optimizing electrode positioning in 3-Lead ECG Chest Devices. Proc INSTICC 2nd International Living Usability Lab Workshop on AAL Latest Solutions, Trends and Applications - AAL 2012 (AAL 2012), Vilamoura, Portugal, 2012.

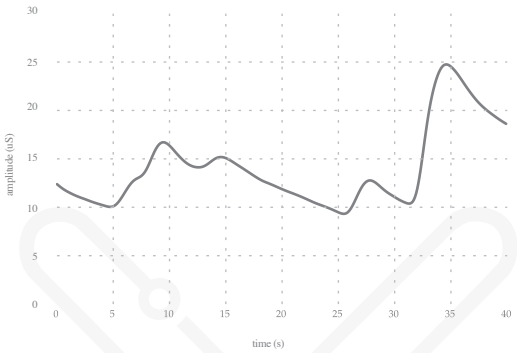
EDA



DESCRIPTION

Electrodermal Skin Activity (EDA) can be defined as a transient change in certain electrical properties of the skin, associated with the sweat gland activity and elicited by any stimulus that evokes an arousal or orienting response.

The EDA sensor is capable of measuring the skin activity with high sensitivity measurement power in a miniaturized form factor. With low noise signal conditioning and amplification circuitry, we are able to provide accurate sensing capability and detect even the most feeble electrodermal skin response events.



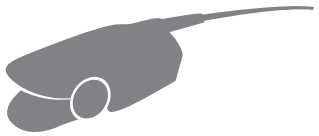
APPLICATIONS

Some of the applications of this sensor include detection of changes in the attentive, cognitive and emotional states. EDA sensors were also used during Endoscopic Thoracic Sympathectomy (ETS) procedures as an auxiliary tool to aid the surgeon.

PUBLICATIONS

H. Gamboa, A. Fred, An Electrodermal Activity Phsycophysiological Model, Proceedings of Med-e-Tel 2007, Luxembourg, April 2007.

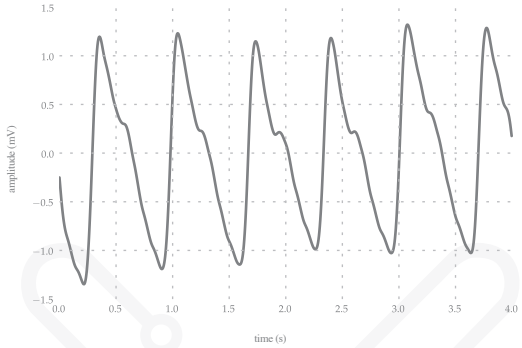
BVP



DESCRIPTION

The Blood Volume Pressure sensor is an optical and non-invasive sensor that measures changes in blood volume in an arterial extremity, based on photoplethismography (PPG technique).

The BVP sensor has a probe for placement on the finger that contains a red light source and a photodetector. These two components are in transmission detection mode and due to its configuration an intuitive detection of the two phases of cardiac cycle (systole and diastole) is possible.



APPLICATIONS

The most common and usual applications are the measurement of heart rate and heart rate variability, but it can be also used to other studies as evaluation of arterial resistance, elasticity of the aorta or even to obtain blood pressure.

Other applications for BVP sensor can be developed, since it allows to obtain vital information. For example, some sleep disorder studies have been using BVP sensors to extract some important parameters to detect sleep arousals.

PUBLICATIONS

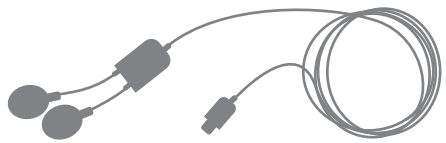
H. Silva, J. Sousa, H. Gamboa. Study and evaluation of palmar blood volume pulse for heart rate monitoring in a multimodal framework. Proc INSTICC 2nd International Workshop on Computing Paradigms for Mental Health - MindCare 2012 (MINDCARE 2012), Vilamoura, Portugal, 2012.

A. Fé, J. Sousa, H. Gamboa. Development of a pulse oximeter and blood pressure measurement device. Proceedings of Biodevices - 5th International Conference on Bio-Inspired and Signal Processing (BIODEVICES 2012), Vilamoura, Portugal, 2012.

J. Medeiros, R. Martins, S. Palma, H. Gamboa, and M. Reis, Development of a Blood Volume Pulse Sensor to measure Heart Rate Variability, Proceedings of IBERSENSOR 2010, Lisbon, Portugal, November 2010.

J. Medeiros, R. Martins, S. Palma, H. Gamboa, and M. Reis, Blood Volume Pulse Peak Detector with a Double Adaptive Threshold, Proceedings of TMSi 2010, Porto, Portugal, October 2010.

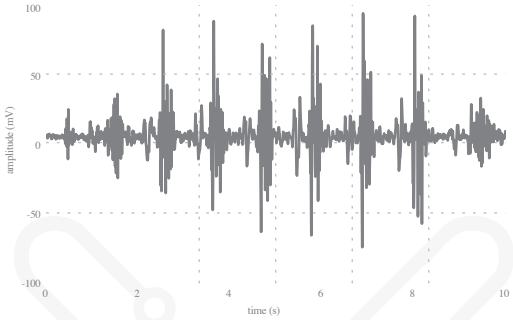
EMG



DESCRIPTION

Muscular movement involves the action of muscles and nerves and needs a very small electrical current. Measuring the electrical activity in muscles and nerves can help finding diseases that damage muscle tissue and the cause of weakness or paralysis.

The sensor is capable of performing electromyography (EMG) measurements that uses bipolar surface electrodes and monitors the muscle activation, as opposed to the activity of only a few fibres as observed using a intramuscular EMG. This technique is used for evaluation and recording of the electrical activity produced by muscles in a number of settings. For example, in a physiotherapy session, muscle activation is monitored using surface EMG and patients have an acoustic or visual stimulus to help them know when they are activating the muscle (biofeedback).



APPLICATIONS

Surface electromyography (sEMG) is a technique which is used in many clinical and biomedical applications, in areas like neurology, rehabilitation, orthopeadics, ergonomics, sports, etc. It is used as a diagnostic or biofeedback tool to identify neuromuscular diseases allowing clinicians to access patients' magnitude and time patterns of muscle activity. Assess muscle fatigue, disorders of motor control and low-back pain is also possible with the EMG sensor.

Sensing isometric muscular activity, where no movement is produced, enables a definition of classes of subtle motionless gestures to control interfaces without being noticed and without disrupting the surrounding environment. These signals can be used to control prosthetic devices such as prosthetic hands, arms, and lower limbs or as a control signal for an electronic device such as a mobile phone or PDA. sEMG recordings may also be a suitable control signal for some interactive video games.

PUBLICATIONS

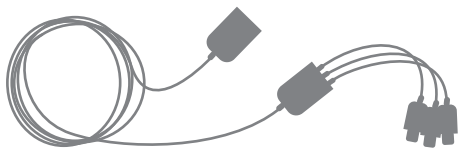
A. Londral, N. Nunes, H. Silva, L. Azevedo. Wireless User-Computer Interface Platform for Mental Health Improvement through Social Inclusion. Proc INSTICC 2nd International Workshop on Computing Paradigms for Mental Health - MindCare 2012 (MINDCARE 2012), Vilamoura, Portugal, 2012.

A. Conceição, H. Gamboa, S. Palma, T. Araújo, N. Nunes, D. Marinho, A. Costa, A. Silva, H. Louro. Comparison between the standard average muscle activation with the use of snorkel and without snorkel in breaskstroke techinique, Book of Abstracts of the 7688 XIth International Symposium for Biomechanics and Medicine in Swimming, 59. Oslo, June, 2010.

A. Conceição, S. Palma; H. Silva, H. Gamboa and H. Louro; Electromyography in Front Crawl Technique - Case Study, Open Sports Science Journal, Vol. 3, No. , pp. 67 - 69, May, 2010.

J. Cabri, H. Gamboa, The use of Electromyography in Physiotherapy - Application in Hydrotherapy, Proceedings of EWOMS'09 European Workshop on Movement Science, Faculdade de Motricidade Humana, Cruz Quebrada, Portugal, June 2009.

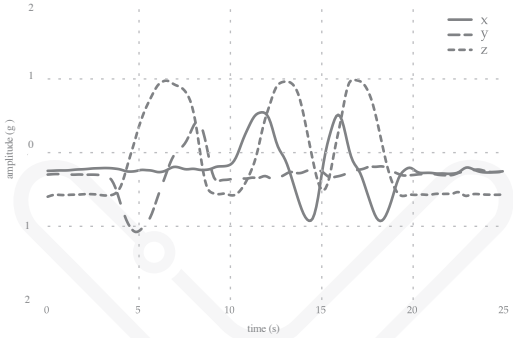
ACCEL



DESCRIPTION

The triaxial accelerometer is based on MEMS® (Micro Electro-Mechanical Systems) technology and has been developed for biomedical applications where cinematic and motion measurements are required. This sensor can measure accelerations relative to free fall and the model available is capable of detecting magnitude and direction of this same acceleration, as a vector quantity. This resulting vector can then be used to sense position, vibration, shock, fall, etc. Attaching the accelerometer to a limb for example, an acceleration can be measured within the dynamic range of the sensor.

The triaxial accelerometer sensor presents itself robust, stable, accurate, low cost, with a dynamic range of ±3g and due to its small size, the integration in the environment is very easy.



APPLICATIONS

Nowadays accelerometers are widely spread from areas so distinguished as engineering, biology, building monitoring, biomechanics, etc. Even cell phones and gaming consoles have them. Vibration measurements, particularly in research applications and studies of bodynamic and biomechanic analysis are the perfect context candidates to use our compact MEMS® triaxial accelerometers.

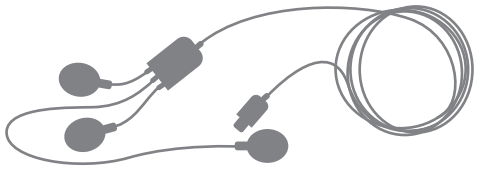
Triaxial accelerometer sensors are designed for applications involving continuous or intermittent accelerometry readings in patients. Depending on the application it may require an acquisition system with up to 3 available analog ports in order to use the full measurement functionalities. For biaxial and uniaxial applications this same sensor can be used.

PUBLICATIONS

H. Myklebust, N. Nunes, J. Hallén, H. Gamboa. Morphological Analysis of Acceleration Signals in Cross-Country Skiing - Information Extraction and technique transitions detection, Proceedings of Biosignals - International Conference on Bio-inspired Systems and Signal Processing (BIOSTEC 2011), Rome, Italy, 2011.

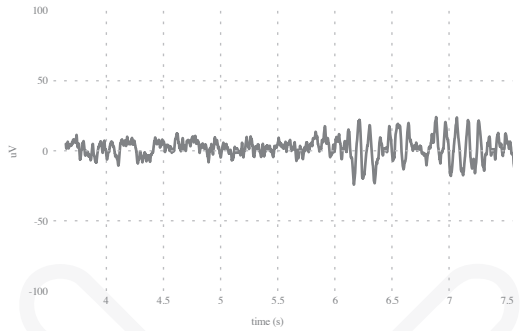
J. Beckert, F. Silva, S. Palma, Inter-Rater Reliability of the Visual Estimation of Shoulder Abduction Angles and the Agreement of Measurements with an Acelerometer, Proceedings of ECSS2009, Oslo, Norway, June 2009.

EEG



DESCRIPTION

The electroencephalography (EEG) sensor is a small sensor capable of performing not only the classic EEG measure, but also providing the possibility to monitor smaller areas. With a bipolar configuration, two detection surfaces are used to detect the electrical potentials in the specific scalp region with respect to a reference electrode, which should be placed in a region of low muscular activity. The result is the amplified difference between these two signals, eliminating the common unwanted signals detected by the surfaces.



APPLICATIONS

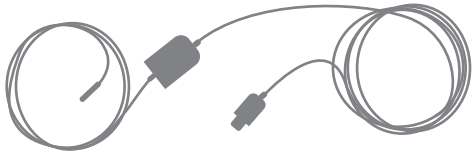
Brain activity involves transfer of information among neurons in the form of electric potentials. Real-time and localized measurements of the electrical activity at the scalp surface can be very useful in several applications, such as epilepsy, detection and classification of human sleep stages, brain computer interfaces, absence seizures, among others.

PUBLICATIONS

T. Araújo, N. Nunes, C. Quintão, H. Gamboa. Localized electroencephalography sensor and detection of evoked potentials. Proc INSTICC 2nd International Workshop on Computing Paradigms for Mental Health - MindCare 2012 (MINDCARE 2012), Vilamoura, Portugal, 2012.

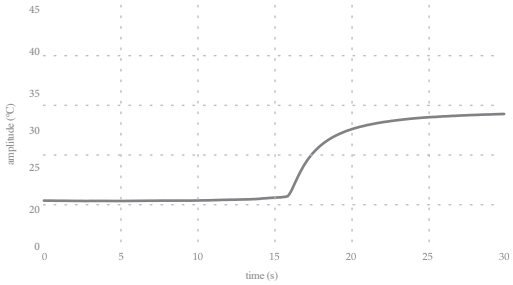
T. Araújo, N. Nunes, S. Palma and H. Gamboa, Alpha rhythm onset detector based on localized EEG sensor, Proceedings of ESBME & MEDICON 2010, Greece, May 2010.

TEMP



DESCRIPTION

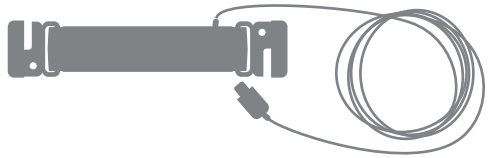
Surface skin temperature is an indicative way of assessing the human body temperature. The Temp sensor is an NTC sensor, developed for biomedical applications and meant to be used on a range of temperatures between 0 ºC to 50 ºC, being robust, accurate and providing fast response.



APPLICATIONS

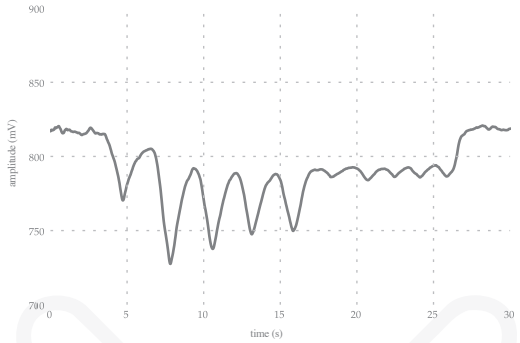
This sensor enables precise temperature measurements in the skin surface. It can be used for applications involving continuous or intermittent temperature readings in patients. The repeatability and fast response is essential not only to intermittent temperature measurements associated with oral and rectal fever, but also with continuous monitoring which is often necessary during induced hypothermia, general anesthesia, or while employed in the care of newborn and premature babies.

RESP



DESCRIPTION

Respiration signals are directly or indirectly related to the lungs' volumes along each breath. Indirect measures of respiration can be taken by using our respiration sensor which integrates a Piezo Film Technology (PVDF) sensor. This sensor measures the length changes related to the abdominal and thoracic movements obtaining a respiration signal with high sensitivity and low noise where respiratory cycles can be observed.



APPLICATIONS

Some of the applications of this sensor include thoracic cavity displacement measurement and respiratory cycle's observation. Diagnosing sleep disorders, such as sleep apnea, characterized by pauses in breathing or abnormally low breathing during sleep, is also an application. Also use the respiratory monitoring in athletes to determine ventilation levels and study the relation with their performance.

PUBLICATIONS

R. Chorão, H. Gamboa. Parallel Programming in Biomedical Signal Processing. Master thesis at FCT/UNL 2012.

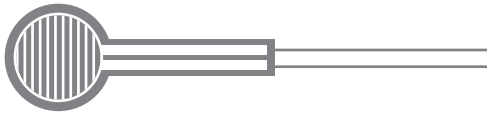
R. Abreu, J. Sousa, H. Gamboa. A Signal-independent algorithm for information extraction and signal annotation of long-term records. Proceedings of Biosignals - 6th International Conference on Bio-Inspired and Signal Processing (BIOSIGNALS 2013), Barcelona, Spain, 2013.

R. Gomes, N. Neuza, J. Sousa, H. Gamboa. Long-term biosignals visualization and processing. Proceedings of Biosignals - 5th International Conference on Bio-Inspired and Signal Processing (BIOSIGNALS 2012), Vilamoura, Portugal, 2012.

J.A. Dempsey, S.C. Veasey, B.J. Morgan, and C.P. O'Donnell. Pathophysiology of sleep apnea. Physiological reviews, 90(1):47–112, 2010.

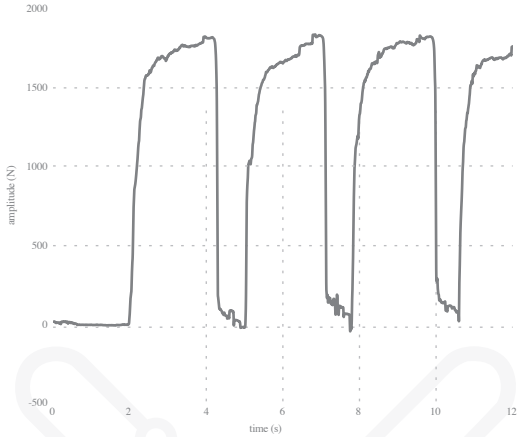
D.T.H. Lai, R. Begg, and M. Palaniswami. Healthcare Sensor Networks: Challenges Toward Practical Implementation. CRC Press, 2011.

PRESS



DESCRIPTION

The press sensor is a very thin sensor that is capable of measuring the force applied to it. The sensing area of the sensor can be round or square and the sensor can be calibrated to respond with more or less sensibility to the loads that are applied. The range of the sensor can go from 0 to 450 kg, depending on the model.

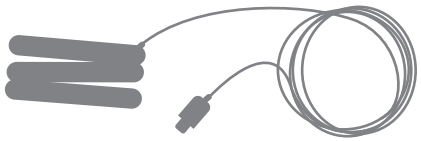


APPLICATIONS

This sensor can be used to detect and measure relative changes in the force applied. It can be used to detect contact or touch and activate a trigger to control a different signal, cellphone or computer applicati - ons. When properly calibrated can measure force quantitatively.

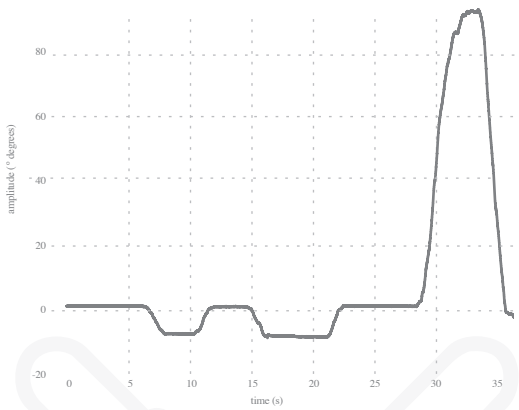
ANG

plux
WIRELESS BIOSIGNALS S.A.



DESCRIPTION

The angle (ANG) sensor is used to measure joint movement in multiple plan, without hindering the actual movement of the joint. It is a dual axis goniometer that allows the monitorization of angles in two different plans, by placing the two end blocks of the sensor across the joint in movement and measuring the angle between these blocks.



APPLICATIONS

This sensor allows real time angle variation analysis in a two dimensional space during the activity of the user. A possible application is for postural evaluation during normal daily activities or work practice. In physical theraphy it can be used to measure the range of motion and assess accurately the progress through time.