



SUSTAINABLE DEVELOPMENT GOALS

7 AFFORDABLE AND
CLEAN ENERGY



Algorithm for Detection of Raising Eyebrows and Jaw Clenching Artifacts in EEG Signals Using Neurosky Mindwave Headset



Authors: Vélez, Luis; Kemper, Guillermo

Abstract: The present work proposes an algorithm to detect and identify the artifact signals produced by the concrete gestural actions of jaw clench and eyebrows raising in the electroencephalography (EEG) signal. Artifacts are signals that manifest in the EEG signal but do not come from the brain but from other sources such as flickering, electrical noise, muscle movements, breathing, and heartbeat. The proposed algorithm makes use of concepts and knowledge in the field of signal processing, such as signal energy, zero crossings, and block processing, to correctly classify the aforementioned artifact signals. The algorithm showed a 90% detection accuracy when evaluated in independent ten-second registers in which the gestural events of interest were induced, then the samples were processed, and the detection was performed. The detection and identification of these devices can be used as commands in a brain-computer interface (BCI) of various applications, such as games, control systems of some type of hardware of special benefit for disabled people, such as a chair wheel, a robot or mechanical arm, a computer pointer control interface, an Internet of things (IoT) control or some communication system.



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Keywords: EEG signals; Brain–computer interface; Neurosky mindwave headset; Artifacts detection

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An Automatic Biodiesel Decanting System for the Optimization of Glycerin Separation Time by Applying Electric Field and Temperature



Authors: Bulnes, Kevin; Paredes, Diego; Vincas, Leonardo

Abstract: During biodiesel production, crude biodiesel and glycerin are separated in resting tanks due to gravity and differences in density, glycerin accumulates at the base of the container; such operation is called decantation. The decantation stage, within the production of biodiesel based on recycled oil, takes from 8 to 24 h to complete. Therefore, the development of an automatic biodiesel decanting system is presented in order to optimize the production time in the line of this bio-fuel. The process consists of applying an electric field through two electrodes at 9 kV and simultaneously applying temperature. The results of the implementation showed that the production time was reduced by up to 99% without affecting the quality of biodiesel, according to the parameters of the American Society for Testing and Materials (ASTM).

Keywords: Biodiesel; Purification; Electrocoagulation; Electric field; Decantation stage

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Bike-Sharing Management System Using IoT



Authors: Renato Mercado Luna; Gabriel Benavente Soto; Daniel Subauste Oleden; Alfredo Barrientos Padilla

Abstract: Nowadays, due to climate change and many other facts affecting daily life a trend to use eco-friendly transportation ways has arisen, and from them the one mostly used and with the highest acceptance is biking. Therefore, several companies have emerged offering bike-sharing systems, and those systems have been greatly accepted in the different metropolises around the world. The generalization of these systems has created a new need: to manage them efficiently. Consequently, in this work, we propose a software architecture and the implementation of a bike-sharing management system using the Internet of things (IoT).

Keywords: Architecture; Cloud; Cloud architecture; IoT; Management system; Bicycles; Climate change; Daily lives; Eco-friendly; Internet of thing (IOT); Show all

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Design of a parabolic solar collector for the drying of *Spirulina* and *Cushuro* microalgae



Authors: Diego Caceres; Leonardo Vines; Margory Dominguez; Julio Ronceros

Abstract: This article proposes the design of a self-sustaining parabolic solar collector for the drying of microalgae: *Nostoc sphaericum* (Cushuro) and *Arthrospira platensis* (Spirulina). According to numerous studies, microalgae have several nutritional effects due to the high levels of proteins in their composition and chemical characteristics. The importance of the process lies in achieving the desired moisture through precise drying control without drastically reducing its high protein concentration (60%-80%). Therefore, mechanical design calculations were performed, as well as the simulation of the dehydrator chamber in order to have a micro algae processing capacity of 5 kilograms of wet *Nostoc* or *Spirulina*. The electrical supply is obtained from a photovoltaic solar system. The results of the drying process simulations were displayed using the ANSYS Fluent software.

Keywords: Author Keywords: *Nostoc sphaericum*; *Arthrospira platensis*; drying control; parabolic solar collector; photovoltaic solar system; ANSYS Fluent

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Assessment of Geothermal Potential and Estimation of Ground Settlements Following the Implementation of a Thermo-active Piles System in Southern Peru



Authors: Anel Canturin; Yanell Casabona; Gary Duran

Abstract: Thermo-active piles constitute a type of sustainable energy because these foundations extract heat stored in the ground through intern pipes for climatize buildings. This technology uses geothermal heat pumps (GHP) that make it possible to dispense with conventional external heating and cooling during winter and summer periods. The implementation of this system requires previous studies to know the geological, geotechnical, thermal, and hydraulic properties of the ground that guarantee the geothermal potential of the soil at a certain depth. In Peru, the existence of hydrothermal sites would make it possible to implement the technique. Despite the presence of these resources, there is a widespread lack of knowledge of the local soils characterization. Therefore, it was necessary to start with research aimed at the behavior of geothermal structures for their future application. In this sense, an analysis of the potential of three areas located in southern Peru (Arequipa, Cusco, and Tacna) was carried out to estimate the maximum energy that can be extracted from the subsoil. Besides, the effect of thermal loads is analyzed using a programming code that will facilitate the calculation of settlements in thermo-active piles. In this way, the research proposes a map of potential and a code of free access that facilitates the understanding of thermomechanical behavior in this type of foundation.



Assessment of Geothermal Potential and Estimation of Ground Settlements Following the Implementation of a Thermo-active Piles System in Southern Peru

Keywords: Thermoactive pile; Heat transfer; Settlements; Thermal load; Building energy

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