



applied sciences

an Open Access Journal by MDPI

IMPACT
FACTOR
2.7

CITESCORE
4.5

Section Applied Neuroscience and Neural
Engineering



an Open Access Journal by MDPI









Section Editorial Board

Prof. Dr. Alexander N. Pisarchik
Prof. Dr. Yvonne Höller
Prof. Dr. Peter Walla
Dr. Alexandros A. Lavdas
Dr. Ursula S. Hofstoetter

Section Introduction

This Section is open to high-quality papers in the field of neuroscience, including fundamental research, engineering techniques, and applications. These studies will enable the scientific community to gain more knowledge and enlightenment regarding how the brain's nerve cells develop, grow, and interact to form (human) thought and action, and how to use engineering technology to interact with, understand, repair, replace or enhance the nervous systems.

Author Benefits

-  **Open Access** Unlimited and free access for readers
-  **No Copyright Constraints** Retain copyright of your work and free use of your article
-  **Thorough Peer-Review**
-  **2022 Impact Factor: 2.7 (Journal Citation Reports - Clarivate, 2023)**
-  **Discounts on Article Processing Charges (APC)** If you belong to an institute that participates with the MDPI Institutional Open Access Program
-  **No Space Constraints, No Extra Space or Color Charges** No restriction on the maximum length of the papers, number of figures or colors
-  **Coverage by Leading Indexing Services** Scopus, SCIE (Web of Science), Inspec, CAPlus / SciFinder, and many other databases
-  **Rapid Publication** A first decision is provided to authors approximately 15.8 days after submission; acceptance to publication is undertaken in 2.6 days (median values for papers published in this journal in the first half of 2023)

Featured Papers

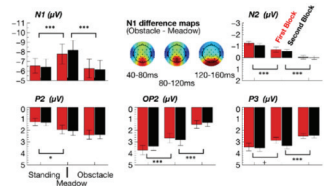
DOI:10.3390/app12136614

Visual Demands of Walking Are Reflected in Eye-Blink-Evoked EEG-Activity

Authors: Edmund Wascher, Stefan Arnau, Marie Gutberlet, Lewis L. Chuang, Gerhard Rinkenauer and Julian Elias Reiser



Abstract: Blinking is a natural user-induced response which paces visual information processing. This study investigates whether blinks are viable for segmenting continuous electroencephalography (EEG) activity, for inferring cognitive demands in ecologically valid work environments. We report the blink-related EEG measures of participants who performed auditory tasks either standing, walking on grass, or whilst completing an obstacle course. Blink-related EEG activity discriminated between different levels of cognitive demand during walking. Both behavioral parameters (e.g., blink duration or head motion) and blink-related EEG activity varied with walking conditions. Larger occipital N1 was observed during walking, relative to standing and traversing an obstacle course, which reflects differences in bottom-up visual perception. In contrast, the amplitudes of top-down components (N2, P3) significantly decreased with increasing walking demands, which reflected narrowing attention. This is consistent with blink-related EEG, specifically in Theta and Alpha power that, respectively, increased and decreased with increasing demands of the walking task. This work presents a novel and robust analytical approach to evaluate the cognitive demands experienced in natural work settings, which precludes the use of artificial task manipulations for data segmentation.



DOI:10.3390/app12115431

Descriptive Time Series Analysis for Downtime Prediction Using the Maintenance Data of a Medical Linear Accelerator

Authors: Kwang Hyeon Kim, Moon-Jun Sohn, Suk Lee, Hae-Won Koo, Sang-Won Yoon and Ahmad Khalid Madadi



Abstract: A medical linear accelerator (LINAC) delivers high-energy X-rays or electrons to the patient's tumor. In this study, we categorized failures and predicted downtime leading to discontinuous radiation treatment using a descriptive time series analysis of a 20-year maintenance dataset of a medical LINAC. A LINAC dataset of failure records for 359 instances was collected from 2001 to 2021. Next, we performed institution-specific seasonal autoregressive integrated moving average (ARIMA) modeling to analyze the causes of the failure categories and predict the downtime. Furthermore, we evaluated the performance of the predictive model using standard error metrics and statistical methods. Our results show that the downtime will increase by 95 h/year after 2022 and 100 h/year after 2023. The accumulated downtime in 2029 is predicted to be a maximum of 2820 h. The modeled seasonal ARIMA showed statistical significance ($p < 0.001$) with a residual error of σ_2 (328.33 \pm 9.4). In addition, the forecasting performance of the model was assessed using the mean absolute percentage error (MAPE). The failure parts where the major downtime occurred were the multileaf collimator (25.2%), gantry and couch motion part (15.4%), dosimetric part (11.7%), and computer console (10.0%). Using the development of the ARIMA model specific to our institution, the downtime is predicted to reach up to 2820 h.

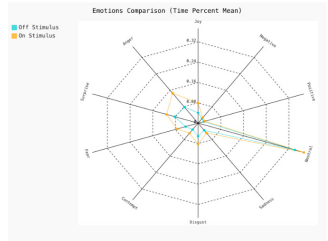


Neuromarketing in the Digital Age: The Direct Relation between Facial Expressions and Website Design



Authors: Guillermo González-Mena, Carolina Del-Valle-Soto, Violeta Corona and Jafet Rodríguez

Abstract: User experience (UX) is key in the immediate and future relationship between the client and business. Achieving a satisfying UX can only be achieved by understanding the wishes and user needs. The following study is carried out as an improvement tool for a Mexican coffee company. The objective is to achieve greater efficiency, attraction, and engagement on the part of the user. The main question is whether the new dynamic website design can directly increase the valence of user emotions compared to the static website design. To answer this question, 39 participants were exposed to the two different web page designs and elicited the following emotions using eye tracking and facial expression analysis (FEA) techniques: joy, anger, surprise, fear, contempt, disgust, sadness, neutral, positive, and negative. Through a Wilcoxon signed-rank test, the results showed a significant increase for the new dynamic design in the following emotions; joy, anger, surprise, disgust, fear and neutral. Thus, five of the seven basic emotions had a significant change that could lead to greater attraction and commitment on the part of the user and also influence, either consciously or unconsciously, their decision when interacting with the company.

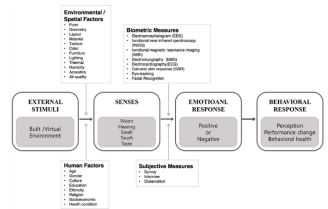


Quantifying Emotions in Architectural Environments Using Biometrics



Authors: Jeongmin Kim and Nayeon Kim

Abstract: This paper reviews studies that have quantified humans' emotions in architectural environments using biometrics. We analyzed the design variables that induced positive emotions and compared the study conditions for each result, including the biometric tools utilized. The objective was to analyze the design characteristics of the architectural environment, biometric tools, and study conditions that measure emotional responses in design research, their limitations, and future uses of biometric devices. Twenty papers were selected using the preferred reporting items for systematic reviews and meta-analyses. The population, intervention, control, outcome, and setting study design were used as an analysis framework. The reviewed papers used biometric tools such as electroencephalography, functional near-infrared spectroscopy, functional magnetic resonance imaging, galvanic skin response, electromyography, electrocardiography, and eye-tracking to analyze emotions. Environmental factors that produce positive emotional responses in the architectural spaces included form, layout, material, color, furniture, and lighting. The findings from methodology using biometric tools have the potential to develop an evidence-based design to produce positive emotions in architectural environments that improve our mental health and well-being.

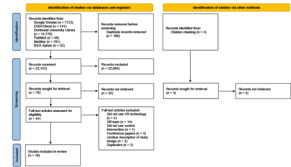




The Advances of Immersive Virtual Reality Interventions for the Enhancement of Stress Management and Relaxation among Healthy Adults: A Systematic Review

Authors: Maria Velana, Sabrina Sobieraj, Jan Digutsch and Gerhard Rinkenauer

Abstract: The rapid changes in human contacts due to the COVID-19 crisis have not only posed a huge burden on the population's health but may have also increased the demand for evidence-based psychological programs delivered through digital technology. A systematic review, following the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)" guidelines, was therefore conducted to explore the advances in stress management interventions utilizing VR and suggest up-to-date directions for future practice. The relevant literature was screened and the search resulted in 22,312 records, of which 16 studies were considered for analysis. The Methodological Index for Non-Randomized Studies (MINORS) was also employed to assess the quality of the included studies. The results suggest that VR-based interventions can facilitate positive changes in subjective stress levels and stress-related biomarkers. However, special attention should be paid to the development of rigorous VR protocols that embrace natural elements and concepts deriving from traditional treatment approaches, such as cognitive behavioral therapy techniques. Overall, this review aims to empower future researchers to grasp the opportunity that the COVID-19 pandemic generated and utilize digital technologies for strengthening individuals' mental health. Future projects need to conduct large-scale VR studies to evaluate their effectiveness compared to other mental health interventions.



MDPI is a member of



Follow


 facebook.com/MDPIOpenAccessPublishing

 twitter.com/MDPIOpenAccess

 linkedin.com/company/mdpi

 instagram.com/mdpiopenaccess

 weibo.com/mdpicn

 Wechat: MDPI-China

Subscribe

blog.mdpi.com



mdpi.com

mdpi.com/journal/applsci

Visit mdpi.com for a full list of offices and contact information.

MDPI is a company registered in Basel, Switzerland, No. CH-270.3.014.334-3, whose registered office is at St. Alban-Anlage 66, CH-4052 Basel, Switzerland.