Mini Review
Volume 15:8, 2022

Journal of Computer Science & Systems Biology

ISSN: 0974-7230

Open Access

Sports and Physical Activity Advancements Using Cloud Connectivity

Marlon Oliveira*

Department of Information Science, University of Cairo, Giza Governorate 12613, Egypt

Abstract

The pervasive or ubiquitous use of computing, i.e. the incorporation of sensor information, processing, and communication technology into everyday objects, has been integrated into a wide range of sports and exercise-related areas. Scientific experiments in motion studies conducted under valid ecological conditions; assistive technology assisting recreational and health-conscious athletes in their physical activities; and performance and tactical analyses of association football games providing analysis immediately following the end of a match, to name a few examples. The current state of the art in micro-electromechanical system inertial measurement units (MEMS IMU) and current approaches for data acquisition on human activities and sports are discussed. The integration of these sensors and cloud computing technologies is discussed later in the work, but first we discuss the benefits of wearable devices, which have gained a strong foothold in sport performance analysis when combined with mobile computing. We look at a variety of pervasive computing applications in sports performance and health. Among these applications are advances in computer vision with deep learning algorithms used to evaluate sports skills, promote injury prevention, and provide key performance indicators in a variety of sports. The progress in the integration of various sensors in wearable intelligent monitoring systems is broadly described. Sensor fusion is used specifically in sports and health monitoring to quantify exercise parameters and body response, provide classification of activities and movement patterns, estimate energy expenditure, and assess sleeping patterns.

Keywords: Sensor fusion • Mobile computing • Wireless technology

Introduction

Sensor advancements have had an impact on every aspect of life, from personal and business communications to home appliances and broadcasting. While sport and fitness have rarely been the driving forces behind sensor development, sport performance analysis and sport science in general have benefited from sensor size reduction and the resulting increase in the ability to collect simultaneous measurements [1-3]. This sea change was brought about by the adoption of technologies such as MEMS (micro-electrical-mechanical systems), which allow for a wide range of measurements in a small, light unit. This technology has been supported by enormous progress in wireless transmission, which has been crucially complemented by a technological breakthrough in the development of long-lasting, compact, and light-weight power supply units. This advancement enabled the widespread dissemination of this technology to all levels of sport, from fitness enthusiasts to top-level professionals. What appears to have gone unnoticed is that single-measurement sensors have been mass-produced since the final decade of the twentieth century.

Polar heart rate monitors were a must-have item for sports enthusiasts at the time. The most visible advancement is the use of inertial measurement units (IMU) in sports, a type of MEMS that collects data from multiple sources in relation to the dynamics of human motion (a standard unit comprises of accelerometer, gyroscope and magnetometer for the gravity direction). Some of them, however, are aimed at outdoor sports and collect temperature and environmental data. The main difference between this technology and previous wearable devices is that it was developed for traditional engineering measurements rather than other medical applications, and its implementation in sport poses some new challenges. While IMUs are precisely calibrated for engineering hardware, where different modal frequency responses can be identified either directly or through the use of highly accurate predictive models, this issue is more difficult to address in sport/health/rehab devices [4-6].

Literature Review

Wearable IMUs provide human motion data that is used as input to models, but human models are not as accurate due to the higher complexity and variability in the response of biological structures and general movement patterns. A recent study uses miniature sensor devices within low-energy-consuming body area networks (BAN) to recognise human activity (HAR). This approach has been used in a variety of applications, including personal assistants, medical treatment, and sports analysis. HAR systems primarily collect data from wearable sensors, with data processing and analysis performed on a host machine. The disadvantage of this method is the requirement for real-time transmission and sensor data processing.

This study focuses on the co-design of hardware to meet software requirements, resulting in optimal results from a wearable HAR sensor network. (1) the design and use of an integrated MEMS IMU for non-invasive direct sensing; (2) smart data processing using in situ computation; and (3) optimised classification algorithms using artificial intelligence techniques are among the contributions listed. While experimental studies were carried out with two sensor nodes worn on the wrist and elbow to validate the effectiveness of recognising ten virtual handwriting activities, they lacked sufficient complexity to justify the claimed achievements. Not surprisingly, the proposed system is claimed to have an accuracy of 99%, which is statistical certainty and suggests overly simplified classification.

***Address for Correspondence:** Marlon Oliveira, Department of Information Science, University of Cairo, Giza Governorate 12613, Egypt, E-mail: MarlonOliveira5@gmail.com*

Date of Submission: 07 August, 2022, Manuscript No. jcsb-22-79071; **Editor assigned:** 09 August, 2022, Pre QC No. P-79071; **Reviewed:** 23 August, 2022, QC No. Q-79071; **Revised:** 28 August, 2022, Manuscript No. R-79071; **Published:** 02 September, 2022, DOI: 10.37421/0974-7230.2022.15.429

Discussion

Cloud computing

Cloud computing refers to a broader application and delivery model for Internet-based services. The method entails frequent transactions with remote resources, rapid exchange, and secure storage in virtual servers. Cloud computing allows for cost-effective scalability while also removing barriers to knowledge transfer and exchange. The CDIO concept (conceive—design—implement—operate) is well suited to thrive in cloud computing technology because the CDIO teaching model combines theory and practice on an open system. The idea has spread to all areas of education. The CDIO teaching model has been used in college to teach aerobics. CDIO is a critical concept that must be refined in order to provide effective talent training. It currently represents a conceptual platform/repository containing various educational modules [7,8]. The cited paper investigates and analyses the use of the CDIO teaching mode in college sports aerobics against the backdrop of cloud computing.

Apps and devices for fitness and sports have drawn a lot of attention to wearable and pervasive computing. Because of advancements in wireless technology, standard mobile phone service enables the connection of wearable devices and cloud computing not only by large corporations but also by smaller commercial entities. Physical activities are undeniably important for better health and general well-being, but the desire for overachievement and/or a lack of knowledge about safe performance can result in temporary or even permanent disability. As a result, injury prevention is a major focus of smart monitoring system research and development. Smart portable fitness sites are becoming increasingly popular in the new COVID reality, where fitness is increasingly performed at home rather than in shared spaces such as traditional gyms. When an inappropriate posture is assumed, the system alerts the user via an Android app and actively encourages posture correction. When performing a specific exercise, a k-nearest neighbours (KNN) classification model guides the user. Overall, the system appears to be a good step toward smart virtual trainers, but the tests generated are limited in scope.

In the last five years, markerless motion capture systems and algorithms have been constantly improved. Modern computer vision algorithms based on neural networks have been adapted for assessing movement patterns in sports performance and physical activity, providing researchers with a practical means for faster data analysis with ecological validity, i.e., outside the confines of labs. Open pose, the most widely used tool for pose estimation, is an example of freely available software. Open pose is free and open-source software that allows for the tracking of human body landmarks. It has also been used in algorithms for estimating joint centres for kinematic analysis by markerless motion capture systems. The most researched application is gait analysis, and the advancement of markerless technology has provided sophisticated means of running technique performance and injury prevention/rehabilitation analyses. Several Open pose-based algorithms have been proposed to estimate segment and joint kinematics from standard digital camera or smartphone images, and their performance has been compared to 3D marker-based motion capture data (MoCap).

The differences in joint angle estimation for the hip and knee were less than 1°. Mean absolute differences in gait parameters such as speed, cadence, step length, and step time were less than 2%. In field environments, Sensor fusion has been established as an alternative for obtaining kinematic parameters with reasonable accuracy. IMUs are a popular example that show some promise in replacing MoCap in certain situations. However, most studies in sports performance still use only acceleration (resultant acceleration in most cases) to calculate variables related to performance, so the full capacity of this type of sensor as a tool for movement analysis is not explored. In reality, it is still impossible to assess the applications of sensor fusion in sports in a broader context.

Conclusion

The use of combined signals to assess various aspects of movement is a work in progress. As previously stated, further development of algorithms for signal processing and data analysis is required before this technology can be used to assess athletic performance. The recognition of daily activities demonstrates that combining multiple sensors, big data processing techniques, and the Internet of Things into an automated recognition system produces some intriguing results. Monitoring and evaluating sleep patterns, as well as their relationship to athletic performance, are hotly debated topics in training and sports sciences. Sleep is an important component of athletes' recovery strategies and has been linked to overall health, cognitive functioning, academic and athletic performance. Wearables have also been used as sleep trackers, with embedded algorithms estimating sleep intervals based on frequency and intensity of activity, or on accelerometers and heart rate photoplethysmography. Such monitors have demonstrated the ability to accurately estimate sleep time, but further development is required to detect sleep/awake periods automatically.

Acknowledgement

None.

Conflict of Interest

Authors declare no conflict of interest.

References

1. Kelton, K.F and Daan Frenkel. "Preface: Special topic on nucleation: New concepts and discoveries." *J Chem Phys* 145 (2016): 211501.
2. Bai, Guoying, Dong Gao, Zhang Liu and Xin Zhou. "Probing the critical nucleus size for ice formation with graphene oxide nanosheets." *Nat* 576 (2019): 437-441.
3. Zhang, Tian Hui, and Xiang Yang Liu. "How does a transient amorphous precursor template crystallization." *J Am Chem Soc* 129 (2007): 13520-13526.
4. Haleblian, John and Walter McCrone. "Pharmaceutical applications of polymorphism." *J Pharm Sci* 58 (1969): 911-929.
5. Fours, Baptiste, Yohann Cartigny, Samuel Petit, and Gérard Coquerel. "Formation of new polymorphs without any nucleation step. Desolvation of the rimonabant monohydrate: Directional crystallisation concomitant to smooth dehydration." *Faraday Discuss* 179 (2015): 475-488.
6. Qasem, Abdullah, Paria Shirani, Mourad Debbabi and Lingyu Wang, et al. "Automatic vulnerability detection in embedded devices and firmware: Survey and layered taxonomies." *ACM Comput Surv* (CSUR) 54 (2021): 1-42.
7. Lou, Xiaoxuan, Tianwei Zhang, Jun Jiang and Yinqian Zhang. "A survey of microarchitectural side-channel vulnerabilities, attacks, and defenses in cryptography." *ACM Comput Surv* (CSUR) 54 (2021): 1-37.
8. Potestad-Ordóñez, Francisco Eugenio, Erica Tena-Sánchez and Antonio José Acosta-Jiménez, et al. "Hardware countermeasures benchmarking against fault attacks." *Appl Sci* 12 (2022): 2443.

How to cite this article: Oliveira, Marlon. "Sports and Physical Activity Advancements Using Cloud Connectivity." J Comput Sci Syst Biol 15 (2022):429.