

Acknowledgments

The author would like to thank Strategic Wisdom and Research Institute Srinakharinwirot University and the financial support from the Faculty of Engineering, Srinakharinwirot University, through the research grant No. 202/2023 acknowledged.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the authors did not use AI tools/services. The authors reviewed and edited the content themselves and took full responsibility for the content of the publication.

References:

- [1] Bersain A. Reyes, Natasa Reljin, Youngsun Kong, Yunyoung Nam, Sangho Ha and Ki H. Chon. (2016) "Employing and Incentive Spirometer to Calibrate Tidal Volumes Estimated from a Smartphone Camera", *Sensors Journal*, 2016, Vol. 16, Issue 3, pp.3 - 4.
- [2] Chii-Wen Jao, Yen-Ling Chen, Tzu Hsuan Huang, Ching-Ting Tseng, Ching-Sung Yang, Chun Yi Lin, Sheng Jia Tsai, Po-Shan Wang, and Yu-Te Wu (2017) "Status Change Revealed by Electrocardiography (ECG) and (EEG) during Cycling Exercise," *The 2017 International Automatic Control Conference (CACs)*, 12 – 15 November 2017, DOI: 10.1109/CACs41547.2017, Pingtung, Taiwan.
- [3] Michal Pielka, Malgorzata Aneta Janik, Grzegorz Machnik and Zygmunt Wrobel (2019) "A Rehabilitation System for Monitoring Torso Movements Using an Inertial Sensor," *The 2019 Signal Processing: Algorithms, Architecture, Arrangements and Applications (SPA) Conference*, 18-20, September 2019, San Fran Cisco, Ca, U.SA DOI: 10.23919/SPA47232.2019.
- [4] Pramila Vijayaraghavan, Mahesh Veezhinathan, "Performance Assessment of Optimized Extreme Learning Machine Based on Evolutionary Computing for Spirometric Data Classification," *WSEAS Transactions on Biology and Biomedicine*, Vol. 11, pp. 147-156, 2014.
- [5] Uttariyo Saha, Amar Kamat, Debarun Sengupta, Bayu Jayawardhana and Ajay G.P. Kottapalli (2020) "A Low-Cost Lung Monitoring Point-of-Care Device Based on Flexible Piezoresistive Flow Sensor," *The 2020 IEEE Sensors Conference*, Rotterdam, Netherlands, 25 – 28 October 2020, DOI: 10.1109/SENSORS 47125.20.
- [6] Safa Salman, Zheyu Wang, Asimina Kiourti, Erdem Topsakal and John L. Volakis (2013) "A Non-Invasive Lung Monitoring Sensor with Integrated Body-Area Network," *The 2013 IEEE MTT-S International Microwave Workshop on RF and Wireless Technologies for Biomedical and Healthcare Applications ZXIMWS-BIO*, Singapore, 9 - 11 December 2013, DOI: 10.1109/IMWS-BIO.2013.6756243.
- [7] S. K. Kim, H. Chang and E.T. Zellers (2009) "Prototype Micro Gas Chromatograph for Breath Biomarkers of Respiratory Disease," *Transducers 2009 International Solid-State Sensors, Architectures and Microsystems Conference*, Denver, CO, U.S.A. 21-25 June 2009. <https://doi.org/10.1109/SENSOR.2009.5285546>.
- [8] Chung-Hsuan Wu, Shih-Pang Wung and Chien-Chong Hong (2015) "Disposable Breath Tubes with On-Tube Nanowire Sensor Array for Non-Invasive On-Site Sensing of Lung Cancer Biomarker," *The 2015 IEEE Sensors Conference*. Busan, Korea (South), 1-4 November 2015. <https://doi.org/10.1109/ICSENS.2015.7370299>
- [9] L. Ridgway Scott, Ariel Fernandez, "Critical Mutations of the SARS-CoV-2 Virus," *WSEAS Transactions on Biology and Biomedicine*, vol. 19, pp. 22-30, 2022. <https://doi.org/10.37394/23208.2022.19.4>.
- [10] Zayed Almheiri, Rawan Aleid, Sharul Sham Dol, "Design of Fixed-Wing and Multi-Copter Hybrid Drone System for Human Body Temperature Measurement during COVID-19 Pandemic," *WSEAS Transactions on Systems*, vol. 20, pp. 31-39, 2021, DOI:10.37394/23202.2021.20.5

Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

- Wongwit Senavongse conceptualized the study and research design, carried out the literature review and theoretical framework development, and performed statistical analysis of collected data, data analysis, and interpretation. He also took care of project administration and funding acquisition.
- Suranan Noimanee organized the experimental protocol, hardware integration, and testing, executed the experiments, refined the methodology and validation as well as software development, manuscript drafting, and revision.

Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself

Financial support was received from the Faculty of Engineering, Srinakharinwirot University, through the research grant No. 202/2023 acknowledged.

Conflict of Interest

The authors have no conflicts of interest to declare.

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