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Development of Intelligent System to Predict the State of Drone's Battery

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Abstract

The decline in battery voltage during drone (UAV) flights poses a critical challenge, impacting flight safety, operational range, and efficiency. As battery voltage drops, motor performance diminishes, increasing the risk of crashes or failure to return to the launch point. This issue requires innovative solutions due to its implications for safety, performance, cost reduction, and sustainability. This research proposed the development of an intelligent system using live data and the machine learning algorithms to predict the state of drone's battery. The model uses historical flight data, incorporating key variables such as battery voltage, wind speed, flight time, and environmental conditions to predict battery discharge during the operation. The proposed research is consisted of multiple phases, starting with problem definition and exploratory data analysis (EDA), followed by correlation analysis to understand the relationships between variables. The final phase will involve developing an interactive intelligent system that integrates the predictive model for real-time monitoring, proactive maintenance, and improved power management strategies. The current study will reduce operational costs, extend battery lifespan, and enhance safety across various drone applications.

Keywords
State of Battery, Drone Battery, Machine Learning, Power Management, Multivariate Time Series.

Biographies

Abdulsalam Ahmed Alqarni is an Assistant Professor at King Khalid University in the Industrial Engineering Department. He received a Ph.D. degree in Industrial and Manufacturing Engineering from North Dakota State University, and M.S. degree in Industrial Engineering from Northeastern University, and a B.S. degree in Industrial Engineering from King Khalid University. Abdulsalam has been honored with several prestigious awards in the fields of quality and reliability engineering, including the SRE Stan Ofsthun Best Paper Award in 2022, the SRE Doug Ogden Best Paper Award in 2023, the Thomas L. Fagan, Jr. Award for Best Paper (First Place) in 2023, and the QCRE William A.J. Golomski Award for Best Paper in 2023.

Bilal Akbar Chuddher is an Assistant Professor at King Khalid University in the Industrial Engineering Department. He completed his PhD in enterprise Engineering from Brunel university London Uk. He completed his MSc in Quality Engineering Management from London South Bank University London and B.Sc. in Mechanical Engineering from University of Engineering and Technology Taxila Pakistan.

Ali Rizqan is an Industrial Engineer and a Teaching Assistant at King Khalid University. He has worked on several projects, including one that won first place in the Industrial Engineering Department at King Khalid University. His research interests include data science and artificial intelligence.

Reena AlAmri is a senior industrial engineering student at King Khalid University, Abha, Saudi Arabia. She has trained at Saudi Electricity Company, engineering consultancy and is currently training at Soudah Development Company (PIF). She is willing to expand her knowledge of artificial intelligence through this project.

Rama Gherman AlAmri is a Senior Industrial Engineering student at King Khalid University. She has completed internships at the Saudi Electricity Company, the Ministry of Environment, Water, and Agriculture, the Communications, Space & Technology Commission, and Soudah Development (PIF). In 2018, she won first place as the best debater in the Aseer Region and qualified for the national level of the National Debate Competition. She actively participates in university activities, including the IEOM Society, Google Developer Student Club, and the "Mohndas" podcast.

Lina Mohammed AlShabaily is a senior industrial engineering student at King Khalid University, Abha, Saudi Arabia. She has trained at the Saudi Electricity Company in the Supply Chain Management, Project Management, and Department of Safety Engineering during the summer of 2023. She aims to contribute to improving efficiency and innovation in various industrial fields, with a focus on enhancing safety and effectiveness to achieve sustainable results.

Dalal Khaled AlDwaish is a senior in Industrial Engineering at King Khalid University in Abha, Saudi Arabia. She has completed an internship at the Saudi Electricity Company in the Safety Department, where her skills and knowledge developed in safety practices. She is passionate about the field of safety engineering and sees a promising future for herself in this area, as well as in other aspects of industrial engineering such as supply chain management, quality control, and process optimization.