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Preface

Journal of Industrial Research and Innovation Volume 17 No 1 April 2023 edition is still managed to publish. This volume presents various fields of transportation and material sciences. Transportation engineering nowadays is among the priority programs in Indonesia, which emphasize in Infrastructures development. Material sciences are therefore very relevant in supporting this theme. Thanks to continuous submission from contributors and hardwork of editor teams.

Research and assessment were conducted by various institutions researchers in those fields. In this edition, the journal publishes important and interesting papers related to Transportation engineering, such as : An investigation into the uncertainty of temperature measurement in internet of things (iot) a case study of battery performance monitoring system for electric vehicles, Take-off analysis of wide-body aircraft in various conditions by integral performance method and Modeling Indonesian motor vehicle tax coefficients based on machine learning emission data. Another paper published related to renewable energy: Advancements in machine learning modeling of co-firing systems: A mini review.

The editors always do their best to improve the quality of the Journal; especially now that we are heading towards an English language journal in order to increase the impact and citations. The next publication is scheduled with new appearance on Agustus 2023. As closing remarks, the editors always call for critics and suggestions to further improve this Journal.

The Editors

Majalah Ilmiah Pengkajian Industri
(Journal of Industrial Research and Innovation)

An Investigation into the Uncertainty of Temperature Measurement in Internet of Things (IoT): A Case Study of Battery Performance Monitoring System for Electric Vehicles

Yaaro Telaumbanua, Ariyanto, Mukhlas Af, Heru Priyanto, Sigit Tri Atmaja, Muhammad Samsul Maarif, Kurnia Fajar Adhi Sukra, Fauzi Dwi Setiawan, Didi Tri Wibowo

Abstract

The value of the uncertainty of the measurement is necessary so that the results of these measurements can be considered whether they are following the needs. In the study of the IoT-based battery performance monitoring system carried out online, the measurement results from the sensors are sent via the internet network to a database which is then accessed, and numerical data processing is carried out. In this system, there are delays from when the data is sampled until the computing device accesses the data, thereby constituting one of the contributing factors to measurement uncertainty. One of the quantities measured in this BMS (Battery Management System) is temperature. Too hot temperatures will make the vehicle battery become quickly damaged. In this study, calibration is carried out with measuring methods and equipment traceable to international standards. The results of this calibration are to ensure that the system measurement results used in this battery performance monitoring system are sufficient or not. Estimated uncertainty, the value reported in this calibration, has considered sources of uncertainty in measurements, including time delays in measuring measurements.

Keywords: Battery management system; Electrical vehicle; Internet of things; Measurement uncertainty; Temperature measurement.

Take-Off Analysis of Wide-Body Aircraft in Various Conditions by Integral Performance Method

Sulistiya, Yudiawan Fajar Kusuma, Ilham Akbar Adi Satriya, Novan Risnawan

Abstract

The integral performance method is an alternative technique for estimating aircraft performance during take-off. This approach can be adaptable to various aircraft and take-off environmental conditions, and the calculations can be completed rapidly in a spreadsheet. This study takes the Boeing 747-400 aircraft, which has four engines, as an example to examine the impact of the aircraft and environmental factors on the necessary take-off distance for wide-bodied aircraft. Various All Engine Operative (AEO) and One Engine In-operation (OEI) conditions are used to calculate the take-off distance. While OEI conditions include Continue Take-off (CTO) and Aborted Take-off (ATO), AEO conditions include normal conditions without rotation and normal conditions with rotation, the runway at an altitude of 3000 m, runway with a slope of 20 and 10 m/s headwind. The data used in this study include Boeing 747-400 aircraft characteristics such as wing configuration, engine performance, and environmental conditions. The analysis results show that altitude, runway slope, wind direction, and the percentage of thrusts used significantly affect take-off performance. Airport altitude contributes to aircraft performance, with higher altitudes requiring a longer take-off distance. The aircraft's take-off distance on a runway with a 20 slope is greater than the normal take-off distance on a flat runway. Thrust reduced to 90% of maximum thrust results in a longer take-off distance than maximum thrust. A 10 m/s headwind will provide a longer take-off distance than ordinary circumstances without wind. The magnitudes of the Balanced Field Length (BFL) and V1 in the case of one engine inoperative (OEI) are 3200 meters and 85 meters per second, respectively.

Keywords: Aircraft performance; Wide-body aircraft, Integral performance method, Take-of

Modeling Indonesian Motor Vehicle Tax Coefficients Based on Machine Learning Emission Data

Fitra Hidiyanto, Kurnia Fajar Adhi Sukra, Rizqon Fajar, Nilam Sari Octaviani, Dhani Avianto Sugeng

Abstract

This study utilized machine learning-based modeling to predict motor vehicle tax coefficients in Indonesia based on vehicle emission data. Three machine learning algorithms, namely Random Forest (RF), AdaBoost (AB), and Neural Network (NN), were employed to develop regression models for the tax coefficients. The research process involved data pre-processing, exploratory data analysis, feature ranking, and regression modeling. Model evaluation was performed using metrics such as Mean Square Error (MSE), Root Mean Square Error (RMSE), Mean Absolute Error (MAE), and Coefficient of Determination (R2). The findings revealed that all three algorithms produced tax coefficient models for diesel vehicles with R2 values approaching 1. Among them, NN achieved the highest R2 value of 0.987, followed by RF with 0.986 and AB with 0.985. NN also performed the best in terms of MSE (0.023), RMSE (0.152), but MAE (0.076) achieved by RF for diesel vehicles. For gasoline vehicles, the NN algorithm yielded an R2 value of 0.970, while RF and AB algorithms resulted in R2 values of 0.969 and 0.946, respectively. NN also obtained the best MSE (0.086), RMSE (0.293), and MAE (0.122) values achieved by RF for gasoline vehicles. These results indicate that the tax coefficient models developed using RF, AB, and ANN algorithms effectively fit the measurement data. These models can support policymakers in formulating taxation regulations based on emission levels and vehicle fuel types, encouraging the adoption of environmentally friendly vehicles. Furthermore, they have the potential to reduce vehicle emissions and improve air quality through more effective taxation regulations.

Keywords : Cabon monoxide; Coefficient tax; Hydrocarbons, Machine learning; Neural network; Nitrogen oxide; Orange data mining; Vehicle emission

Advancements in Machine Learning Modeling of Co-firing Systems: A Mini Review

Fauzi Dwi Setiawan, Rizqon Fajar, Kurnia Fajar Adhi Sukra, Nilam Sari Octaviani, Fitra Hidiyanto

Abstract

Accurate modeling of biomass co-firing systems is essential to enhance renewable energy usage by optimizing efficiency and minimizing harmful emissions. Traditional modeling approaches, such as mathematical models and simulations, have limitations in capturing the complex dynamics and non-linear relationships inherent in co-firing systems. In contrast to traditional modeling, machine learning provides a promising approach by utilizing historical data patterns to create precise prediction models. This paper reviews recent machine learning techniques applied in modeling biomass co-firing systems, focusing specifically on models for predicting thermal efficiency and emissions. The examined studies exhibit machine learning's potential to accurately forecast and enhance thermal efficiency factors like feed water, fuel, and air properties. Deep learning methods, including Deep Neural Networks (DNN) and Artificial Neural Networks (ANN), have shown superior modeling capabilities in optimizing thermal efficiency. Regression tree, random forest, and fuzzy logic algorithms have also proved effective in optimizing thermal energy production and power estimation. Moreover, machine learning algorithms such as Support Vector Machine (SVM), Gaussian process (GP), polynomial regression, and fuzzy logic have demonstrated accurate predictions of emissions, including CO2, NOx, and other pollutants. Challenges related to data availability, model interpretability, and scalability need to be addressed for further advancements in machine learning modeling.

Keyword: Biomass co-firing; Emission; Literature review; Machine learning; Modelling; Renewable energy; Thermal efficiency