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# Identifying Representative Driving Cycles for Electric Motorcycles: a Data-Driven Approach to Evaluate Energy Consumption and Regeneration

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Objectives
Standard driving cycles for motorcycles often fail to capture the specific energy consumption and regenerative braking dynamics of modern electric models under diverse riding conditions. Consequently, they lead to inaccurate energy efficiency assessments and unrealistic range estimates. This study aims to develop tailored driving cycles for electric motorcycles across representative operating contexts (including urban, rural, and highway environments) based on real-world data to enhance the accuracy of range and energy consumption estimation.
Methods
Real-world data were collected using an instrumented electric motorcycle under diverse riding conditions. The acquisition system continuously recorded parameters, including speed, acceleration, GPS data, rider inputs, and battery and motor energy usage. Leveraging an advanced data-driven methodology, the raw data were statistically processed to synthesize representative driving cycles that accurately reflect the kinematic characteristics and topographical challenges of each environment.
Results
The analysis identified distinct representative riding cycles for each specific application, characterized by significant variations in vehicle usage and energy management. Major discrepancies compared to standard profiles were observed, particularly in rural environments, where the influence of regenerative braking is more pronounced.
Conclusion
The data-driven approach presented in this study provides an innovative tool for the automated development of tailored driving cycles, establishing a robust framework for evaluating electric vehicle performance and battery management strategies. Ultimately, this methodology facilitates more realistic range estimates for consumers and supports manufacturers in optimizing electric powertrains for specific real-world usage patterns.

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