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Information length quantification and forecasting of power systems kinetic energy

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Abstract-

One of the short-coming challenges of power systems operation and planning is the difficulty to quantify the variability of power systems Kinetic Energy (KE) to unveil online additional information for the system operators’ decisions support. KE monitoring requires innovative methods to analyse the continuous fluctuations in the KE power’s systems. In this paper, we propose the use of information theory, specifically the concept of Information Length (IL), as a way to provide useful insights into the power system KE variability and to demonstrate its utility as a starting point in decision making for power systems management. The proposed IL metric is applied to monthly collected data from the Nordic Power System during three consecutive years in order to investigate the KE evolution. Our results reveal that the proposed method provides an effective description of the seasonal statistical variability enabling the identification of the particular month and day that have the least and the most KE variability. Additionally, by applying a Long Short-Term Memory (LSTM) neural network model to estimate the value of the IL on-line, we also show the possibility of using the metric as data-driven support.

Index Terms- Kinetic Energy Variability, Information Length, Time-series Forecasting, Support Decision Tools, Data Fluctuation Analysis.

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