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Non-intrusive load monitoring (NILM) for energy disaggregation using soft computing techniques

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Abstract-

Non-intrusive load monitoring (NILM) has become an important subject of study, since it provides benefits to both consumers and utility companies. The analysis of smart meter signals is useful for identifying consumption patterns and user behaviors, in order to make predictions and optimizations to anticipate the use of electrical appliances at home. However, the problem with this kind of analysis rests in how to isolate individual appliances from an aggregated consumption signal. In this work, we propose an unsupervised disaggregation method based on a controlled dataset obtained using smart meters in a standard household. By using soft computing techniques, the proposed methodology can identify the behavior of each of the devices from aggregated consumption records. In the approach developed in this work, it is possible to detect changes in power levels and to build a box model, consisting of a sequence of rectangles of different heights (power) and widths (time), which is highly adaptable to the real-life working conditions of household appliances. The system was developed and tested using data collected at households in France and the UK (UK-domestic appliance-level electricity (DALE) dataset). The proposed analysis method serves as a basis to be applied to large amounts of data collected by distribution companies with smart meters.

Index Terms- NILM; disaggregation methods; non-intrusive load monitoring; appliance consumptions; soft computing

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