Method for high frequency electric load disaggregation with hardware and network constraints

Description

With reference to Figure 1, the components of the system are:

1) Data collection device with key elements including (2), (3), (4) and (6)
2) Metrology chip(s)
3) Processor(s)
4) Communications module(s)
5) Electrical wires
6) Sensing elements
7) Wireless network
8) Server

The data collection device is installed in an electrical distribution panel and obtains analog current and voltage inputs using the sensing elements. The analog inputs are processed using the metrology chip(s) and processor(s), before being communicated to a server through a wireless network.

Once installed, the data collection device analyzes electrical parameters generated by the metrology chip(s) to perform feature identification for electrical loads. Those features are used to perform load disaggregation, also known as non-intrusive load monitoring. The states and energy consumption characteristics of the disaggregated loads are communicated to the server. Models on the data collection device are trained and enhanced based on input provided from the server.

Brief Description of the Drawings

Figure 1 shows a data collection device sensing parameters from electrical wires that is communicating with a server to implement the described method.

Claims

1. Data collection device comprising:
    - One or more sensing elements configured to provide a plurality of instantaneous electrical current and voltage measurements;
    - A metrology element configured to determine electric power parameters that may include active power, reactive power, power factor, harmonics, and energy;
    - A processor element to perform computing operations on and store data;
    - A communications element to transmit data from the data collection device to an external device, system, or network via wireless means;

2. The data collection device of claim 1, wherein the processor element is configured to generate features based on:
    - Parameters obtained from the metrology element
    - One or more electrical load models obtained from the Server

3. The data collection device of claim 1, further comprising a user interface configured to display machine or appliance specific electrical parameters

4. Method for feature selection from electrical parameters, comprising:
    - determining the time an electrical event occurs
    - determining the corresponding magnitude and direction of change for a plurality of electrical parameters
    - determining the period and magnitude of cycles occurring in the electrical parameters over a specified time interval

5. Method for providing equipment specific energy readings based on information obtained from the method of claim 4, comprising:
    - processing the feature information to generate a score
    - determining that the score matches a plurality of models stored on the data collection device and server
    - selecting the model with the best fit in accordance with the score
    - generating a graph based on the selected model