Public Abstract

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Graduation Term:SS 2015

Department:Electrical Engineering

Degree:MS

Title:Lossless Data Compression of Monitored Power Signals Using the PLHaar Transform

The quality of AC power is often affected by unpredictable situations like lightning storms and short circuits. Not only does this reduce the efficiency of devices drawing upon mal- formed power signals, but in the high-powered equipment common to industrial installations bad power can cause immense damage to the machines and even pose a danger to nearby human beings. The common solution to this problem is power quality monitors, devices which measure the Voltage and current and issue alerts when the degradation is sufficiently poor to suggest a serious problem. When it rains it pours, unfortunately, and often the problems cascade through the power network, which runs a serious risk of saturating the data network by which the monitoring stations transmit their bulletins. Consequentially, it is preferable to compress the measurements before sending them through the network in a manner not dissimilar from .mp3 audio compression or jpeg image compression.

Using recent advances in signal processing, we create a lossless algorithm for the com- pression of these signals by means of rotating the data through a "space" very different from our typical, Euclidean understanding of the term. Additionally, we show that this space possesses attractive properties which can be utilized to better "fit" transformations into the binary format of computer systems. In fact, it turns out that all typical rotations can be transformed into the odd rotations inherent to this space, and that wavelets, a large class of transformations commonly applied to data compression, corresponds directly to a subset of the ones we introduce.