ABSTRACT

The two way communication of information between agents in the smart grid, while making way for better monitoring and control, comes at the cost of elevated communication traffic. Compressive sensing is a data compression technique that accounts for sparsity of electricity consumption pattern (in the Haar basis) and achieves sub-Nyquist compression. Household power consumption data however has varying sparseness due to for example multi-state appliances. Compressing this data with a fixed ratio can lead to non-optimal results (less compression or large reconstruction error). In this regard, a dynamic compression scheme that estimates a signals sparsity and decides the amount of compression is desirable. We demonstrate that this approach, when applied with existing estimators of sparsity has its limitations in overemphasizing one objective compared to the other. We propose the use of a new measure derived from coefficient of variation and demonstrate that it achieves a better trade off between reconstruction performance and compression ratio. In addition, we employ a dynamic spatial compression scheme to account for spatial correlation between data of neighboring nodes and present a framework that incorporates dynamic temporal and spatial compression.We present the results on three publicly available data sets at different sampling rates and outline key findings of the study