

Automated Classification of Power Signals

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The Non-Intrusive Load Monitor (NILM) is a device that utilizes voltage and current measurements to monitor an entire system from a single reference point. The NILM and associated software convert the incoming signal into a spectral power envelope which can then be searched to determine if and when an electrical transient has occurred. The identification of this transient can then be determined by an expert classifier, and a series of these classifications can be used to diagnose system failures or improper operation. Current NILM research conducted at Massachusetts Institute of Technology's Laboratory for Electromagnetic and Electronic Systems (LEES) is exploring the application of NILM technology to ship system diagnostics.

This thesis presents the *ginzu* application which implements a detect-classify-verify loop that locates the indexes of transients, identifies them using a decision-tree based expert classifier, and generates a small descriptive *event file*. The *ginzu* application provides a command-line interface between streaming pre-processed power data (PREP) and a separate graphical user interface. This software was developed using thousands of hours of archived data from the Coast Guard Cutters ESCANABA (WMEC-907) and SENECA (WMEC-906). A validation of software effectiveness was conducted through the real-time application of the NILM system onboard USCGC ESCANABA.