D.J. Anderson dra2zp 10/16/2017

**PASEM**

Problem and importance

This paper addresses the problem that “today’s commercially available circuit breaker panel submetering technologies require bulky current transformers and voltage connections to be installed inside the panel.” In addition, installation requires an electrician, so it can cost between $1,500 and $5,000 per panel. It is important because people may want to monitor their electricity usage with an inexpensive device without needing to contact an electrician.

Hypothesis

This paper argues that PASEM can accurately measure electricity usage in thermal-magnetic circuit breakers by sensing the magnetic field of current flow.

Assumptions

* A large number of people will want to personally monitor their electricity usage.
* The inexpensiveness of the device is worth the 5% error rate.

Strengths

* The authors tested their device in both a laboratory environment and a residential environment.
* The authors analyzed the in-panel crosstalk and showed that an algorithm could be used to eliminate most of the errors from crosstalk.

Weaknesses

* The authors didn’t consider the expected lifetime of their device.
* The laboratory environment setting and even the residential setting may not be completely representative of every circuit breaker and may only represent an ideal environment.

Compelling evidence

Figure 12 is the most compelling because it compares PASEM measurements against contact-based measurements and shows that the maximum error is <1%.

Presentation Interest Impact Overall Confidence

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**Synthetic Sensors**

Problem and importance

This paper addresses the problem that general-purpose sensing is very difficult as opposed to a single-purpose sensor or an array of sensors. General-purpose sensors may have difficulty monitoring many different facets when limited to a possibly inconvenient location such as a wall outlet. This is important because many people don’t want a huge number of unsightly sensors all around their house; instead, it would be much more aesthetically pleasing to just have a single sensor that does everything.

Hypothesis

This paper argues that their synthetic sensor has sensors for temperature, humidity, pressure, light color, light intensity, magnetometer, Wifi RSSI, GridEye, PIR motion, microphone, and accelerometer. All the data can be featurized on the sensor in order to give feedback to the user in a way that they understand.

Assumptions

* The sensors will not interfere with each other. For example, the heat that is generated by one sensor will not significantly affect the temperature sensor and cause the sensor to think that the room is heating up.
* Machine learning algorithms will continue to improve, so that the sensor can characterize multiple simultaneous events at once.

Strengths

* The authors don’t put cameras on their sensor and characterize all the data on the sensor to protect the user’s privacy.
* The authors showed that their average sensing accuracy across 38 synthetic sensors in five locations spanning seven days was 96%.

Weaknesses

* Although the authors tested that combined data from multiple sensors can make the sensor more accurate, they didn’t consider cross-sensor interference.
* The synthetic sensor has a lot of trouble characterizing events that happen simultaneously (e.g. a microwave beeping to indicate that it is finished and someone knocking at the door).

Compelling evidence

Figure 6 is the most compelling because it shows the learning curves for their synthetic sensor in each test location, and it appears that their accuracy is very high (at or above 90% on deployment day > 2).

Presentation Interest Impact Overall Confidence

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