Technology Innovation Project *Project Brief*

TIP 247: Image Processing Occupancy Sensor (IPOS)

Context

Current motion detectors are based on old security technology and are still effective in that role, but are less effective in lighting control or HVAC situations because much of the time there is no motion to detect. But these functions still have to be continuously controlled, as opposed to security sensors, which only have to work when there is a breach. Security sensors are also known for high instance of false positives and are in general misapplied in other than security settings, and they are not suited for specific identification of human presence as opposed to the presence of, for example, the chance animal intruder.

Description

Occupancy sensors are used to infer the presence or absence of people, in order to minimize building energy use. Infrared and ultrasonic occupancy sensors have been an element of building energy efficiency for decades, but their reliance on motion detection, results in a lack of robustness and limits their application. This work proposes to develop and demonstrate a cost-effective occupancy sensor based on cell phone camera technology and novel image processing techniques to identify and classify occupancy, even in the absence of motion. The occupancy classification could include the number of occupants and the level of activity, and this information will be made available to building automation systems, allowing improved performance of temperature, ventilation and lighting control and possible future security system integration.

Also notable is a possibility for extended range sensors that would reduce the number of sensors needed for any particular area. These newer sensors would be more robust and intelligent, such that in a big office building the need for sensor units could be reduced by perhaps 30 percent -- with daylight features included, even 50 percent. Equipment costs could also be reduced – and the enhanced units might save 5 percent in energy usage, which translates regionally into a potential 32.7 aMW to offset regional load growth.

An enhanced IPOS prototype will be built using commercially available components to demonstrate proof-of-concept, robustness of detection and value proposition.

Why It Matters

This project reinforces BPA's energy efficiency leadership reputation and supports BPA achieving energy efficiency targets. This project will develop and demonstrate a new occupancy sensing technology, which may be more robust, requires less calibration, is less expensive and has expanded energy and nonenergy applications. This project aligns directly with a technology gap listed as a high priority for Research and Development in the BPA Energy Efficiency Technology Roadmap.

Goals and Objectives

In FY12, the project will enhance an existing IPOS prototype to achieve the following:

1. Improve occupancy and vacancy detection robustness. Reliably estimate the number of occupants, type of activity and approximate occupant location.
2. Reliably estimate the occupied area luminance level.
3. After enhanced prototype proof-of-concept, field tests will be performed to verify functionality, including communicating with a building energy management system using a BACnet interface.
4. The outcomes will be documented in a final report.

Deliverables

BPA project deliverables will include test plans, results and a final report in electronic format. The final report will summarize the results and key outcomes of the two stage gates.

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Project Start Date: 12/02/11

Project End Date: 9/30/12

Funding

Total Project Cost:	$501,970
BPA Share:	$251,970
External Share:	$249,970
BPA FY2012 Budget:	$151,970

Participating Organizations

National Renewable Energy Laboratory

For More Information Contact

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