

EMERGING TECHNOLOGIES SHOWCASE WEBINAR: IMAGE PROCESSING OCCUPANCY SENSORS

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September 19, 2012
Question and Answer session

Q: Is there any pushback about putting cameras in work locations? Can IPOS ever be considered for restrooms with the camera concern there? Is there a privacy issue violation with these cameras?

A: NREL had the same concern about putting cameras in certain areas. The IPOS technology is such that images never leave the sensor itself. All images exist in a temporary memory buffer for a short time, the time it takes for the sensors to process the image. The images are then deleted and replaced with new images. The algorithms are trained not to recognize or identify specific faces and people, but just to recognize motion or presence of a face or person. This concern is valid and may be a potential concern in the future if IPOS was adopted and expanded into public places, such as in restrooms. The installation location may in part help to resolve this, along with the assurance that no images get out of the sensors.

It's important to note that people originally had similar concerns with the currently-used occupancy sensors with PIR and ultrasonic sensors, especially in restrooms. These technologies have been accepted for a while. The hope is that in the future there will be no privacy concerns with IPOS due to its good design and transparency of how the sensors only detect presence of people.

Q: Can sensors be omitted in science laboratories so lights don't go out while people are working? There is time in these locations when there is very little movement.

A: This can even be possible with PIR sensors today by adding the maximum amount of time out. Unfortunately, that would defeat the potential of energy savings with PIR technology.

It is hoped that IPOS can overcome this problem because of the multiple detectors technology. Two additional detectors working in concert with the motion detector is a more reliable way to infer occupancy regardless of motion.

Q: Can the IPOS be used with a LonWorks based system in a manner similar to BACnet? Can it be used with other building communication systems?

A: Yes, IPOS can work with other communication systems, and it is relatively easy to change the protocols. The NREL demonstration project was based on BACnet because it was readily accessible and they already had BACnet communication protocols. Communication between IPOS and building

communication systems is through a simple memory map interface. These BACnet layers/stack can be easily replaced with any other communication system, and adapted to another way of communicating. IPOS can even communicate with multiple communication networks at once, as long as all protocols are able to lock into the same specific area of the IPOS application to extract information and convey it over specific protocol.

Q: Please talk about the path to commercialization.

A: NREL has several paths for commercialization, which is a natural evolution of technology. One of the paths is called the Cooperative Research and Development Agreement process, or CRADA which is a process for licensing technology to manufacturers. CRADA is used to explore ways to deploy technology to willing industry partners who can take the initial prototype and adapt it to the market in a cost effective manner. One of the advantages is that there is favorable licensing to whoever is willing to take the technology to market. This year NREL is contacting a few potential partners about IPOS, and next year NREL hopes to select one partner to take it from the lab to the market place.

Q: How closely related is this technology to the device shown on TV ads where you can check on what's happening in your home via your cell phone as a result of sensor detection?

A: Not aware of that technology enough to say. However, there's a lot of activity in the area of image recognition thanks to powerful algorithms that can be used readily through the open-source channel and to the improved processing power of computers. There are a lot of small applications that are running similar technology today. For example, a small camera can provide the sensor function. A simple application can be used to detect motion. A cell phone can signal the presence of someone in the house. There will probably be more and more of these as the technology advances and there is wide adoption.

Q: Have you considered integrating IPOS with other sensors such as PIR, ultrasound, and microphonics? Does a dual sensor solve many of the PIR sensor deficiencies?

A: NREL considered those questions when they started the project. They don't think they can partner IPOS with PIR because of the PIR technology that they want to replace. There is merit to pair IPOS with sound detection though. In fact, one of the cameras in the demonstration project has a tiny microphone that they're not yet using, but could be used as an additional sensor to detect not only images but also sounds and try to recognize what kind of sounds they are. It may seem like another invasion of privacy, but it can be leveraged to be more effective as an energy savings occupancy sensor. Another way to be more effective is to combine multiple IPOS sensors in the same area at different angles. If, for example, a people detector fails because it's facing the some other direction, another IPOS sensor can pick it up. Integration of integration modules of two or more IPOS, can potentially add even more reliable detection.

However, NREL is not exploring these options because their goal is a cost-reduced solution, and IPOS already performs multiple detection in one with a lower cost.

Q: In terms of privacy, would the IPOS sensor have the same effectiveness if you took out the facial recognition portion of the image processing algorithms?

A: IPOS would not have the same effectiveness if they took out facial recognition. If privacy really became an issue to the adoption of the IPOS technology, images could be manipulated – they could be blurred via software manipulation yet still be able to recognize faces and people without knowing details. Or the images could be processed to produce shapes in a way that only outlines of people can be recognized but not the people themselves. NREL can explore more such things.

Q: Will IPOS work in a completely dark room?

A: The current prototype does not work in a completely dark environment. The full-spectrum camera that was used in prior testing did not help in that regard. However, this can be remediated via a very simple and inexpensive infrared LED illuminator mounted with the sensor camera. This LED is very similar to those commonly used in remote controls. Its IR emission would be providing some level of “invisible” light enabling the camera to “see” in dark environments as well. The LED could be turned on only when IPOS senses a luminance level falling below a pre-set threshold. NREL has not yet experimented with this, but they hope to have time to explore this next year.