Cool! Researchers Find Way To Use HVAC Ducts For Wireless Monitoring Technology

EurekAlert

A new study by a team including a professor from North Carolina State University has found a way to implement wireless monitoring technology - with uses ranging from climate control to health and safety applications - by tapping into a building's heating, ventilating and air-conditioning (HVAC) ducts. The finding could lead to significant time and cost savings for builders and building managers, since the systems can be put into place without the expense and effort of running wires throughout the buildings.

At issue are radio-frequency identification (RFID) tags, which can be equipped with sensors that allow them to transmit information - such as temperature - back to a reader. RFID systems use centralized readers to collect data from relatively small, lightweight tags equipped with radio antennas. In an RFID system, an electronic reader broadcasts a radio wave with a specific frequency. When an RFID tag receives the transmission it absorbs energy from that transmission, enabling it to respond to the reader by the way that it reflects the wave.

The technology may also have significant applications for health and safety monitoring. "This would work with anything you can create an electronic sensor for," says Dr. Dan Stancil, co-author of the study paper and professor and head of NC State's Department of Electrical and Computer Engineering. The new research opens the door to RFID tag smoke detectors, carbon-monoxide monitors, or sensors that can detect chemical, biological or radiological agents.

The researchers focused on ultrahigh-frequency (UHF) RFID systems, which operate in the 902-928 MegaHertz band in North America (and on various other bandwidths in other parts of the world). When placed in open spaces, UHF RFID tags typically need to be within 5-10 meters of the reader in order to respond to a transmission. However, the researchers have found that, by tapping into a building's HVAC system, UHF RFID tags can operate when located 30 meters or more from a reader.

"Because you can tap into existing infrastructure, I think this technology is immediately economically viable," Stancil says. "Avoiding the labor involved with installing traditional sensors and the related wiring would likely more than compensate for the cost of the RFID tags and readers."

For example, existing climate-control units have thermometers placed throughout a building, each of which is connected to a central climate-control monitor via extensive wiring. However, you could distribute RFID tags with temperature sensors throughout the building instead, with short antennas connecting them to the building's HVAC ductwork. The tags would then send temperature data wirelessly to readers via the ductwork.

The HVAC ductwork is an excellent conduit for the radio transmissions because the ducts typically consist of hollow metal pipes. Those pipes can be used to guide the radio waves, keeping the waves from dispersing, and helping to maintain a strong signal over a greater distance. The researchers performed their experiments in ductwork that was 30 meters long, and found that the RFID tags functioned well at that distance. The researchers don't yet know how much further a tag can be from a reader and still function effectively.

SOURCE [1]

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