Study Shows Promise for Item-Level Use of RFID in Retail Environment

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(PhysOrg.com) -- A new study by the RFID Research Center at the University of Arkansas shows further promise for the use of radio-frequency identification tags on individual retail items. Researchers tested three popular retail scenarios, and the technology yielded read-rate percentages at or near 100 percent with one or more combinations of tags and readers. The results are encouraging for managers looking for better methods of tracking and managing inventory through all phases of a retail operation, including point of sale.

“The purpose of this feasibility study was to provide initial proof-of-concept data and insights,” said Bill Hardgrave, director of the research center and professor of information systems in the Sam M. Walton College of Business. “The overall results are very encouraging and indicate a favorable outcome with many types of tags and readers. This project has successfully demonstrated the feasibility of RFID for specific applications and has the potential to satisfy many common-use cases, especially inventory management.”

The researchers attached passive, ultra-high frequency, generation 2 tags to a variety of individual clothing and footwear items, including shirts, pants, socks, underwear and shoes. Generation 2 refers to the highest-performing technical protocol for passive RFID tags, as approved by EPCglobal Inc., the organization that sets international RFID standards. Tests included three different types of tags, four mobile devices, including handheld readers, and three static readers. Non-hand-held mobile readers were used on forklifts, pushcarts and other transport

devices.

Scenarios covered basic in-store situations in which items and readers were either mobile or stationary. For example, the first scenario included static items and moving readers. Items were hung on two different types of fixtures – a “rounder” and “z-bar” – and placed on shelves and in boxes. In each situation, an associate walked around a fixture, shelf or box and scanned items by pointing a hand-held reader at them. Sometimes, depending on the situation, the reader was moved in a horizontal, vertical or sweeping fashion. In all situations, a 100-percent read rate was achieved using one or more combinations of tags and readers. Not all tests produced 100-percent read rates, but at least one test per situation did.

“This was insightful,” Hardgrave said. “It suggested influence on read rates from such things as tag type, reader type, tag location, fixture type and number of items on a fixture.”

Although this test scenario – static items/moving readers – focused on effectiveness of the technology, it also provided a glimpse into potential efficiency gains from using RFID. For example, as a baseline comparison, inventory for a rounder fixture containing 97 items was taken using a barcode reader. This process took approximately nine minutes. With the same fixture and same number of items, inventory with RFID took only seven seconds.

In the second test scenario, both tagged items and readers were stationary. This scenario included a “smart shelf,” a conventional shelf in which reader antennae were embedded in zones within the shelves. Each shelf was attached to the reader, which was set to read tags every 15 seconds. Tests consisted of removing and replacing items on multiple shelves and noting the read rate. The scenario was designed to simulate the movement of items during daily actions of shoppers and store

associates. The smart shelf read 100 percent of the items on the shelf for at least one tag type.

A point-of-sale system was also part of the second test scenario. In this test, researchers constructed an aluminum cylinder and placed it around an antennae positioned under a sales desktop. The cylinder funneled the radio-frequency field into a precise read zone required for a practical point-of-sale application. Researchers performed several real-world enactments, including hanging or placing many items near the zone, to test the robustness of the system. The reader consistently read only items within the pricing zone and ignored all tags outside the zone. The researchers used two tag types and experimented with four groups of items. Each group contained a different number of items. Seven out of eight tests yielded 100-percent read rates.

The third test scenario involved mobile items and a fixed reader. Associates moved items through a static reader portal, similar to the theft-prevention gates seen in many department stores, on various transport devices, including rolling fixtures, plastic and steel handcarts and a conveyor. Except for the situation of boxes on a conveyor moving at a rate of 600 feet per minute, which read at 99.07-percent success, all other situations achieved a 100-percent read rate using one or more combinations of tags and readers.

The project is an initial phase of a broader effort to identify what retailers call “use cases” or “payback areas,” which are simply business processes upon which retailers expect item-level tagging to have the greatest impact. In this instance, the major use cases included product life-cycle management, inventory management, loss prevention, dressing-room management and point of sale. Beyond the imminent goal of providing an objective evaluation of item-level tagging for apparel and footwear, the project will lead to further research that will generate greater inventory efficiency for retailers and product availability for

consumers. Taken further, the research could lead to consumers purchasing items without a cash register.

The study is available for download at itri.uark.edu/research . Enter "rfid" as the keyword.

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