There’s a robot in my data center!

The speed, reliability and cost benefits of robots have been proven time and time again

The image that comes to mind when most people hear the word “robot” is a vaguely human-shaped machine capable of performing various tasks. The word was first used in a 1920 Czech play to describe human-like machines created to work in a factory. Robot actually translates as “drudgery“ or “hard work” in Czech.

These translations are in line with the reality of modern industrial robots. Designers have customized them to perform an amazing array of tasks, from repetitive, small-object pick-and-place operations to palletizing heavy products. They operate with impunity in environments intolerable to humans, from orbiting spacecraft to deep-diving, sub-sea vessels. Robots have proven themselves tremendously useful in doing things that are too boring, dangerous, difficult, or just inefficient for humans.

Data centers have mostly been overlooked as a potential application for robotic automation, but that’s changing. Many organizations are considering automation opportunities, and some are already realizing an ROI on robot deployments.

Automation via robots

“Relieving humans of repetitious tasks is one of the most common and beneficial functions of automation,” said Mark Reed, ABB’s director, data center industry in North America. “And it’s a benefit readily attainable in data centers where much of the work consists of simply pulling, testing and replacing servers.”

A robot adapted to server maintenance would most likely consist of an arm mounted on a wheeled, motorized base or gantry. The arm, equipped with an appropriate gripper to pull and replace servers, would be guided to the target server using any of a variety of technologies such as RFID tags, optical codes or others.

The most basic application would be simply to dispatch a robot to withdraw a faulty box from the rack and insert a replacement. Implementing this application might require

updating servers and racks with push-in/pull-out power and data connections. Once extracted, the robot could return the defective server to a repair area.

When the robot finishes its maintenance work, it can resume technology-refresh activities.

"Robots could diagnose the specific trouble once the server is returned to the maintenance area," explained Reed. "And many server repairs could be accomplished by simply swapping defective components such as a power supply or board with a spare from the site's inventory."

Temperature

The data center environment is optimized for the servers, not for the humans who maintain them. Revised temperature standards may further encourage the use of robotic automation.

Heat is the bane of data center operators. Keeping centers at the desired temperature accounts for nearly half of a center's power consumption in some cases. The high costs of cooling data centers are due, in part, to the brute-force approach that has been traditionally applied.

> "The majority of data centers tend to set thermostats to a low temperature, regardless of the needs of the ITE (information technology equipment), and that setting was based on return temperature rather than ITE inlet temperature."[1]

But higher operating temperatures are on the rise. Relying on data collected from a broad cross-section of IT equipment manufacturers, ASHRAE (formerly the American Society of Heating, Refrigerating and Air Conditioning Engineers), published guidelines supporting higher temperatures. Relying largely on the ASHRAE recommendations, the General Services Administration recommends raising data center temperatures from 72 F to as high as 80 F. The GSA estimates 4% to 5% energy cost savings for every degree increase in the server inlet temperature.[2]

In 2011, a survey reported that 15% of the data centers were at temperatures below 65 F. But in the last two surveys, only 6% were running below 65 degrees.

"As data center temperatures continue to rise, they will become increasingly inhospitable to technicians and maintenance people," Reed predicted. "Robots, though, would be able to perform effectively in any temperatures tolerable by the servers they support."

Additional automation benefits

There are a number of other payoffs from data center automation.

Security: Data centers are highly secure facilities, with multiple safeguards to protect them from physical tampering. Relying on robots to roam the data center keeps people out of the aisles and limits opportunities to tamper with servers or surreptitiously download data via a USB. It also provides a well-documented paper trail of what was done, where and when.

Space: Server racks are designed with a basic, ergonomic limitation; technicians must be able to reach the top server. Robots have no such limitation. With a high-reach gantry or other support structure, there's little need to limit rack height, creating considerable floor-space savings.

Accuracy: The accuracy of robots is one of their major benefits. Automation reduces errors.

Headcount Reduction: Another obvious benefit of robots is that they can reduce the number of people needed to operate a data center. And robots can work around the clock with no need for breaks.

Summary

"The speed, reliability and cost benefits of robots have been proven time and time again," Reed said. "These same benefits are available to data center operators. ABB is actively seeking appropriate data center installations to demonstrate the advantages robotics can bring. With over 200,000 ABB robots in use today, it is clearly an opportunity we are well qualified to address."

Organizations are already applying robotics to specialized data center applications. Broader applications are mostly still in the conceptual stage. There's little doubt, though, that these concepts will increasingly be taking physical form in the near future.

Reference

[1]ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers (2012) “Equipment Thermal Management and Controls.” Available: http://tc99.ashraetcs.org/documents/ASHRAE%202012%20IT%20Equipment%20Thermal%20Management%20and%20Controls_V1.0.pdf

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