

technology TODAY

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Intelligent Robots

Today's fully automated manufacturing facilities often transport and process materials into products without any human intervention. Since the machines can't see the materials they process, manufacturers often save money by turning off the lights in the manufacturing area. As a result, this type of processing is called *lights-out manufacturing*. By processing in the dark, automated facilities turn a negative—the fact that the machines can't see—into a positive, by saving money on electricity.

The physical movement and processing of material in such a facility is often compared to the choreography of ballet dancers or a movie fight scene. It is mind boggling to watch machines and conveyer systems working together under computer control, without any visible human intervention.

Still, manufacturers who use machines that can't visually check their surroundings run into problems when any part of the system malfunctions. Even though force-feedback technology on the machines can quickly tell technicians that they need to stop the line and make repairs, manufacturing engineers have long wanted robots that can "see."

A machine that has a stereoscopic vision system could make adjustments to correct alignment problems on the line. This would help create a zero-defect production line that wouldn't be thrown off schedule when parts arrived at a workstation out of proper alignment.

FANUC Robotics America Inc. recently introduced its FANUC I-21i

stereoscopic vision robotic system. This robot is the first "intelligent" six-axis machine that can perform complex random material handling and mechanical assembly. The



Courtesy of PR Newswire Photo Service

photo above shows the I-21i robot moving its arm and gripper fingers into proper position to choose a bearing holder that it is programmed to find, pick up, and install.

On its own, the robot selects the item to remove from the box. Then, it completes its assembly task after visually aligning the part for installation. The robot's six-axis movement allows it to align its gripper with objects that have been randomly thrown into a parts container. Just like a human worker, it combines its arm's physical dexterity, its vision, and a force-sensing capability to perform its assigned task.

Before the 2003 introduction of this machine, only a human worker could perform this type of operation. The robot's force-sensing capability can be compared to people's sense of pressure and force when they squeeze or lift an object. Not only does the I-21i see its target, it also senses when it has made contact so that it can grip and pull the object

free from other parts in the container. It can "see" the point where it must assemble the part and "know" when the part has been properly seated in the assembly. The robot's force-sensing feature allows it to handle assemblies that could easily be damaged if too much force was applied.

You can learn more about this system on the FANUC web site at www.fanucrobotics.com. Also, your students will probably enjoy downloading and watching a FANUC video that shows robots in action.

Recalling the Facts

1. What makes the new I-21i robotic system superior to earlier systems?

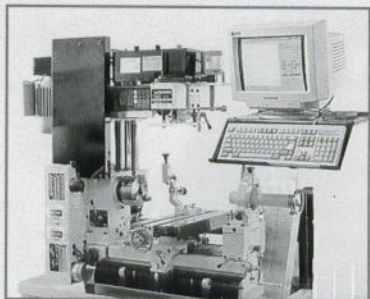
2. This robot has three sub-systems that function together to give it its full capabilities. Name the three systems and explain what each system does. ☺

Alan Pierce, Ed.D., CSIT, is a technology education consultant, technical writer, and public speaker on technology issues.

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