

# World's First Optical Card Reader-Writer

Canon has developed the world's first optical memory card reader-writer—a device for entering and retrieving data from a card using a semiconductor laser. A Canon spokesman says the new development opens the way for putting laser cards into commercial use.

The reader-writer consists of a semiconductor laser and the electronic circuits controlling it. It is used with a 54mm by 85.7mm by 0.7mm optical card with a memory capacity of 2 megabytes, equivalent to 800 double-spaced pages of data, or enough to fill a book.

Data is burned into the smooth surface of the card by a high-power laser beam. The tiny pits are later read by a low-power laser that scans the surface, detecting bit patterns by differences in reflectivity. The equipment can input 8 to 10 kilobits of data per second and retrieve it at a rate of 100 kilobits per second.

The new recording medium can store 10,000 times as much data as a magnetic card, and 250 times more than an IC card. Moreover, whereas magnetic cards are vulnerable to magnetic fields and IC cards to static electricity, optical cards are not easily damaged or erased and are easier to handle.

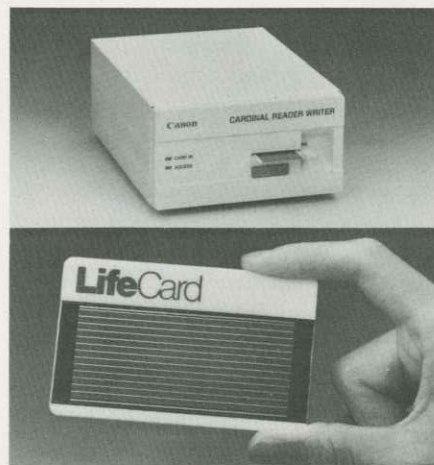
The technology itself was originally

developed by America's Drexler Technology Corp. but Canon is the first to commercialize the essential reader-writer. The autofocus and autotracking techniques developed by Canon for its cameras were the key to solving a major technical stumbling block: how to cope with changes in the speed and motion of the card during data recording and reproduction.

The company is already shipping the reader-writers to Blue Cross-Blue Shield of Maryland in the United States, which is establishing a new medical insurance system based on optical cards. Under an exclusive supply contract, about 60,000 reader-writers worth ¥10 billion will be delivered to the health insurance company over the next five years.

Blue Cross has dubbed its new system "Life Card." In addition to basic data such as the card holder's name, address and date of birth, the cards also record details about his or her insurance, past medical history and electrocardiogram and X-ray results. Japan's Ministry of Health and Welfare and medical associations are showing growing interest in the optical card system.

According to Kazuhiro Hirayama, assistant general manager of Canon's



World's first optical memory card reader-writer developed by Canon Inc., and the Blue Cross Life Card.

New Enterprise Division, the company has also received inquiries from airlines and shipping companies interested in using optical cards for aircraft and ship maintenance records. He said Canon is now working on a low-priced terminal with a "read-only" function. Such a device would find wide application in electronic publishing and personal computer software.

(Tsukasa Fukuma, staff writer with Kyodo News Service)

## New Visual Sensing Robot

Spotting overlapping building blocks and determining how they have been piled up may be child's play to a human infant. But it is no easy feat for a robot. Now, though, a research team at the Electrotechnical Laboratory of the Agency of Industrial Science and Technology, the Ministry of International Trade and Industry (MITI), has developed a robot capable of telling at a glance the shape and location of three-dimensional objects.

Sensors are essential to intelligent robots, and all the more so visual sensors. Visual sensors can grasp the surrounding situation without relying on physical contact. An intelligent robot with visual capabilities is a system with the flexibility to adjust to a changing environment.

Robotic machines can sense two-dimensional objects, such as writing, with relative ease, and such machines are already in wide use. But robots still find it quite difficult to perceive three-dimensional objects.

The robot developed by the Electrotechnical Laboratory senses three-dimensional objects by using variance in

the apparent brightness of reflected light depending on the angles of incidence of the object to a light source.

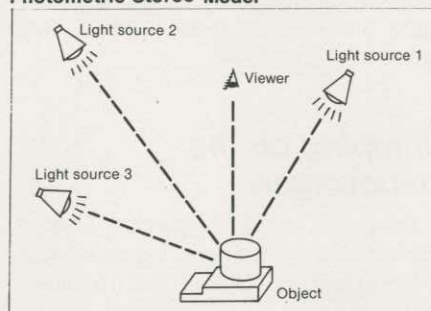
In the trial system, the robot's computer memory is loaded with three-dimensional models of building blocks. The robot can recognize particular blocks by comparing them with the objects in its memory.

But first it must recognize the shape and direction of the surface of the block. When light is shed on an object, the apparent brightness of the reflected light varies depending on the direction of the surfaces. Using this to determine three-dimensionality, however, requires solving a complicated equation which, in turn, can take up to five or six hours.

The Electrotechnical Laboratory team's new method of determining the direction of the surface does away with the equation. A spherical object is used as the computer model for calibration, so that the brightness of certain spots of the object under view can be related directly to the direction of the surface.

This method is applied to determine

Photometric Stereo Model



the distance of all the surfaces of the building block by means of the two television cameras installed in the robot. By this method, the object can easily be compared with the memorized model. The shape of the block and the way it overlaps with other blocks can then be determined.

The present experimental system still requires two to three minutes to recognize a given object. In time researchers hope to reduce recognition time to five or six seconds.

(Akira Shoji, staff writer with Kyodo News Service)