MITSUBISHI ELECTRIC RESEARCH LABORATORIES http://www.merl.com

## Artificial retina chips as on-chip image processors and gesture-oriented interfaces

H. Kage, W. Freeman, Y. Miyake, E. Funatsu, K. Tanaka, K. Kyuma.

TR2000-06 December 2000

#### Abstract

Players of a video game may sometimes fine the use of conventional interfaces inappropriate. In such cases, we think that interfaces realized with a vision-based gesture recognition system may find favor. The artificial retina (AR) chip is a versitile image sensor whose use ranges from normal image acquaistion to on-chip image processing, including on-chip image convolution. In this paper, we describe a gesture-input video game system, with the AR module including the AR chip, and motion-based gesture recognition algorithms. We showed that the algorithms can be accelerated by projection data, the direct output from the AR chip. To show its performance, we have applied our ssytem to two commercially available video games.

Optical Engineering, vol. 38, no. 12, pp. 1979–1988

This work may not be copied or reproduced in whole or in part for any commercial purpose. Permission to copy in whole or in part without payment of fee is granted for nonprofit educational and research purposes provided that all such whole or partial copies include the following: a notice that such copying is by permission of Mitsubishi Electric Research Laboratories, Inc.; an acknowledgment of the authors and individual contributions to the work; and all applicable portions of the copyright notice. Copying, reproduction, or republishing for any other purpose shall require a license with payment of fee to Mitsubishi Electric Research Laboratories, Inc. All rights reserved.

Copyright © Mitsubishi Electric Research Laboratories, Inc., 2000 201 Broadway, Cambridge, Massachusetts 02139



### MERL – A MITSUBISHI ELECTRIC RESEARCH LABORATORY http://www.merl.com

# Artificial retina chips as on-chip image processors and gesture-oriented interfaces

Hiroshi Kage, William T. Freeman, Yasunari Miyake, Eiichi Funatsu, Ken-ichi Tanaka and Kazuo Kyuma

TR-2000-06 March 2000

#### Abstract

Players of a video game may sometimes find the use of conventional interfaces inappropriate. In such cases, we think that interfaces realized with a visionbased gesture recognition system may find favor. The artificial retina (AR) chip is a versatile image sensor whose use ranges from normal image acquisition to on-chip image processing, including on-chip image convolution. In this paper, we describe a gesture-input video game system, with the AR module including the AR chip, and motion-based gesture recognition algorithms. We showed that the algorithms can be accelerated by projection data, the direct output from the AR chip. To show its performance, we have applied our system to two commercially available video games.

Published in Optical Engineering, vol. 38, no. 12, pp. 1979–1988. December, 1999.

This work may not be copied or reproduced in whole or in part for any commercial purpose. Permission to copy in whole or in part without payment of fee is granted for nonprofit educational and research purposes provided that all such whole or partial copies include the following: a notice that such copying is by permission of Mitsubishi Electric Information Technology Center America; an acknowledgment of the authors and individual contributions to the work; and all applicable portions of the copyright notice. Copying, reproduction, or republishing for any other purpose shall require a license with payment of fee to Mitsubishi Electric Information Technology Center America. All rights reserved.

Copyright © Mitsubishi Electric Information Technology Center America, 2000 201 Broadway, Cambridge, Massachusetts 02139 1. First printing, TR2000-07, March, 2000

### Author's addresses:

Hiroshi Kage, Eiichi Funatsu, Ken-ichi Tanaka and Kazuo Kyuma Mitsubishi Electric Corporation System LSI Division Business Promotion Project of Artificial Retinas Miyashimo 1-1-57 Sagamihara, 229-1195 Japan

William T. Freeman MERL, Mitsubishi Electric Research Labs. 201 Broadway Cambridge, MA 02139

Yasunari Miyake Mitsubishi Electric Corporation Advanced Technology R&D Center Tsukaguchi-Honmachi 8-1-1 Amagasaki, 661, Japan