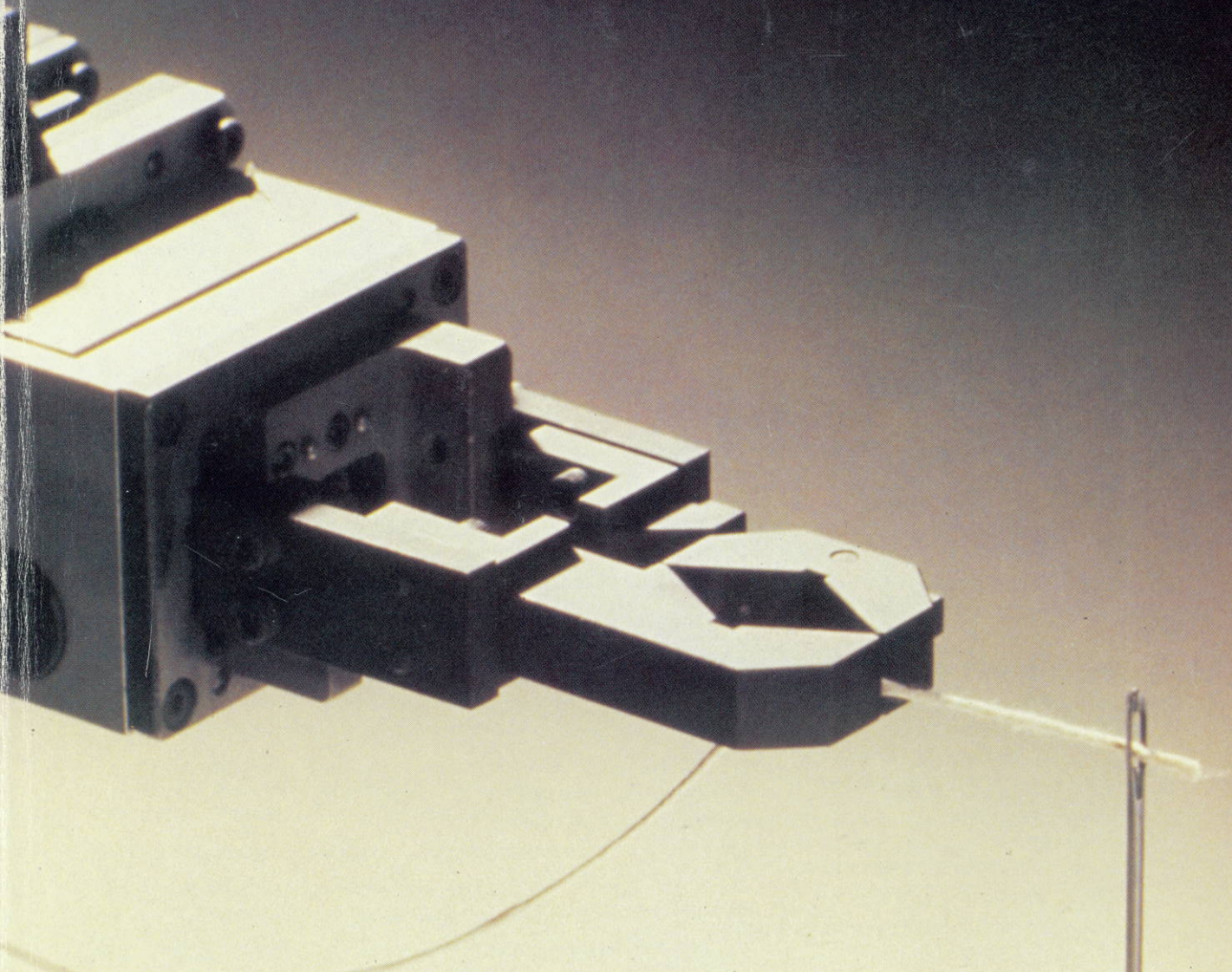



AUGUST 1987

COMPUTER



CAD-BASED ROBOT VISION

 THE COMPUTER SOCIETY
OF THE IEEE

 THE INSTITUTE OF ELECTRICAL AND
ELECTRONICS ENGINEERS, INC.

COMPUTER

August 1987

Published by the Computer Society of the IEEE

Vol. 20, No. 8

ARTICLES

12 Guest Editors' Introduction: CAD-Based Robot Vision

Bir Bhanu

19 CAD-Based 3D Object Representation for Robot Vision

Bir Bhanu and Chih-Cheng Ho

Computer vision researchers lack a systematic approach for building object models for industrial environments. We propose a CAD-based approach for building representations and models for applications involving 3D object recognition and manipulation.

37 A CAD System Based on Spherical Dual Representations

John W. Roach, Praveen K. Paripati, and Jeffrey S. Wright

Most CAD systems for 3D modeling use geometric representations incompatible with vision technology. Here, a CAD system based on an extension of the Gaussian image, the spherical dual representation, preserves duality.

46 Prediction-Based Vision for Robot Control

Michael O. Shneier, Ronald Lumia, and Martin Herman

This sensing and control system employs a feedback loop to bring a robot's internal representation of its environment into registration with the real world.

58 Model-Based Strategy Planning for Recognizing Partially Occluded Parts

Radu Horaud and Thomas Skordas

Recognizing partially occluded objects requires off-line modeling and planning, and runtime recognition. After deriving a customized method, we can compare recognition with and without off-line planning.

66 CAD Model-Based Localization of Parts in Manufacturing

Kristjan T. Gunnarsson and Friedrich B. Prinz

We need automatic part localization in flexible manufacturing. One method of achieving it uses a CAD model and sparse data.

76 Model-Based Programming and Control of Robot Manipulators

Charles N. Stevenson

Multiple sensor systems and geometric object models can help a manipulation system adapt to uncertainty in its environment.

SPECIAL REPORT

85 The Effect of Abstract Data Types on Program Development

Jeffrey Mitchell, Joseph E. Urban, and Robert McDonald

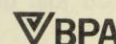
An experiment demonstrated that using unsupported abstract data types increases program development time for novice programmers in an Ada environment.

Circulation: *Computer* (ISSN 0018-9162) is published monthly by the Computer Society of the IEEE. IEEE Headquarters: 345 East 47th St., New York, NY 10017; Computer Society of the IEEE, Publications Office, 10662 Los Vaqueros Circle, Los Alamitos, CA 90720; (714) 821-8380. Annual subscription included in society member dues. Nonmember prices: available upon request. Single copy prices: members \$7.50; nonmembers \$15.00. This magazine is also available in microfiche form.

Postmaster: Send undelivered copies and address changes to *Computer*, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. Second class postage is paid at New York, New York, and at additional mailing offices.

Copyright and reprint permissions: Copyright © 1987 by the Institute of Electrical and Electronics Engineers, Inc. All rights reserved. Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limits of US copyright law for private use of patrons: (1) those post-1977 articles that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 29 Congress Street, Salem, MA 01970. (2) pre-1978 articles without fee. Instructors are permitted to photocopy isolated articles for noncommercial classroom use without fee. For other copying, reprint, or republication permission, write to True Seaborn, Editor and Publisher, *Computer*, 10662 Los Vaqueros Circle, Los Alamitos, CA 90720. All rights reserved. Copyright © 1987 by The Institute of Electrical and Electronics Engineers, Inc.

Editorial: Unless otherwise stated, bylined articles, as well as product and service descriptions, reflect the author's or firm's opinion. Inclusion in *Computer* does not necessarily constitute endorsement by the IEEE or the Computer Society. All submissions are subject to editing for style, clarity, and space considerations. *Computer* subscribes to the Computer Press Association's code of professional ethics.

 BPA