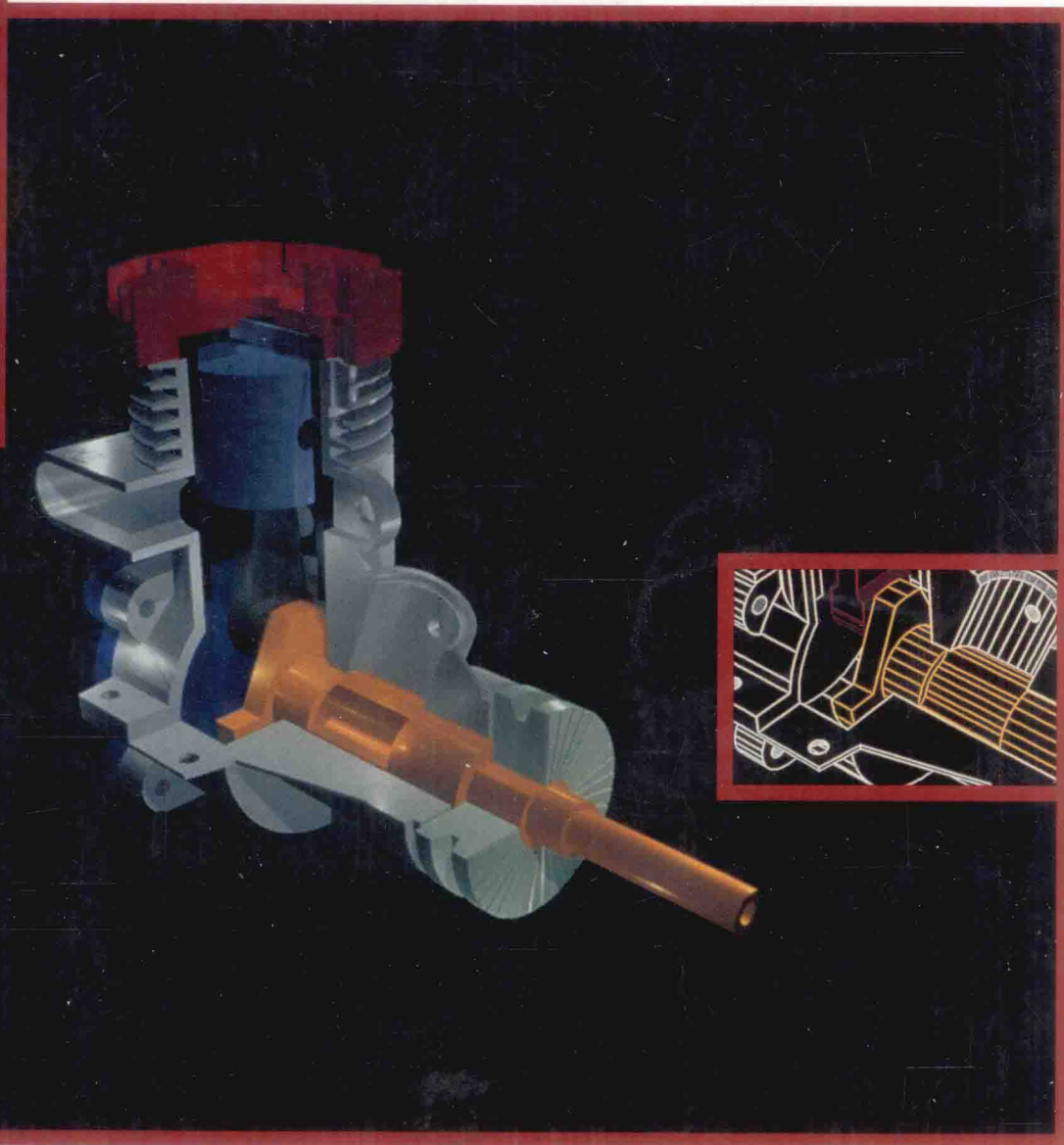


Modeling for Design Using AutoCAD[®] Release 13 and AutoSurf[®]



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Modeling for Design *Using AutoCAD® Release 13* *and AutoSurf®*

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Press

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Albany • Bonn • Boston • Cincinnati • Detroit • London • Madrid
Melbourne • Mexico City • New York • Pacific Grove • Paris • San Francisco
Singapore • Tokyo • Toronto • Washington

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PWS Publishing Company

Autodesk Press imprint

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For more information contact:

Autodesk Press

3 Columbia Circle, Box 15-015

Albany, New York 12212-5015

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High Holborn

London WC1V 7AA

England

Thomas Nelson Australia

102 Dodds Street

South Melbourne, 3205

Victoria, Australia

Nelson Canada

1120 Birchmont Road

Scarborough, Ontario

Canada M1K 5G4

International Thomson Publishing Southern Africa

Building 18, Constantia Park

240 Old Pretoria Road

P.O. Box 2459

Halfway House, 1685 South Africa

International Thomson Editores

Campos Eliseos 385, Piso 7

Col. Polanco

11560 Mexico D.F., Mexico

International Thomson Publishing GmbH

Königswinterer Strasse 418

53227 Bonn, Germany

International Thomson Publishing France

Tour Maine-Montparnasse

33, Avenue du Maine

75755 Paris Cedex 15, France

International Thomson Publishing Asia

221 Henderson Road

#05-10 Henderson Building

Singapore 0315

International Thomson Publishing Japan

Hirakawacho Kyowa Building, 31

2-2-1 Hirakawacho

Chiyoda-ku, Tokyo 102

Japan

Printed and bound in the United States of America

by Courier Westford, Inc.

1 2 3 4 5 6 7 8 9 10—99 98 97 96

Sponsoring Editor: Jonathan Plant

Production Editor: Andrea Goldman

Manufacturing Coordinator: Andrew Christensen

Associate Developmental Editor: Mary Thomas-Stone

Marketing Manager: Nathan Wilbur

Interior Design: James E. Bolluyt

Cover Design: Julie Getcha

Cover Images: Autodesk, Inc.

Cover Printer: John Pow Company

Printer & Binder: Courier Westford, Inc.

Library of Congress Cataloging-in-Publication Data

Stewart, Michael D.

Modeling for design using AutoCADE release 13 and
AutoSurf/Michael D. Stewart, James E. Bulluyt, Adebisi
Olaipupo

p. cm.

Includes and index

ISBN 0-534-95220-8 (alk. paper)

1. Computer graphics. 2. AutoCAD (Computer file)

3. AutoSurf. 4. Engineering design—Data processing. I.
Bolluyt, James E. II. Oladipupo, Adebibi. III. Title.

T385.S733 1996

620'.0042' 02855369—dc20

94-26726

CIP



Preface

Much of the history of design deals with the development of tools and techniques for producing more complete and accurate representations to effectively communicate a design. Until recently, designers were limited to creating drawings of some number and kind on a two-dimensional medium such as paper or creating a three-dimensional physical model or scaled prototype. Three-dimensional computer modeling seems well on its way to replacing both of these methods for design representation.

In many fields, 3-D computer modeling is having a profound impact on the entire design process — from analyzing and defining the problem to conceptualizing, analyzing, documenting, and producing the solution. This text is intended to be an introduction to the use of computers, appropriate software, and in particular, *surface* and *solid modeling* to create three-dimensional models as an integral part of the design process. It is also a textbook on using the Autodesk, Inc. software, AutoCAD Release 13, with its solid modeling features and the surface modeling software, AutoSurf to create, analyze, and communicate design ideas by creating 3-D models.

One of the goals of traditional graphics has been to help users think and design in 3-D even though the medium was 2-D (pencil on paper). However, 3-D feedback in the form of a model or prototype was rare; the best that could normally be expected was checks made by other users, pointing out such things as inconsistencies among views or unrealistic geometry.

Current modeling software and affordable computer hardware now offer the realistic opportunity to work immediately in 3-D. When modeling in 3-D, problems tend to be apparent immediately — at best, the model does not look like what had been envisioned; at worst, the modeler will produce an error message saying a request was not realistic. In any case, the feedback, whether positive or negative, is usually immediate.

This text was written with the intention of encouraging students and designers to work and therefore think in 3-D from the very beginning of the design process. It is an attempt to illustrate the 3-D computer model data base at the core of the design process and 2-D views (*drawings*) as an easily obtained by-product of the modeling process (still necessary in many applications, but a by-product nonetheless). Most chapters begin with an explanation of general concepts and methods used in computer-aided modeling software in general, and then illustrate those concepts with either AutoCAD Release 13 or AutoSurf examples. End-of-chapter exercises are designed to further the understanding of modeling concepts as well as provide practice in

applying the solid modeling features and surface modeling features of AutoCAD Release 13 and AutoSurf software.

Features include:

- an emphasis on 3-D computer modeling characteristics and concepts including
 - coordinate systems
 - modeling methods and corresponding model definitions
 - view types and specifications
 - geometric analysis techniques
 - model editing techniques
 - the 3-D to 2-D conversion for documentation
- coverage of both basic and more advanced modeling concepts
- a variety of step-by-step AutoCAD and AutoSurf examples to illustrate the concepts and thoroughly introduce the software
- summary descriptions of additional AutoCAD and AutoSurf options that apply to each topic
- end-of-chapter exercises on both concepts and software that vary from simple to challenging

This book was written to meet the needs of any person who is using AutoCAD Release 13 and or AutoSurf, and wishes to learn how to work in 3-D to design objects. It was designed for the person who wishes to learn 3-D modeling by independent learning, and works equally well when used as a working textbook and reference in a class in engineering design graphics, 3-D modeling, or other design-oriented course, where an instructor is teaching the class. This textbook can also be used as a training manual for training centers in their training courses.

ACKNOWLEDGMENTS

A project such as this is not possible without the help, patience, and understanding of many people. We extend sincere thanks to all the people at PWS Publishing Company and Autodesk Press, who have guided us throughout this project, including Jonathan Plant, Mary Thomas Stone, and Andrea Goldman.

We also extend sincere thanks to all those reviewers who provided valuable critiques of early drafts and made us think carefully about what we were hoping to accomplish with this project.

Thanks also to the Education Department at Autodesk, Inc., the many Autodesk Training Center managers, instructors, and others for all the help and encouragement they provided. A special thanks to the many students at the University of Arkansas at Little Rock who tested the examples and exercises in this text.

And most of all, we want to thank our wives children, friends and colleagues for their patience, encouragement, and understanding.

Michael D.Stewart, James E.Bolluyt, Adebisi Oladipupo

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James E. Bolluyt joined the faculty at Iowa State University in 1975 and has taught courses in engineering and architectural graphics, steel design, reinforced concrete design, and structural analysis. He has been instrumental in introducing 3D computer modeling into graphics classes for architecture and engineering at ISU, and has also done computer modeling, CAD/CAM system programming, and computer aided analysis for industry. Jim was responsible for the majority of the general CAD material in this text.

Adebisi Oladipupo is an Associate Professor in the Department of Engineering at Hampton University. Through his efforts in using computer modeling for visualization, the freshman engineering graphics class at H.U. has become one of the most popular classes offered. He has published and presented talks on computer modeling and its use for visualization, and is also an investigator on various research projects funded by NASA and NSF. Adebisi worked with Jim on providing the general CAD material in this text.



Software Installation Instructions

Example and Exercise Disk Installation Procedure

This batch file will load the files into your computer, follow these steps.

1. In Windows use the File Manager to create a new directory, for example TEXT. Use File>Create Directory. Once the directory has been created make it current by highlighting it. Now run installa.bat or installb.bat depending on which disk drive your 3 1/2" drive is. Use the command File-Run and type in a:installa.bat or b:installb.bat. This install routine will copy and uncompress all of the files to the current directory.
2. In DOS, change directories to the directory which you want to load this textbook's drawing files. (Type in for example CD\TEXT if you have this directory) or create a new directory to load these drawings using the DOS command MD\TEXT.

Insert the diskette from the back of the book into the A: or B: drive and then type the following (the typical DOS prompt "C:\>" is assumed):

```
A:installa <Enter>  
or  
B:installb <Enter>
```

All of the drawing files which will be used in the examples and exercises in each chapter should now be loaded and ready for you to use. When you are asked to load a drawing for an example or exercise in this book, you will have to make sure that you select this working directory before you will be able to find these drawing files. It would be a good idea to make this directory your default working directory.

If you are using AutoCAD Release 13 for Windows, highlight the AutoCAD icon in Windows, select File from the pulldown menu,

and then click on Properties. Type the name the subdirectory, for example C:\TEXT, in the area that says working directory.

To do this using the DOS version of AutoCAD Release 13, add this sub directory to your ACADR13.bat or other batch file used to begin AutoCAD Release 13.

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