*SIGGRAPH 1991*
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*Interactive Techniques*

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# COURSE NOTES *C19*

# TECHNICAL EVALUATION OF 3D GRAPHICS WORKSTATIONS

*Chair*
Scott R Nelson
Sun Microsystems, Inc

*Lecturers*
Michael F Deering
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Digital Equipment Corporation

# Siggraph '91

# Technical Evaluation of 3D Graphics Workstations

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Course Chair

## Abstract

This course covers many of the things one needs to know to evaluate 3D graphics workstations The competition is fierce in the 3D graphics workstation market and it is not always clear, based on marketing literature, which features are important versus which features may be clever designs, but are of little value to a particular application This course is an attempt to clarify the features that are important in 3D workstations under many different circumstances

The course begins with a detailed look at the features found in 3D graphics workstations with an explanation of why each feature is important and how these features might differ from one vendor to the next Next, we cover how one might determine which features are needed for a particular application Then we cover how to measure performance and how to determine which areas of graphics performance are important for your needs

In the second half of the course image quality issues will be discussed in detail There is currently no standard measurement for image quality as there is for graphics performance, but this is an attempt to give the participant skill in evaluating image quality relative to his needs Many examples will be used, both live and as photographs taken from real systems to illustrate the differences in levels of image quality

An important part of the course is the hands-on experience with workstations from many different manufacturers providing an opportunity to immediately apply the knowledge gained from the course

The goal of this course is to provide the attendee with enough information - through the lectures and through the hands-on sessions - to be able to make an intelligent selection among the many choices in graphics workstations offered today

## Course Description

Many different workstation manufacturers are claiming to have the fastest 3D graphics performance or the highest image quality This course provides a detailed explanation of how to evaluate 3D graphics workstations and how to understand what the manufacturer's specifications really mean Topics include 3D graphics workstation features, the measurement of 3D performance, evaluation of wireframe and polygon image quality and what features to expect in the future Live demonstrations of several different 3D graphics workstations will be used to help clarify the points made in the lectures. Hands-on access to 3D graphics workstations from the major workstation vendors will provide additional experience.

## Who Should Attend

Technical professionals, managers and computer graphics users who need to understand the technical differences between the various 3D graphics components of workstations on the market today Those who desire a better understanding of 3D graphics workstation performance and image quality

## Recommended Background

Assumes a basic understanding of computer technology and a familiarity with the basic terminology of computer graphics No mathematics or programming skills are required

# Biographies

## Michael F. Deering – Sun Microsystems

Michael Deering is a senior staff engineer at Sun Microsystems and is currently the manager of the 3D Technology Group He is the architect of the latest generation of 3D graphics hardware at Sun He holds a B A and Ph D in Computer Science from the University of California at Berkeley and is the author of 10 U S patents in the area of graphics and imaging

## David Naegle – Silicon Graphics Computer Systems

David Naegle is a graphics hardware engineering manager in the Advanced Systems Division of Silicon Graphics Computer Systems, Inc He worked on the architecture of SGI's PowerVision graphics workstation Dave has been involved in the development of graphics hardware for the past 12 years He holds B S degrees in Computer Science and Electrical Engineering and an M S degree in Electrical Engineering from the University of Utah

## Scott R. Nelson – Sun Microsystems

Scott Nelson is a staff engineer at Sun Microsystems in the Graphics Systems Products division He works in development of new graphics accelerator architectures Scott has been involved in the development of graphics hardware for the past 11 years and has worked in the computer industry for the past 15 years He holds a B S in Computer Science from the University of Utah

## Randi J. Rost – Digital Equipment Corporation

Randi Rost is a principal engineer and has worked in Digital's Workstations Systems Engineering organization as a member of the Advanced Technology Development group for the past five years Randi has been Digital's representative to the Graphics Performance Characterization (GPC) Committee for the past three years He is one of the chief architects of PEX, the 3D graphics extension to the X Window System He is also the author of the "X and Motif Quick Reference Guide" from Digital Press and has published several other papers on X, PEX, and 3D graphics He holds a B S in Computer Science/Math from Mankato (MN) State University and an M S in Computing Science from the University of California at Davis/Livermore

# Topics

I. **Introduction / Scott Nelson**

II. **3D Graphics Workstation Features / Dave Naegle**

- A. A detailed look at features found in 3D graphics workstations
- B. Why each feature is important
- C How features differ among vendors
- D How to determine which features you need

III. **Measuring 3D Graphics Performance / Randi Rost**

- A. Issues in measuring 3D graphics performance
- B History of the Graphics Performance Characterization (GPC) committee
- C Overview of the Picture Level Benchmark (PLB) effort
- D Discussion of standard PLB benchmark files
- E Remaining problems and future work
- F Current test suites and work in progress

IV **2D Graphics Performance / Scott Nelson**

- A Issues relating to 2D graphics performance
- B Features that make window systems more efficient
- C Issues of 2D graphics with deep frame buffer architectures

V. **Wireframe Image Quality / Scott Nelson**

- A. Features that affect line quality
- B The 12 characteristics of "good' antialiased lines
- C Considerations in using antialiased lines

VI. **Polygon Image Quality / Michael Deering**

- A. Methods of sampling polygons on a pixel-by-pixel basis
- B Various methods of antialiasing polygonal images
- C Lighting and shading issues
- D. Features vs cost and performance
- E How to recognize levels of quality in rendered images

VII **Wrap-up / all**

- A. Future directions
  - 1 Which features will become more important
  - 2 Expected levels of performance

# Schedule

| | |
|---|---|
| 8·30 | **Introduction** / Nelson (15 minutes) |
| 8 45 | **3D Graphics Workstation Features** / Naegle (75 minutes) |
| 10.00 | Break (15 minutes) |
| 10 15 | **Measuring 3D Graphics Performance** / Rost (75 minutes) |
| 11 30 | **Hands–on: Benchmarks and Q&A** (30 minutes) |
| 12 00 | Lunch (90 minutes) |
| 1 30 | **2D graphics performance** / Nelson (15 minutes) |
| 1 45 | **Wireframe Image Quality** / Nelson (60 minutes) |
| 2.45 | **Hands–on: Line quality and Q&A** (15 minutes) |
| 3 00 | Break (15 minutes) |
| 3 15 | **Polygon Image Quality** / Deering (60 minutes) |
| 4 15 | **Hands–on: Polygon quality and Q&A** (15 minutes) |
| 4 30 | **Wrap–up / Nelson and all speakers** (30 minutes) |

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## Course Notes



## Support Articles