Design Issues in Virtual Reality

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Task

Develop a VR application to amplify

the human ability to understand or evaluate

"some concept"

What does VR give you that existing tools do not offer?

- first−person perspective
- ability to iterate using computer models
- a new tool for communication

Are the design decisions you make in the virtual environment ...

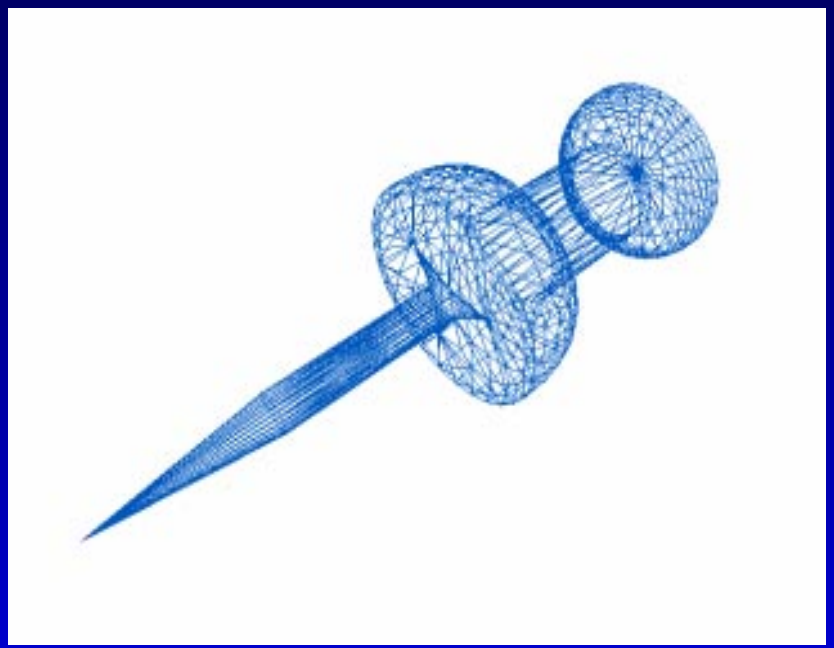
Better?

The same?

Worse?

Application development

Geometric modeling



Environment building

Design issues related to geometric modeling

- Interface with existing modeling software
- Trade−off between level of complexity and real time display
- Loss of non−geometric information
- Time required to create models

Design issues related to viewing and interacting in the environment

- Navigation – Rudy Darken
- Psychological and Physiological Effects – Mary Lynne Dittmar
- User Interfaces – Frank Wood

How have companies addressed these issues?

- Funded proof−of−concept projects
- Developed in−house expertise
- Hired consultants

John Deere

General Motors

Ford

Chrysler

Boeing

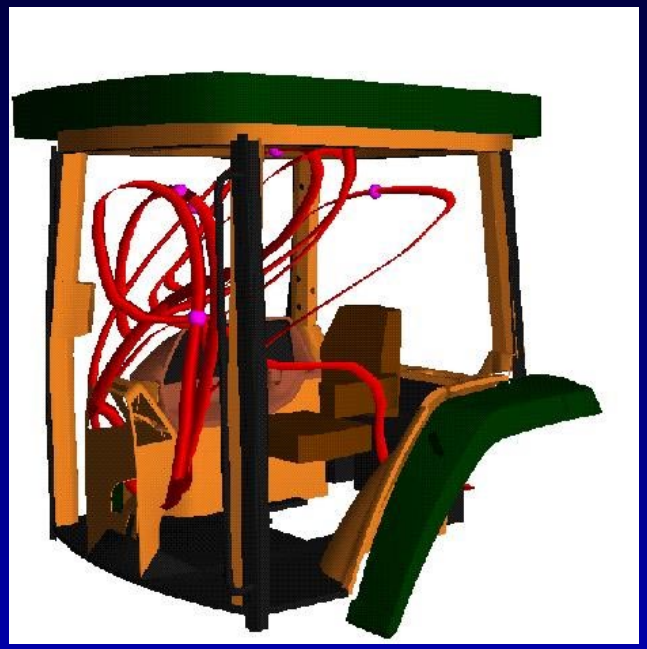
JOHN DEERE

John Deere

"Virtual prototyping can be valuable in a wide range of design, analysis, and evaluation tasks. Each time we show a VR application to a group of people from Deere, new ideas for future applications of this technology emerge."

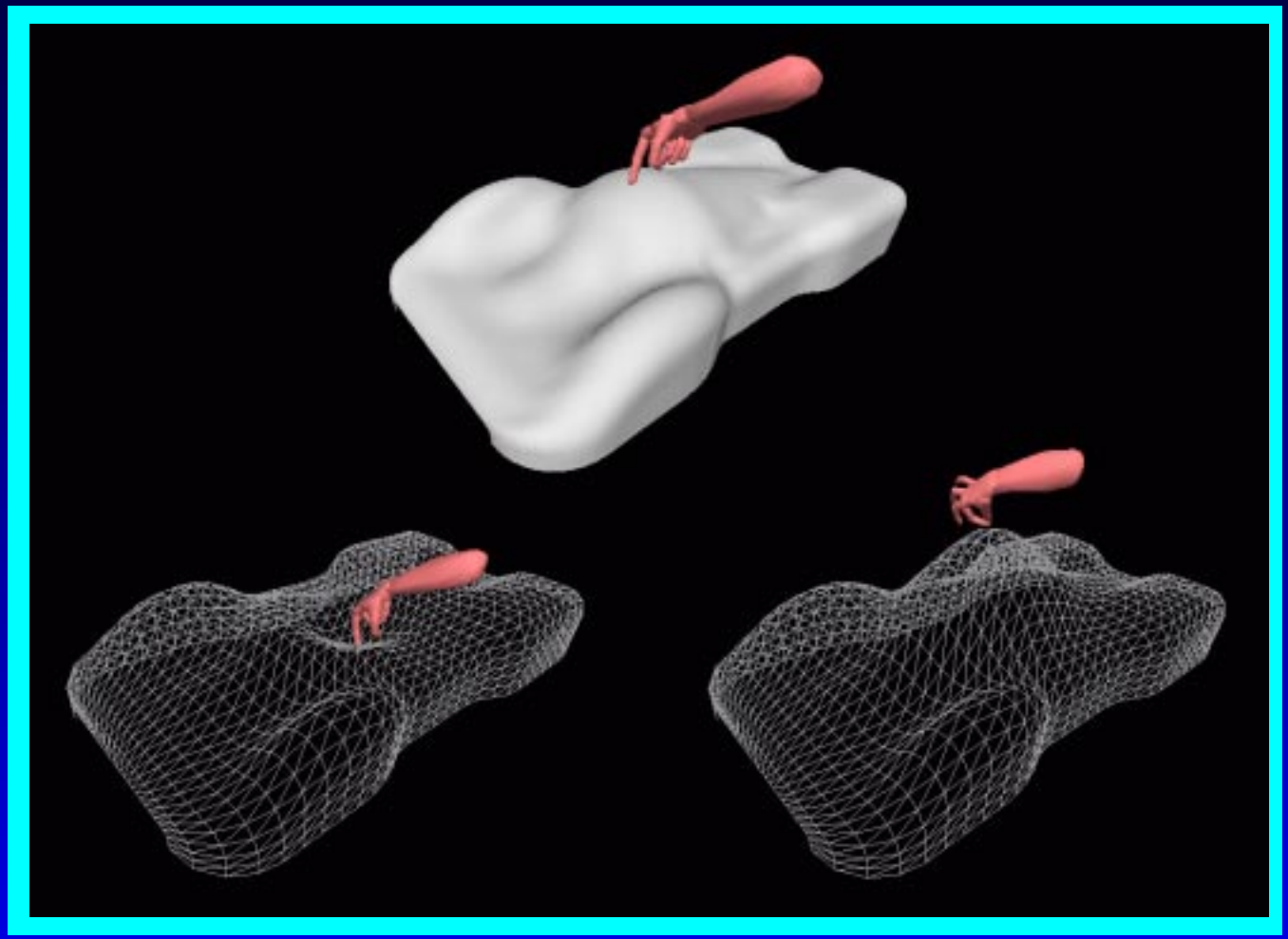
Jerry Duncan
Senior Staff Engineer
Product Technology, Human Factors
Deere and Company Technical Center

Prototype and Data Visualization



Real−time System Interaction

Geometry Manipulation and Annotation



General Motors

General Motors

"We think a lot of physical models are built simply for communication. People don't understand how changes they make affect the interior team, unless they have something full−size and tangible they can talk about. VR fills that need."

Randy Smith
Staff Research Scientist
Manufacturing and Design Systems Department

General Motors

VisualEyes™

- Visual impact
- Packaging
- Ergonomics
- Component integration
- Structural and trim development
- Check for visual limitations

Ford Motor Company

"It’s inevitable. If you can go through hundreds of iterations as opposed to, maybe, 10, you’re learning more with each one, and the quality improves quite a bit."

Ray Brynes
Project Manager
Advanced Vehicle Systems Engineering

Ford Motor Company

- Crash−test results
- Noise, vibration and harshness results
- Packaging studies
- Air flow results

Chrysler

"We made a decision to custom−develop our software because we couldn’t find a system that did everything we wanted it to on the outside. We wanted something that was tailored to our needs, where we could take the CAD models, put them into a virtual environment, and evaluate them in a matter of minutes to hours, in a format that was very realistic."

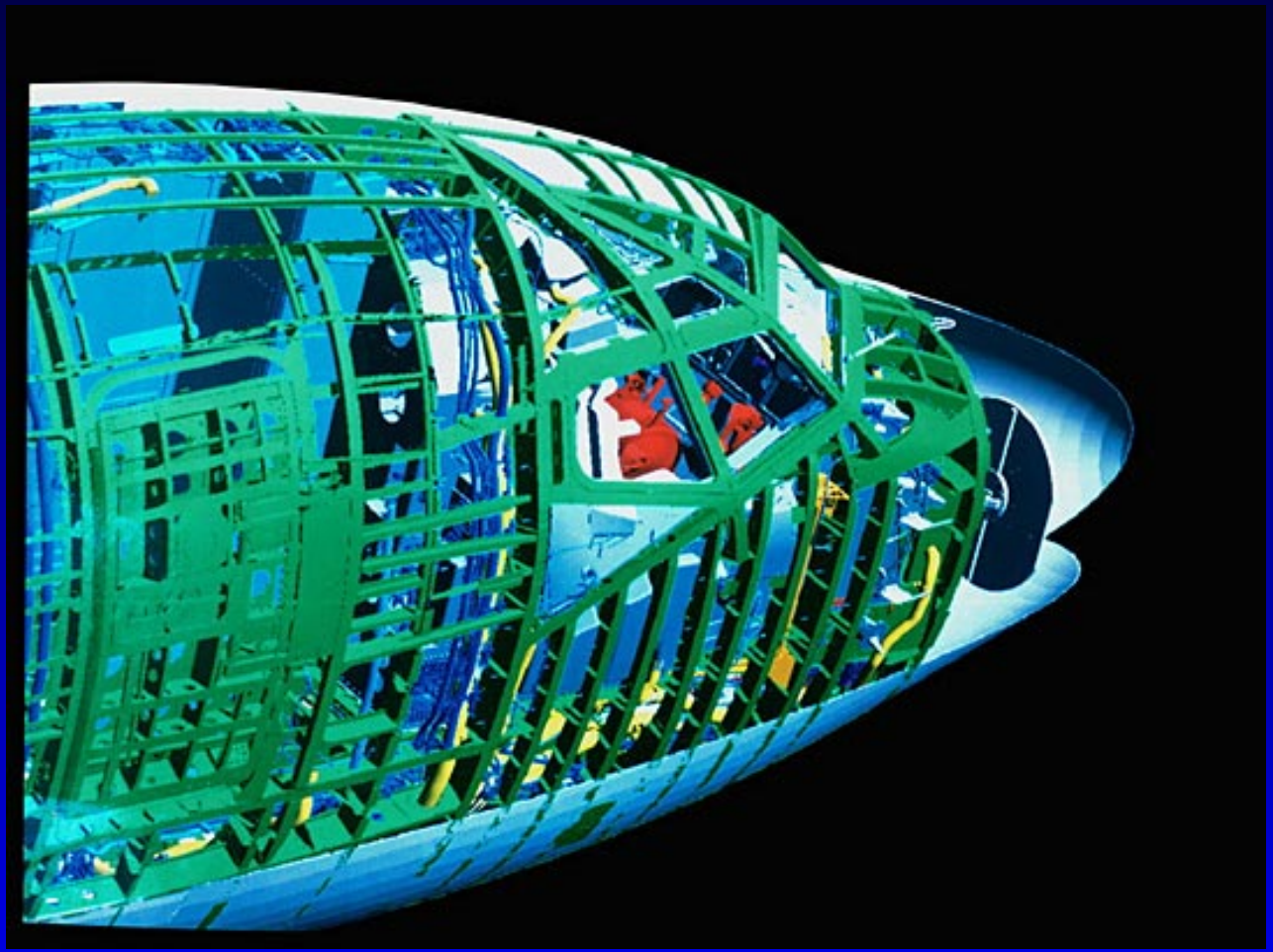
Ken Socks
Chrysler Engineering Supevisor

Chrysler

Chrysler Data Visualizer (CDV)

- Design reviews for collision
- Detection and solving space management problems
- Design styling as a surface verification tool
- Scientific visualization
- Communications tool

BOEING



BOEING

"Virtual Mockup facilitates the exploration of a larger design solution space, at the same time that it helps catch problems before they become very expensive. This enabled Boeing's 777 program to achieve unprecedented levels of rework reduction, product quality and customer satisfaction."

William A. McNeely
Senior Principal Scientist
Boeing Information and Support Services

BOEING

FlyThru™

Update™

BuildIt

PigsFly

TeleFly

BOEING

- Interference checking
- Training and maintenance documentation
- Large scale manufacturing illustrations
- Detection of motion anomalies
- Interactive design reviews across a network

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- Using VR as a communication tool
- Finding additional benefits from using VR
- Using VR to encourage investigation of alternative designs

What do we need?

- The ability to visualize large−scale scenes
- Efficient methods for getting CAD data into and out of the virtual environment
- Simulation of touch−sensitive tasks

Wrap-Up