VE applications

- Current production applications are few, and limited in complexity
- In particular, current production apps have low levels of interactivity
- Claim: Future applications will be more interactive, more feature-rich, more focused on productive work
  - Depends on 3DUI research
  - Depends on benefits of immersion research
Overview

- Applications to design & construction
- Applications to education
- Potential “killer apps” for VEs
Design and construction

- Architecture, Engineering, and Construction (AEC) industry

Problems:
- Visualization & presentation of designs
- Assessment of the impact of design changes
- Management of project information
- Coordination / communication between stakeholders (client, architect, structural engineer, contractor, subcontractors)
Architectural walkthrough

- Real-time, interactive viewing of architectural spaces
- Fly- or walk-through the design
- “Occupant’s-eye” view
- Realistic depth cues
- Real design scale
- Assess traffic flow, wayfinding, lighting, visual impact, …
Limitations of architectural walkthrough

- Lack of interaction
  - Passive visualization
  - Changes must be made with other tools

- Lack of information
  - Perceptual information only (mostly visual)
  - No abstract project or design information
Extending the arch. walkthrough

- Interaction: *immersive design* tools
  - Allow visualization and creation/modification of designs while immersed in the VE
  - Tighten design cycle by providing immediate feedback on design changes
  - Link the VE to traditional CAD tools so that changes propagate in both directions
Extending the arch. walkthrough

Information: *information-rich VEs*

- An IRVE is a *realistic* VE that is enhanced with the addition of related *abstract information* (VE + InfoViz)
- Add information about design rationale, construction schedule, materials used, …
- Can allow users to:
  - Understand complex relationships between various types of information
  - Make informed decisions
Design and construction examples
Design and construction examples
Virtual-SAP 2.0
Many concepts in a variety of domains are spatiotemporal in nature
- 3 or more spatial dimensions
- Dynamic, time-varying

Even non-spatiotemporal concepts can often be mapped to a reasonable spatiotemporal representation

Visual learning is one of the dominant modes of learning

Thus, visualization should be useful in education
Education - immersion

- Immersive VEs should allow for greater understanding of complex spatiotemporal information
  - Natural head and body movements - proprioception
  - Direct experience of the visualized information
  - Both outside-in and inside-out views
- Immersive VEs are now inexpensive enough to be brought directly to the classroom
Education - interactivity

• Constructivist theory of learning
  ◦ Learn by doing
  ◦ Build one’s own mental model of the concept

• Passive visualization is good, but student control of the environment is better

• Possible interactions:
  ◦ Navigate to view scene from various locations
  ◦ Explore parameter space
  ◦ Test “what-if” scenarios
Education examples
Portable classroom-based immersive VE for education
UI design for education app.

- Remote control metaphor
- Button overloading
- View management
- Menu lists
- Gaze-based interaction
What is the “killer app” for VEs?

- Killer app: an application that requires a particular technology, and is so useful that it justifies the technology on its own
- GUIs: spreadsheet (VisiCalc)
- Internet: web browser (Mosaic)
- VEs/3D UIs:
  - Entertainment?
  - Teleconferencing?
  - Design?
- BUT, the success of VEs does NOT depend on a killer app
Tourism / heritage
VE gaming
3D UIs in gaming

(C) 2008 Doug Bowman, Virginia Tech
3D desktop UIs
Another type of desktop 3D