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Faculty of Computer Science & Information Technology  
Department of Graphic Design & Multimedia

# VR Development Applications

**Text Book :** VIRTUAL REALITY Steven M. LaValle University of Illinois

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# Commercial Based VR

- Current VR software supports a wide range of VR implementations.
- VR software is not only concerned with 3D object generation, but also needs to allow for navigation and interaction within the 3D world.
- There are several features that need to be considered which include support for importing 3D models from other systems, 3D libraries, optimization of level of detail (LOD), object scaling, rotating and translating, stereo viewing, animation, collision detection, and multi-user (avatars) networking.

# Commercial Based VR Features

- ▶ Importing models
- ▶ Model Libraries
- ▶ Level of detail (LOD)
- ▶ Object Position and Orientation
- ▶ Constraints
- ▶ Articulated features
- ▶ Animation
- ▶ Collision detection
- ▶ Physics
- ▶ “Parallel worlds”
- ▶ Light sources
- ▶ Event handling
- ▶ Audio
- ▶ Control language
- ▶ Sensors/Tracking
- ▶ Device Support
- ▶ Stereo viewing

# Commercial Based VR

- ▶ There are two major categories of commercial based VR software:
  1. Toolkits / Software Development Kits (SDKs)
  2. Authoring Systems.

# Toolkits / Software Development Kits (SDKs)

- ▶ SDKs are programming libraries (generally written in C or C++) that provide a set of common functions with which a skilled programmer can quickly create a basic layout of the VR application.
- ▶ Benefits of Toolkits:
  - Flexibility of Device Interfaces.

# Toolkits / Software Development Kits (SDKs)

- ▶ Toolkits for Various Levels
  - 3D Graphics (Scene Graph, etc)
  - Physics & Behaviors
  - Audio (VSS, Bergen, OpenGL, EAX)
  - Haptics (GHOST, ReachIn, e-Touch)
  - Device Interface and Interaction (VRPN)
- ▶ Integration of different kits is an issue

# Authoring Systems

- ▶ Authoring systems are mostly **icon-based programs** with graphical user interfaces (GUIs) to create virtual worlds without going through detailed programming.
- ▶ Targeted at specific application markets.
  - Psychological testing and rehabilitation
  - Medical Training Simulators
  - Product Design (integrated with CAD/CAM)
  - Web3D graphics

# Authoring Systems - Styles

- ▶ Open Source
- ▶ Proprietary
- ▶ Web targeted
  - ▶ Marketing Worlds (VRML)
  - ▶ E-Commerce Objects
  - ▶ Community Worlds
- ▶ High End Systems
- ▶ Systems Integrators



# Authoring Systems - Example

- ▶ Alice
- ▶ dVISE
- ▶ WorldUp
- ▶ Eon Reality
- ▶ Lightning
- ▶ MetaVR
- ▶ Gismo3d
- ▶ Meme
- ▶ Multigen
- ▶ Quest3D
- ▶ R3Vis
- ▶ SVE
- ▶ Virtool
- ▶ VRJuggler
- ▶ VOS
- ▶ CAVELib
- ▶ GHOST
- ▶ PeopleShop

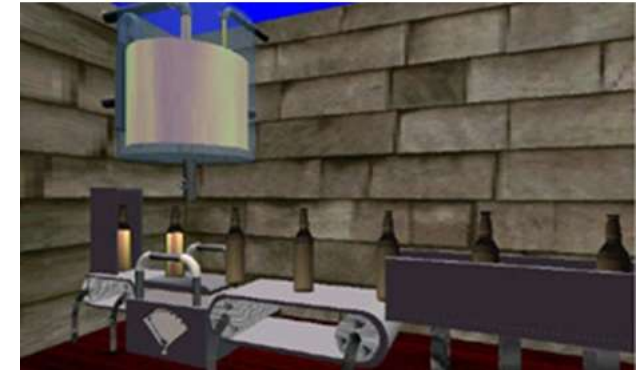
# World Toolkit (SDK)-Sense8

- ▶ The World Toolkit (WTK) consists of a library of over 1000 functions written in C that enable users to rapidly develop new VR applications.
- ▶ Using WTK, programmers build virtual worlds by writing codes to call the WTK functions.
- ▶ However, WTK is now discontinued.



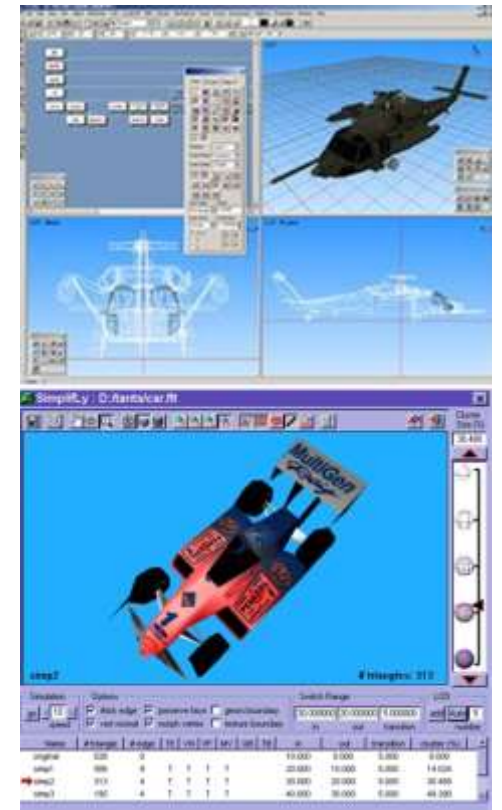
# WorldUp (authoring tool)-Sense8

- ▶ It provides an easy-to-use GUI from which users create objects and properties and design simulations.
- ▶ It can create or import 3D scenes, make them interactive with an easy-to-use drag and drop assembly, and can also integrate them with the industry standard tools that are already available.
- ▶ In adding behaviors to the objects, users can author custom behaviors or change a property of an existing behavior by writing scripts using the BasicScript language, or use property change events to trigger behaviors.



# Multigen –Paradigm (Presagis) (authoring tool)

- ▶ Paradigm provides modular based commercial VR and 3D content creation.
- ▶ They offer an industry-leading range of fully integrated, highly automated real-time 3D database development and visual and sensor simulation tools for the IRIX™ and Microsoft Windows operating systems.



# Multigen –Paradigm (Presagis) (authoring tool)

Some of the products available are:-

1. [MultiGen Creator](#) for modeling
2. [TerrainPro](#) for Large Area Terrain generation
3. [RoadPro](#) for creating roads that meet real-world engineering standards
4. [Vega](#) for the creation of real-time visual and audio simulation, VR, and general visualization applications.

# Unrealty (authoring tool)-Perilith Industrielle

- ▶ Unrealty is an innovative commercial VR creation kit.
- ▶ The VR kit was developed utilizing the game engine of a currently popular 3D game i.e. Unreal Tournament from Epic games.
- ▶ Designed in part to assist real estate agents, the editor allows one to create a "locale" complete with staircases, windows, and even pools of water.

# Unrealty (authoring tool)-Perilith Industrielle

Due to ease of use and highly realistic production of real-time images, Unrealty was used in the Virtual Notre Dame Cathedral of France project.



# Unrealty (authoring tool)-Perilith Industrielle

- ▶ NASA has also used Unrealty to create their Virtual International Space Station (ISS).





# Quest3D (authoring tool)-Act-3D

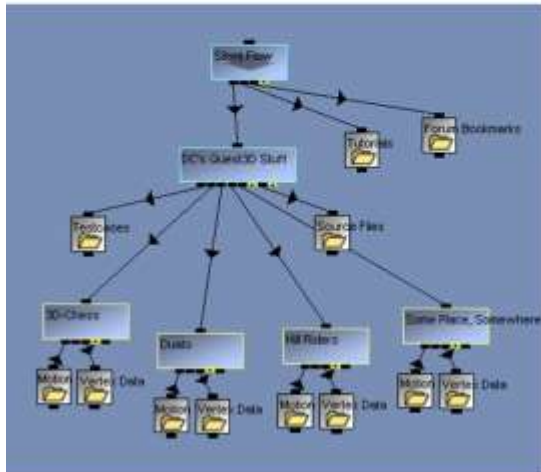
- ❑ Quest3D is a graphical development environment for real-time 3D projects.
- ❑ Projects can be published as a single [executable, installer, screensaver](#) or [web page](#).
- ❑ It provides solutions for architecture, digital entertainment, computer training and high-end VR applications.
- ❑ Users of Quest3D can create a wide range of applications by linking components in a visual environment.
- ❑ Website – <http://www.quest3d.com>

# Quest3D (authoring tool)-Act-3D

Quest3D comes in three editions which include:

1. **Quest3D Creative Edition** - Contains all basic facilities, needed to quickly create real-time 3D software.
2. **Quest3D Power Edition** - extends the package with more advanced functionality, such as networking, database access, GUI components and advanced graphics techniques. These techniques involve HDR rendering, advanced motion blending and advanced particles. Quest3D Power Edition suitable for making games, enterprise applications and complex visualizations.
3. **Quest3D VR Edition** - especially made for creating real-time 3D VR systems, such as 3D training facilities, CAVE environments, simulators. The VR Edition is also a tool being used for TV broadcasting solutions. It supports several kinds of motion tracking hardware, multi-projector rendering, stereo projection and environment simulation.

# Quest3D (authoring tool)-Act-3D



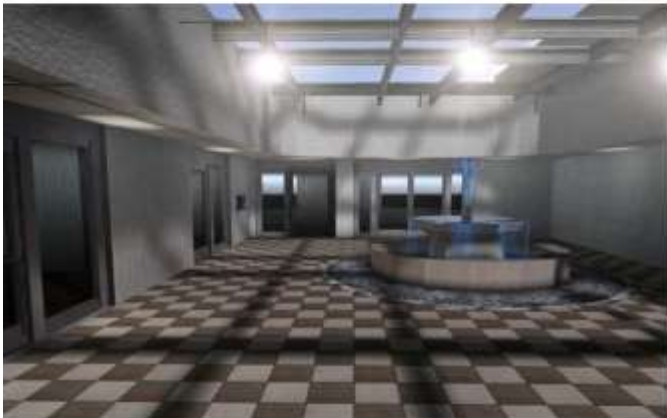
# 3D Game Engines (3DGEs)

- The use of 3DGE to create real-world VR applications is a promising alternative to currently available commercial VR development platforms.
- Research efforts have proven that the use of 3DGE which is also known as [Game Development Kits \(GDKs\)](#) is a viable solution to creating visually engaging VEs while still maintaining a low-cost development and execution platform.
- Some of the 3DGEs that can be used to develop VR applications are [Unreal Tournament](#) from Epicgames and [Quake](#) from ID Software.

# 3D Game Engines (3DGEs)

- Properties of 3D game engines
  - ▣ game engines run on relatively cheap hardware.
  - ▣ multiplayer ability enlarges the interactivity of the engine for its users.
  - ▣ this enables user-friendly, smooth and real-time exploration of an environment or model.
- The use of 3D game engines is a very useful alternative:
  - ▣ **relatively low expenses** for both user and designer and a quick result.
  - ▣ **high level of interaction** with the virtual environment and other users.
  - ▣ **user-friendly** and **fun** to explore
  - ▣ **broad audience** because of the high recognition factor.

# 3D Game Engines (3DGEs)



# 3D Game Engines (3DGEs)

- ▶ A group of game enthusiasts released a version of Quake for the PocketPC known as [PocketQuake](#).
- ▶ Using Pocket Quake, users are able to use the PocketPC to navigate through a 3D virtual environment that is fully lighted and textured.
- ▶ Since the software is Open Source, users can create 3D models using various third party 3D level editors for Quake.



# 3D Game Engines (3DGEs)

