

Real World Virtual Reality and Manufacturing

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1 of 20

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Overview of Talk

- **Some VR Definitions**
- **Two Different Types of VR**
- **Manufacturing**
- **Experiences with Deneb Robotics QUEST and Black & Decker**
- **User Interface Issues**
- **Image-based VR as a User Interface - Immersion as an Organizing Principle**
- **Integrating the Internet and a VR Environment (VRML)**



Some Virtual Reality Definitions

- Immersive vs. Non-immersive
- Desktop VR
- Image-based VR
- Virtual Environments, Synthetic Environments, Augmented Reality, See-thru VR



Components of Immersive VR

- Position Trackers
- Head (Helmet) Mounted Displays (HMD)
- Spatial Audio
- Whole hand input - Gloves
- Tactile Feedback

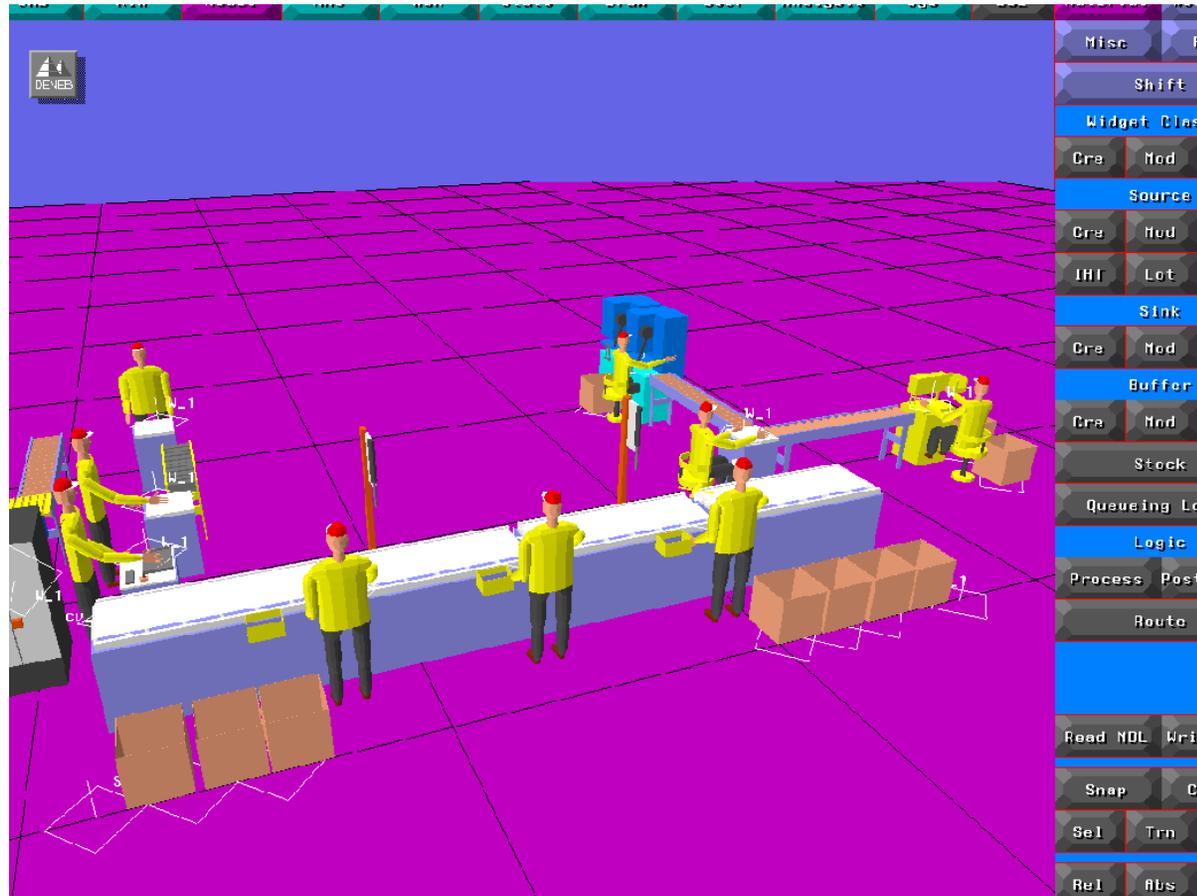


Manufacturing

- Investigate use of VR for a variety of manufacturing processes
- Use commercial off-the-shelf software
- Work with “real” industrial partners - Black & Decker



Simulation of a final assembly area at B&D

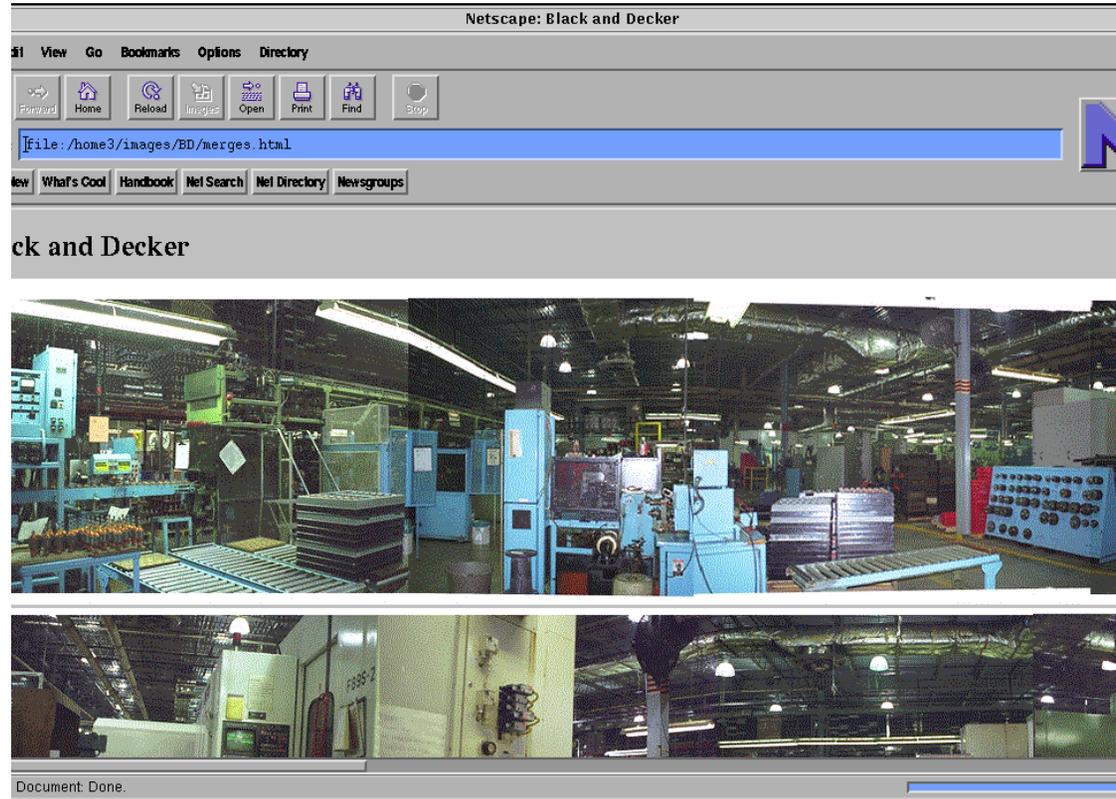


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6 of 20

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Factory floor images for image-based VR



VR as a User Interface - Immersion as an Organizing Principle

- First person point-of-view (POV) environments are natural - we are in them every day.
- Computer based POV environments attempt to move users from the real world to a virtual world.
- Movement in the virtual world is not natural and must be learned.



VR as a User Interface - Immersion as an Organizing Principle (cont.)

- Arrangement of items in and around the user can be highly personalized. (I can find stuff in my messy office because I've internalized the location of objects).
- Spatial metaphors can be tailored to the individual, office, building, city, maps.
- One can “objectify” locations - i.e. turning locations of interest into objects (a la 3D clip art) and placing them in memorable locations



.Entertainment as a Technology Puller

- **Nintendo/Sega - Jurassic Park**
Alternates between typical 2D video game and 3D POV views for interior scenes, cartridge based.
- **Broderbund/Cyan - MYST**
Move around environment, sync sound highly photorealistic.
- **Virgin Games/Trilobyte - 7th Guest**
First person POV plus active elements (actors/agents)
- **Id - Doom**
Highly responsive real time POV and networking



Entertainment as a Technology Puller

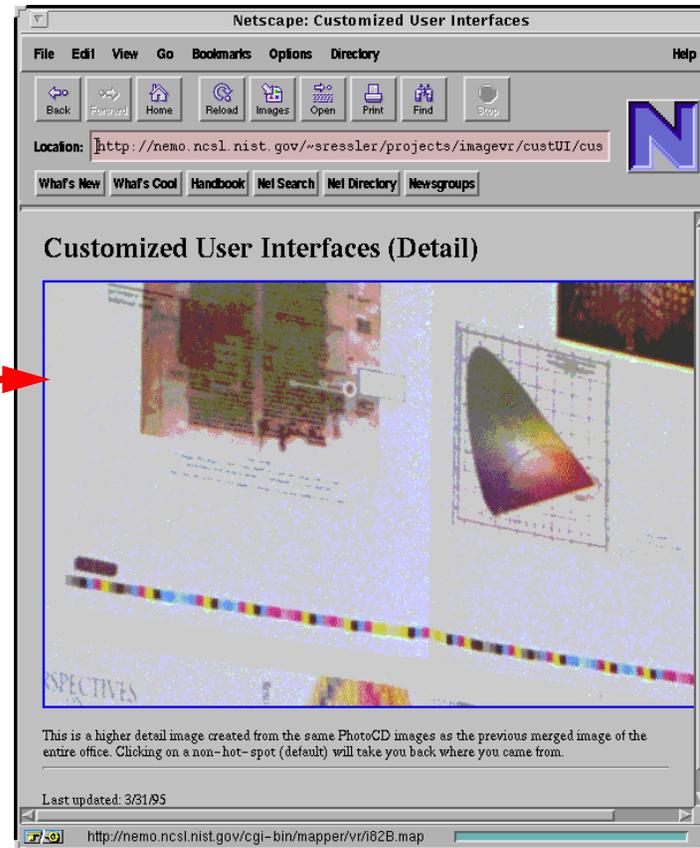
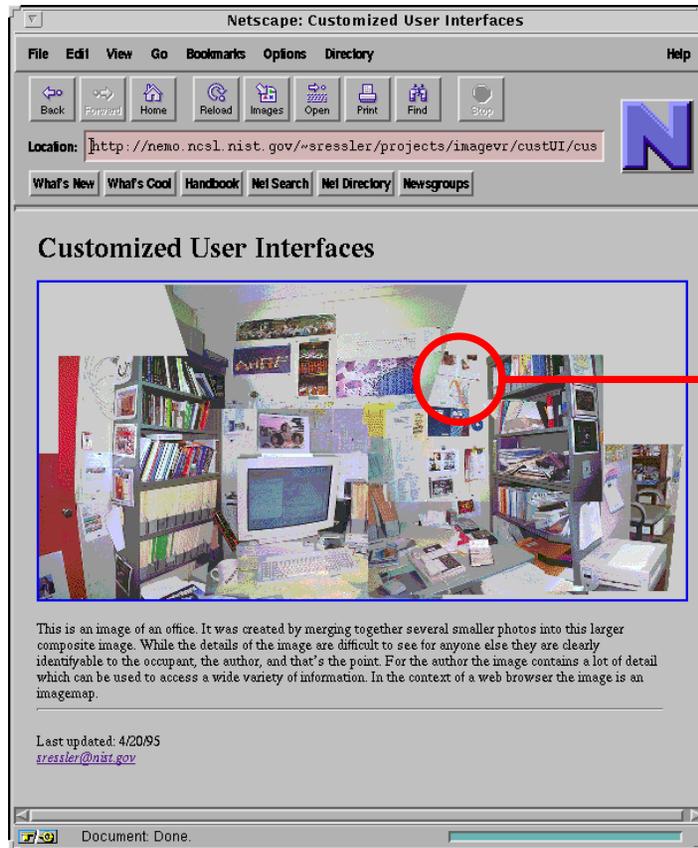
- All of the games provide First Person POV
- All synchronize sound with the action and environment of the moment.
- Level of interactivity is highly variable ranging from no time dependence to real time requirements (i.e. you die if you don't do anything).
- Increasing level of autonomous sophistication, actors/agents.
- Autonomous agents can be carried into more “serious” applications for information grazing/retrieval.
- Tools for information discovery with increasing degrees of intelligence embedded in natural spatial environments.

*People VOLUNTARILY pay money for these.
Why not use these environments as user
interfaces?*



Familiar space as organizing device

- Customized User Interfaces via Image-based VR



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12 of 20

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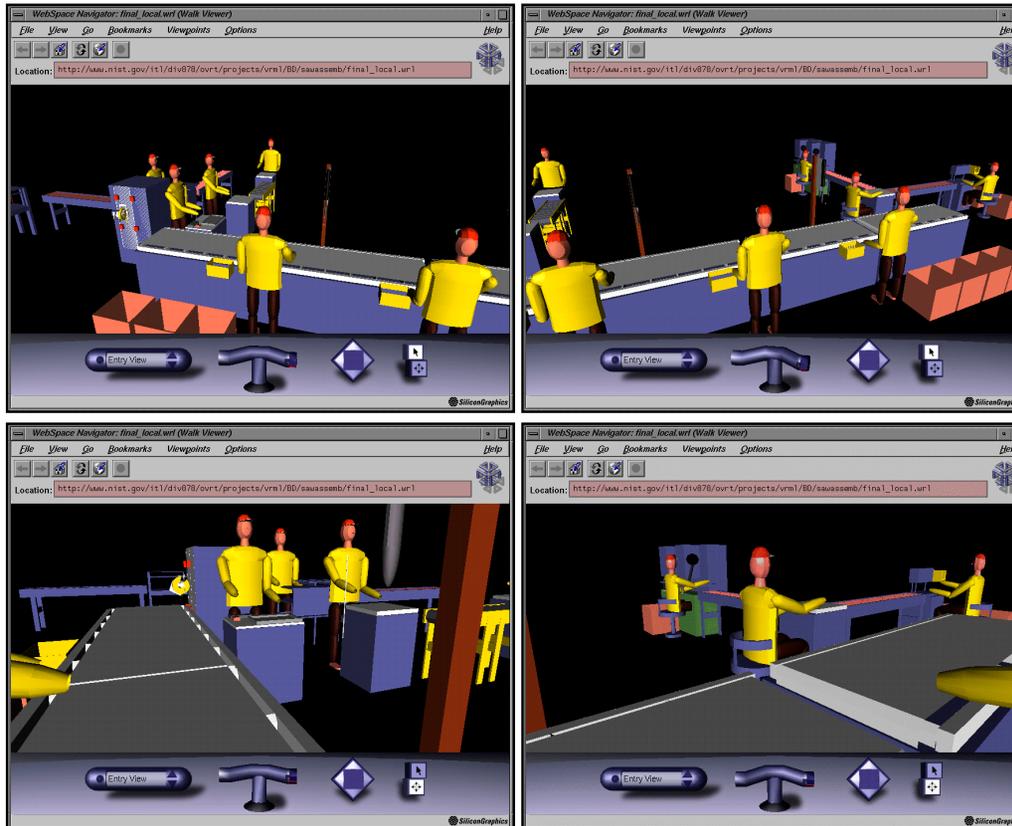
Immersive VR - Fan Press Operation



Integrating Internet with VR Environment



VRML View of Assembly Area



Integrating VR with the Internet (conf.)

The VRML Motor Line

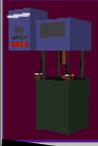
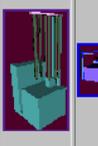
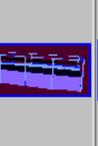
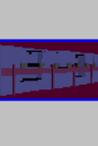
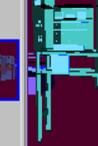
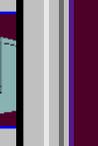
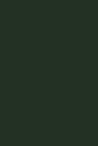
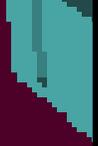
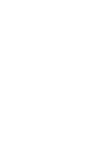


This set of files represents a collection of machines which manufactures an electric motor. The objects were originally modeled by Qiming Wang, Sue Sherrick and Christine Platko using Robotics "Quest" simulation software. Next Qiming imported them into the WorldToolbox library and converted into nff format. The objects were then converted into VRML using an up version of Bernie Roehl's nff2vrm (thanks Bernie!) converter by Sandy Ressler. Files were arranged and colored and linked using SGI's webspace author.

This work is being done in collaboration with the Manufacturing Engineering Laboratory at Black & Decker.

[Overview of Motor Line](#)

Select S for Safety, T for Training, M for Maintenance information associated with each equipment.

Fan Press			Stacker			Balancer			Impregnator			Wedge			Spin		
S	T	M	S	T	M	S	T	M	S	T	M	S	T	M	S	T	M
																	

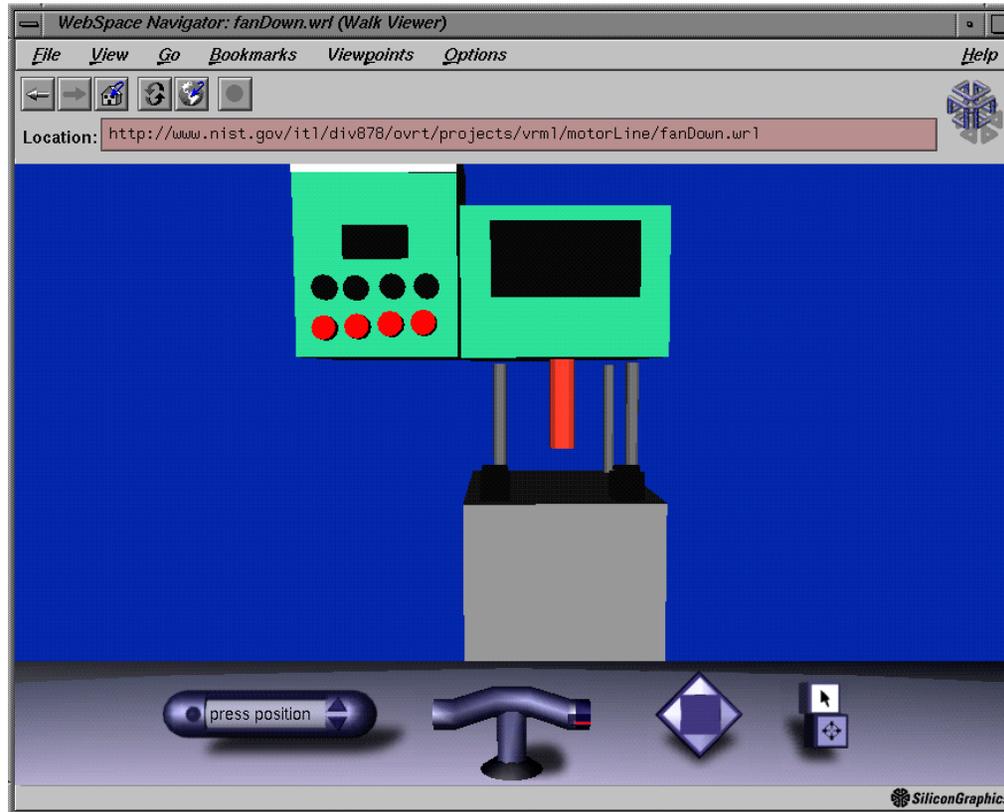


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16 of 20

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Integrating VR with the Internet (cont.)



- VRML Web browser (WebSpace)

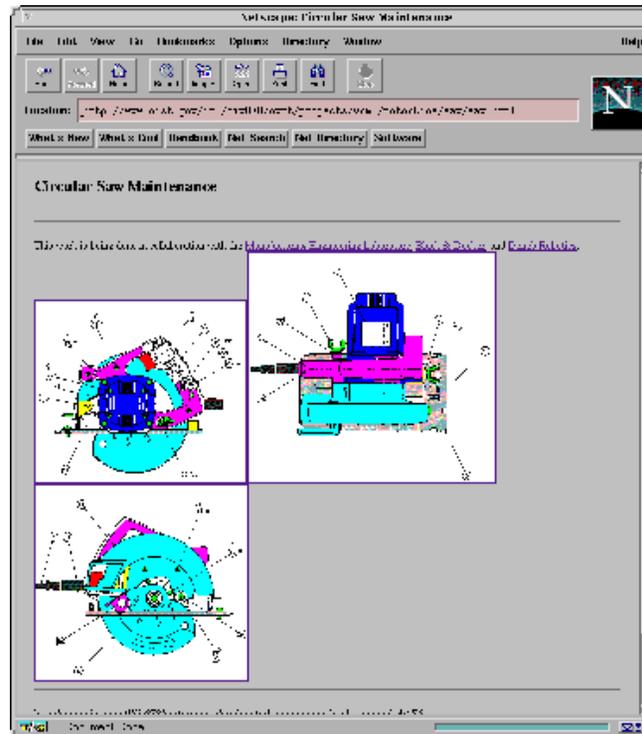


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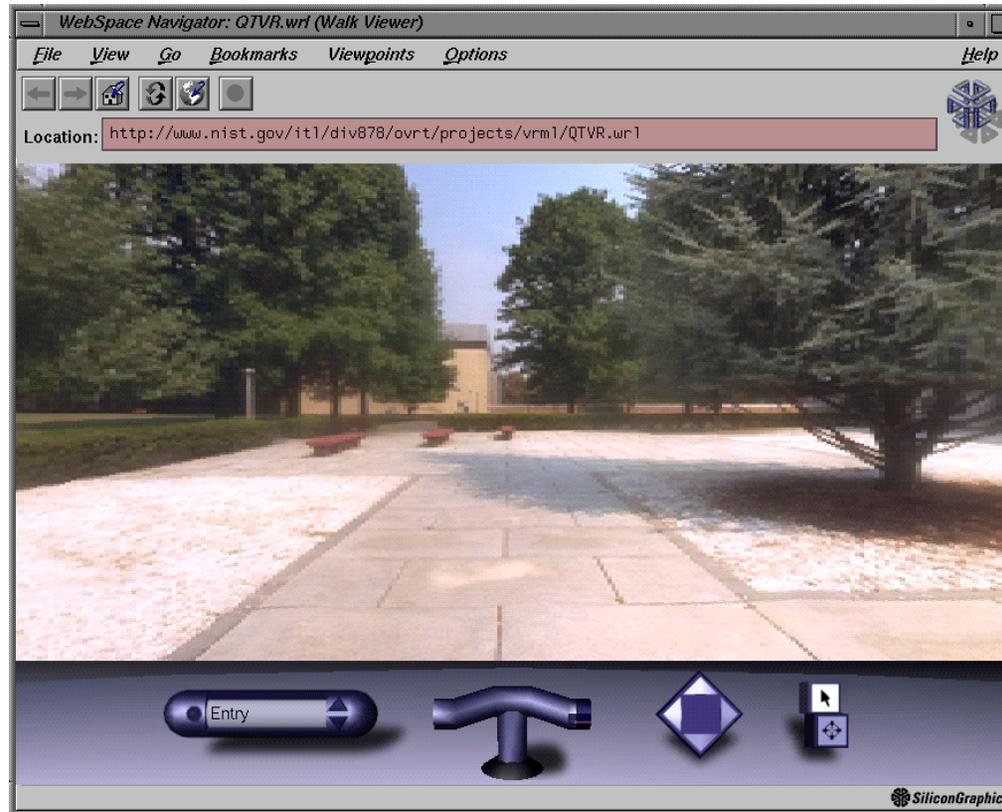
17 of 20

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Associated Technical Documents



Fusion - Images and Polygon (QTVR & VRML get married)



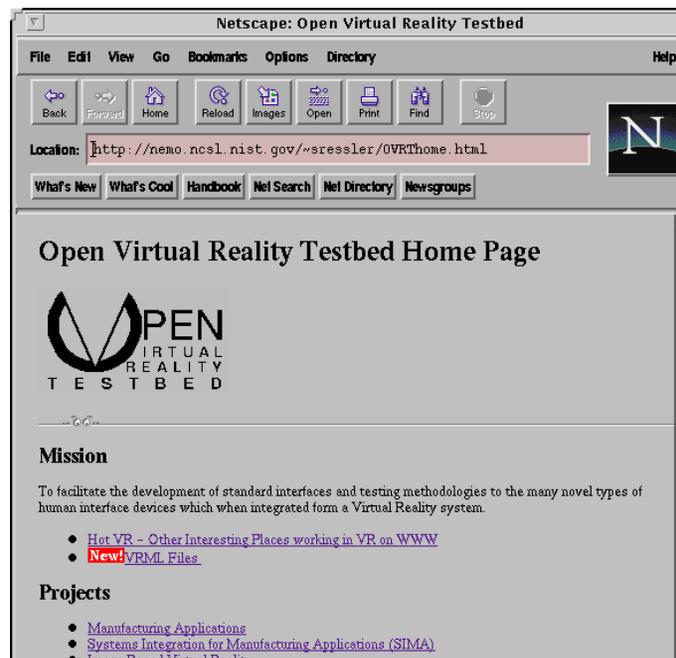
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19 of 20

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Open Virtual Reality Testbed — On the Web (cont.)

- Project “Home Page” URL - <http://www.nist.gov/itl/div878/ovrt>
- For more information contact Sandy Ressler: sressler@nist.gov



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20 of 20