

Interactive 3D stage design: “Skeletons of Fish” at LIFT 2001 (London International Festival of Theatre)

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Summary

We created an interactive real-time 3D model of a theatre and two alternative stage designs using Quest3D. With the resulting model, the stage designs can be switched interactively and the light intensity levels can be set using on-screen sliders. The walkthrough can be published on the Web for collaboration between the various remotely located parties. Everyone can walk or fly through the theatre, test sight lines and familiarize themselves with the set before it's built on location. Although this article focuses on theatre and set design, the same method and technology can equally be used for architecture walkthroughs.

Background of the set design project

The project was commissioned and produced by the London International Festival of Theatre and was performed by the U.S. based performance company The Hittite Empire and UK artists Chakra Zulu. The performances took place at Riverside Studio 2, London in July 2001 as part of the international festival.

Remote work between the USA and England began in April using the Internet. A design diary of set, costume and projection ideas was published on the project's website. The feedback from the Directors in both countries was done via email. The company and production team met for the first time only 6 weeks before the production.

The theatre provided the plans and elevations in AutoCAD format and these were imported into 3D Studio Max, where all the 3D modelling was done. The resulting designs were presented in the form of a video walkthrough of the theatre and set and printed stills from the set design.

Benefits of real-time digital sets

There were some hands-on sessions with the Directors using the 3D model, but since at that point the set was not in a real-time format, this was limited. Therefore the next step was to transfer the model into a real-time interactive format, where you can try out different design ideas and materials, animate scenery, move objects around. While working with the director you can check sight-lines, create and test virtual scenery for projecting on stage, and familiarise the actors with the stage before it is built. When published on a Website, real-time set design models offer increasing possibilities for remote co-operative working, which is especially useful for touring shows. They can now test their stage design in a theatre well before the arrival and build.

Functional requirements

One of the first things to consider when converting the objects in your 3D set for real-time is where it is viewed and what kind of interaction, level of object and texture detail you want to realise within the model. In this example we want to create an interactive real-time presentation where we can view an empty theatre space (Riverside Studio 2) and then switch between two alternative sets designs. Furthermore, we want to add some spotlight effects for atmosphere and then determine the sight lines from various seats.

Tips for exporting the model and textures

The effort spent preparing your model for export is important, as this will eventually save you time and increase your real-time performance. The exported results will vary between different 3D software packages. In our case we exported the models from 3D Studio Max into DirectX format using the updated .X export plug-in from Act-3D.

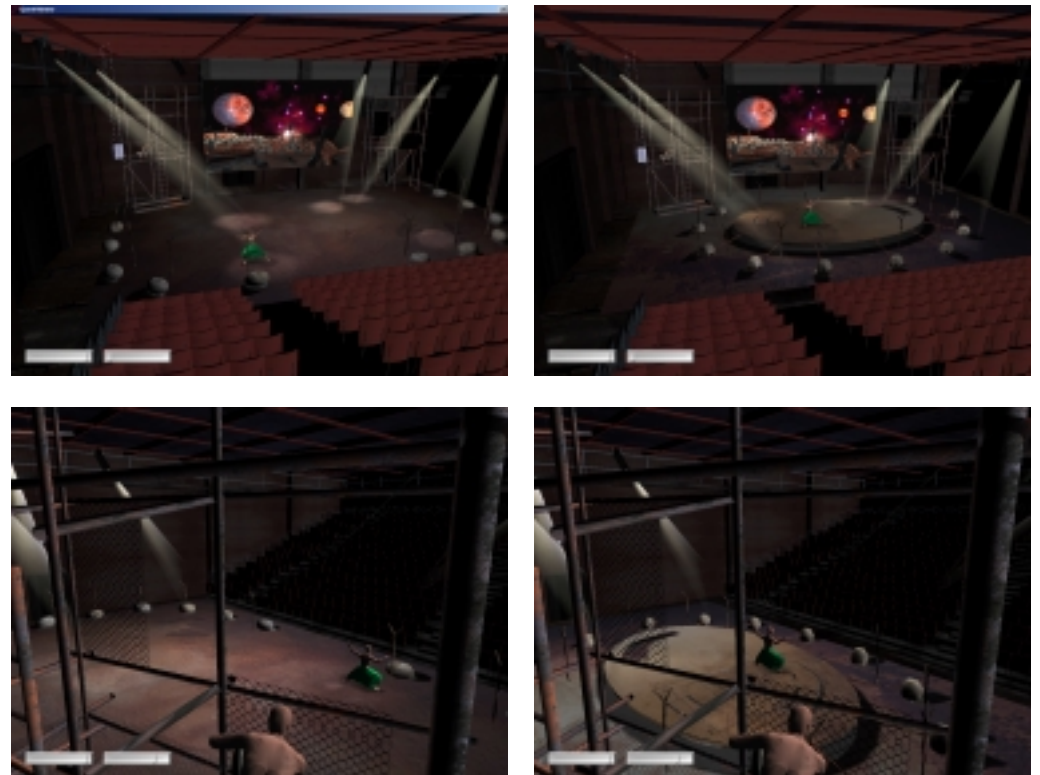


Figure 1. Screenshots of the two stage design options in the Quest3D real-time rendering viewer. Although the second design (right-hand column) is more sophisticated, the left one was selected and used for the play for budget reasons.

Model preparation. We collapsed all objects that had the same textures into one mesh, for example all the seats in the theatre. This is useful because a real-time 3D environment works best with few separate surfaces. Modifier stacks always need to be turned into editable meshes before exporting. You may need to increase the polygon mesh on some of the object surfaces to get a better spot light effect. We did this for the stage floors. Complex objects can often be simplified using primitives with a high-res texture rendered onto it. Take away all invisible surfaces and unused materials. Export all the objects that will need to be switched interactively in separate files. The outer walls were one-sided surfaces so you can see through them from outside the theatre space.

Texture preparation. For 3D graphics cards to work efficiently, textures need to have a resolution that is a power of 2 in each direction. The maximum resolution that most cards can handle with good performance is 1024x1024. Quest3D, the tool we used for the real-time walkthrough, will scale any imported texture to the closest power-of-two resolution, but it is better to do this scaling in Photoshop. Photoshop's image scaling algorithms are very good, and it is important to be aware of your texture budget during the modelling phase. You may need to replace textures with low-resolution JPEG-compressed equivalents for a Web version of the project.

Conversion. Quest3D reads in .3DS, .LWO and .X (DirectX format) files. Best results are achieved with the updated .X exporter and the also updated .X importer from Act-3D. Tick the option to Flip Y Z. In case your model does not get in properly, you usually forgot to collapse your modifier stacks into editable meshes. Export of bone-animated characters is a story in itself; it needs careful model preparation and re-initialization of Physique. Act-3D is working on other options for animation conversion.

Creating your real-time presentation

Interactive switching of stage designs – We wanted to create object switches in Quest3D for 2 different stage design options. In this case, we used the CallSelected channel. For switching textures, like the background projection, ChannelSwitch is usable. The Quest3D screenshot of figure 2 shows the switching construction.

Animated textures in AVI format for e.g. the background projection can be used with a separate MediaTexture channel, which you can download from the Quest3D.net site.

Setting the light intensity with sliders - We made volumetric spotlights on the stage using a cone primitive in Quest3 with a gradient texture as alpha map plus a "real" spotlight, both parented to the



Figure 2. Screenshot of the stage switching construction in Quest3D. A CallSelected channel is connected to two different Render channels, one for each stage design. To use the same camera and lights for both stages, make shortcuts of these and connect the shortcuts to both Render channels.

physical 3D light object. The light intensity of the main theatre light and the spotlights can be adjusted with sliders. We used the Quest3D Slider template for this; you can find it under GUI Drop-ins in the template window. As its perspective will not change with the walking movement through the theatre, it needs its own Render channel with camera and light, separated from the other Renders. We created shadows on the stage floors in Max, saved into the texture.



Figure 3. Close-up of the stage, showing the effect of the light cones. You can set the intensity level with the sliders.

What to do different next time:

1. Take more photographs and film of the theatre and its immediate environment, for background pictures of the café, as seen through open doors, the outside view from the windows, stone textures of the wall etc. You can use them as textures on flat surfaces behind the doors and windows.
2. Apply real-time modelling techniques earlier on in the project. It helps also to work more efficient in Max for conventional rendering, with no loss of visual quality.
3. Do more texturing in the real-time animation tool. It works more efficient thanks to better 3D hardware support and it provides better WYSIWYG feedback than Max.

References

3D modeling: 3D Studio Max 3.0, www.discreet.com

3D conversion: 3D Exploration, <http://www.us.righthemisphere.com/products/3dexplore>

Real-time interactive 3D: Quest3D, www.quest3d.com

Biographical information

Roma Patel studied Scenography in UK. Since her graduation in 2000, she has completed several digital set designs for theatres and festivals in London. She now lives in The Netherlands and runs her company Digital Set Design from there (www.digitalsetdesign.com). You can reach her at roma@digitalsetdesign.com.

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