Living in the Past
A digital reconstruction provides valuable insight to Jerusalem's archaeological treasures

BY AUDREY DOYLE

Jerusalem is rich with archaeological sites that hold valuable historical evidence of the way people lived and the customs they observed many years ago. But even though a great deal of the city's ruins have been excavated, it still can be difficult to visualize the way Jerusalem looked 2000 years ago, for example. Recognizing this, the Israel Antiquities Authority (IAA) is using real-time 3D simulation technology to help visitors to the new Ethan and Marla Davidson Exhibition and Virtual Reconstruction Center visualize what Jerusalem's famed Herodian Temple Mount looked like prior to its destruction by Roman troops during the first century.

"The visualization is based totally on archaeological evidence and accurate historical information," says Jacob Fisch, the IAA's director of external affairs.

The Davidson Center, which is located at the entrance to the Jerusalem Archaeological Park, is an underground complex that includes rooms containing maps, drawings, and physical models of various antiquities. It also features a real-time interactive 3D simulation of the Herodian Temple Mount site—created jointly by the IAA and the Urban Simulation Team at UCLA—that takes visitors on a free-roaming walk through the model, as though they're exploring the Jerusalem of long ago.

The simulation is shown on a large screen within a theater environment. Movement through the model is controlled by an archaeologist guide, who manipulates the direction of the walkthrough in real time, based on the audience's questions and interests. Enabling this capability is the Urban Simulation Team's uSim real-time software, which runs on an SGI Onyx2 InfiniteReality3 workstation.

To generate the model's terrain, primary modeler Lisa Snyder, a senior member of the UCLA team and a Ph.D. candidate, digitized a topographical map of ancient Jerusalem. She then imported the data into MultiGen-Paradigm's CreatorPro 3D modeling software, where she created individual data layers for the topographical lines and raised them to their proper elevations. She also incorporated an aerial photo of modern-day Jerusalem, as well as a map of ancient Jerusalem that she used to outline and extrude the old city walls. Throughout the process, Snyder also relied extensively on pictures she took of the site during a visit in 1999, using them as a reference for constructing the geometry and as source material for the texture maps.

The most challenging aspect of the project, according to Snyder, was creating a realistic model that could be manipulated in real time. To conserve polygons, she incorporated 2D billboard-style characters, animals, and market goods into the model, rather than 3D objects. She also used simple animation techniques in MultiGen Creator to augment the model. In one instance, she mapped an image of smoke onto multiple polygons and animated them in Creator so that the smoke looks like it's rising from an altar. Last, Snyder created clickable hot spots that show how portions of the site look today, so visitors can put the digital reconstruction in perspective with the actual excavations.

In all, the group spent nearly 1600 hours on the model over a two-year period. But the work has been worth the effort. The reconstruction has been so well received that the IAA is negotiating with the Urban Simulation Team to add another model to the virtual reconstruction that shows the site as it existed in the late seventh century, during another large building period at the site.

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Audrey Doyle, a contributing editor to Computer Graphics World, is a freelance writer and editor based in Boston. She can be reached at audreyd@mediavone.net.