

Pandemic Studios breaks the LOD barrier with Multi-Resolution Mesh technology

The first DARK REIGN stunned the Real Time Strategy world with subtle AI, intelligent unit dynamics and realistic use of terrain. It also left Pandemic Studios, the Santa Monica based game developer for Activision, Inc., with a formidable challenge—design a DARK REIGN sequel and really make it rock.

The development team realized that DARK REIGN II had to be totally three-dimensional. They would need a vast, immersive 3D world of mountains, rivers, ravines and forests that players could actually creep into and use for ambushes and battles. They wanted animated, texture mapped, “skinned” characters with realistic movement. The concept that director **Greg Borrud** stressed was “not just making it 3D because it looks nice, but because it can really enhance game play.” Their goal was the kind of complex environment that RTS players yearned for and programmers feared. And at first, Greg remembers, the programmers said “just no way. To have that many polygons in an RTS game with the amount of information that each unit carries is next to impossible.”

The Problem

The team had run into fundamental laws of 3D design. The more realistically a figure looks and moves, the more polygons it takes to draw. The more polygons there are to draw, the slower the computer’s frame rate. And as the frame rate slows, the game’s realism and playability fall apart. That’s why so many games rely on blocky, tank-like figures, claustrophobic settings and barren 2D terrain to lower their polygon count. “Our jail,” explains **Josh Resnick**, president of Pandemic Studios, “is how many frames per

second we get on the screen when we're in these 3D worlds. Anything that makes an impact on that is huge and very important to us.”

The traditional, workaround solution depends on managing scene complexity with Levels of Detail (LOD). As objects recede from the foreground, programmers substitute models with less and less detail, lowering the polygon count. But LOD's carry their own penalties. “Popping” between LOD models distract players and the burden of creating multiple models of the same object bury the artists in rework. For each distance mark they have to re-render the objects, revise the texture maps and redo the animations. To succeed, DARK REIGN II needed a totally new approach.

The Solution

They found their solution in Intel's 3D Software Toolkit. Its Multi-Resolution Mesh (MRM) technology enables developers to extend their 3D rendering engines and dynamically set complexity within the application. MRMinng dramatically reduces polygon counts while maintaining topology and surface attributes. Because the technology scales the polygon count on the fly, artists need only one model. MRMinng changes the model seamlessly and totally eliminates “popping.”

“I'm really, really pleased,” Graphics Programmer **John Cooke** says, “it's plugged in incredibly well.” **Andrew Payne**, DARK REIGN II's Main Programmer, sees it as “a huge gain for us. There's no popping. It's a smooth transition.” To Greg Borrud, “It made our game possible. The reason we're so high on MRM technology is it's the difference between being able to do the game we want and not.” “When we realized MRM's capabilities and how good the game will look,” adds game designer **Dave Osper**, “one of the things we were able to do was then design a richer world.”

Author Once, and save 50% in production time

Rick Glenn, Dark Reign II's art director, found that MRMinG "was really the key to doing everything. Not having to do the LOD's has saved us probably 50 percent of the production time that the animated characters would have cost us. We gained a lot of time we can use for other things." He compared MRM's results with custom designed static LOD's. "As it res's down with MRMinG, the asset always looks as good or better than a custom lower res asset! So we are letting the artist use as many polys as he needs to get an outstanding model."

In fact, the freedom he gets from MRMinG has changed the way Rick sees the project. "Until now the restrictions have been so limiting that it was often a waste of time to design extremely complicated shapes and have the artist figure out how to reduce them. With this technology I can approach the conceptual phase as I would a film project. Design the optimum 'look' and style of the world and its contents, then figure out how to represent that within our ploy limits. Having the flexibility to have every asset MRM at a different rate means that we can reduce an asset's poly count downstream in the engine."

MRMinG opens up the cinematic possibilities of the game. Josh Resnick refers to "fun features like recording the whole games session and then taking the camera and moving around as you watch your characters play it out." He's pleased that "we don't have to spend \$100,000 creating camera-generated movies. The movies are almost looking as good as what you would do by rendering things off."

Gain Scalability

Rick Glenn enjoyed the scalability they gained from MRM. "The real benefit is that the artwork can now adjust to be as good as the player's machine will support. Which is phenomenal for us. We can now have a high-res asset that will look as good as

close as the camera's ever going to get, and we can have that automatically toned in to the frame rate of the machine."

Adam Iarossi, the team's Physics programmer, likes the way that "on slow computers it's going to make this game playable." John Cooke says, "we're really excited about the scalability." He sees that MRM has two effects, "it makes it scalable—really fast machines can get detailed graphics, slow machines can drop the detail seamlessly and still run at a reasonable rate. But it also, on any given platform, lets us get richer detail, especially in the foreground. It's saved us an incredible amount of programming time and given us something really that we couldn't have had."

Matthew Versluys, DARK REIGN II's AI programmer, agrees that "if we didn't have it, then just the overall quality of our game would have to be lower. Without these kind of technologies, we can't make it look amazing on high-end computers but still run a reasonable rate on the low-end machines."

Longer "Legs"

Rick emphasized that with MRM "it's scaleable in both directions. It gives the game more legs, more opportunity to keep being a high-level art game much further down the road. I can make one asset even higher res, and maybe nobody with a current processor will see that asset. But let's say six months from now, they're going to be able to see that without having to change the game. They get it right away. It's a free benefit on both sides. It's perfect."

"We're targeting our assets toward higher-end machines than even exist right now, Greg Borrud explains, "But as they get faster and faster processors, as the machines get

better and better, this game is just going to continue to look better and better. That is something that we've never really been able to do.

Competitive Edge

To Greg the MRM advantage “is the difference between a great game and just another game.” John Cooke suspects that “any game that doesn't have something that does this will just be so out of date that no one will buy it.” Rick Glenn rejoices that “I don't have to fret the little stuff nearly as much as I did before.” He can “just go ahead and design what we most want visually. Go ahead and just remove all the floodgates. Go ahead and let's go to the wall, design whatever we want, and then we'll find a way to bring it back down within the realms. And MRM goes hand in hand with how we fit that back in. That makes a tremendous difference.”

Josh Resnick sums up the team's experience with MRM. “Obviously, it saves us an enormous amount of time and it saves us a lot of money. So we can put that energy and resources into something that will be more impactful to the acquirer. The only thing I'd love, is for them not to share it with my competition.”