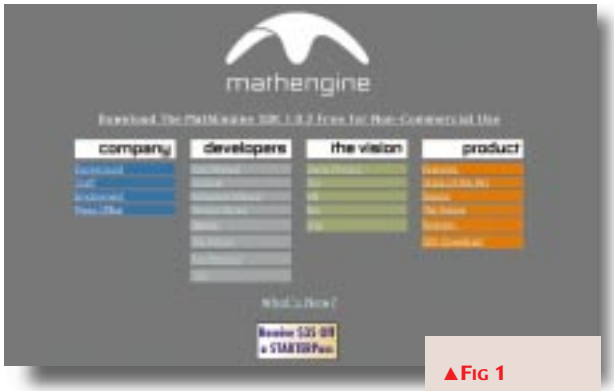
Rules of the game

A games SDK which can simulate physical dynamics? Benjamin Wooley reports.

A tiny, British-based technology company called Mathengine has announced a new piece of software developer's kit (SDK). The product, an SDK for 3D games and simulations, seems to offer something genuinely interesting which demonstrates a great deal of awareness of the force of gravity, as well as all the other physical forces which make the real world behave as it does.

As previously noted in this column, software for creating 3D scenes or virtual worlds has, until recently, been unable to take into account the most basic laws of physics. Create an animation of a rubber ball dropping onto a solid floor, for instance, and the ball is liable to fall straight through and sink into infinity. The animation software simply does not know about the physical properties the ball and floor are supposed to posess and cannot take them into account when generating the animation.

Most mainstream packages such as Ray Dream Studio, Truespace, 3D Studio MAX and Lightwave 3D now include some form of physics in their feature set. In Ray Dream, for example, one object can be given a friction setting to control its resistance to sliding over another. However, introducing physical reality to the virtual world presents two problems: one is that the results can be unpredictable — indeed, the more realistic, the less predictable — the other is that the amount of processing power needed to calculate the physical processes involved adds greatly to the rendering times.



▲ Fig 1 Mathengine's SDK is less than a 2Mb download

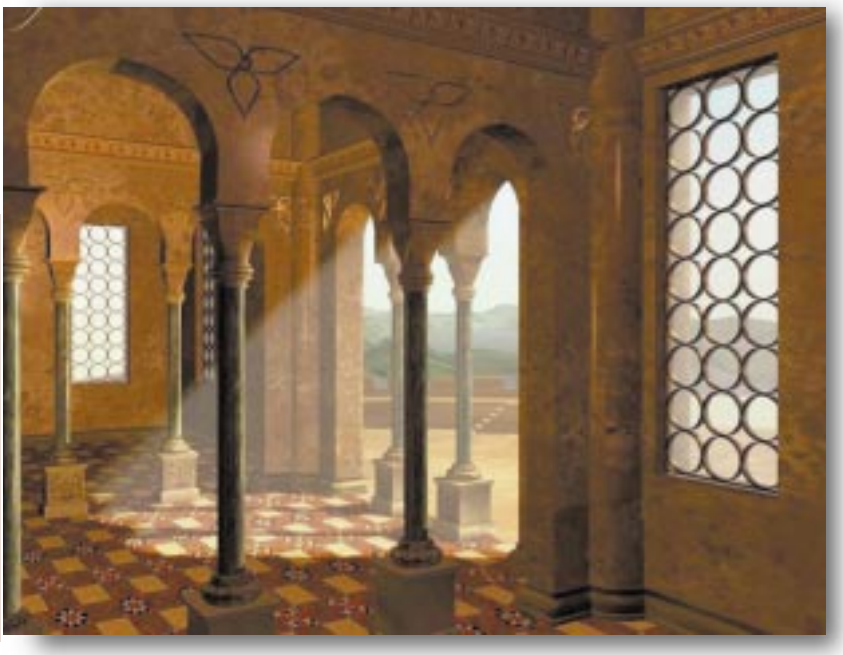
Mathengine's founders claim to have solved the latter problem. They have created a set of routines which allow quite complex physical dynamics to be simulated. Nothing special there, except that these routines are supposed to be so efficient they can calculate the dynamics for several interacting objects in real time.

Of course, you already get real-time physical dynamics in games but these are often crude and limited to a particular aspect of the game, say the collision of cars in a racing game. But after all, games programmers are not physicists.

Indeed, it is the games market that Mathengine is primarily targeting for the time being, offering its SDK to developers so they can integrate dynamics directly with the game code.

The company claims that a games programmer should be able to integrate Mathengine's 'physical framework' into a game within a few hours, complete with all the forces and interactions it specifies.

Those who are not developing games can test these claims by downloading the SDK (less than 2Mb) from the company's website at www.mathengine.com [Fig 1]. There is a selection of precompiled demo files. For example, you can play a sort of planetary billiards with a set of coloured balls scattered around black space which run using a basic DirectX/OpenGL renderer included in the package. The source code for the examples is supplied, so those who fancy dabbling in a bit of C programming can try to tweak them, but you will need a C compiler to do it. There is an extensive manual, together with programming tips and examples, and even a Workspace

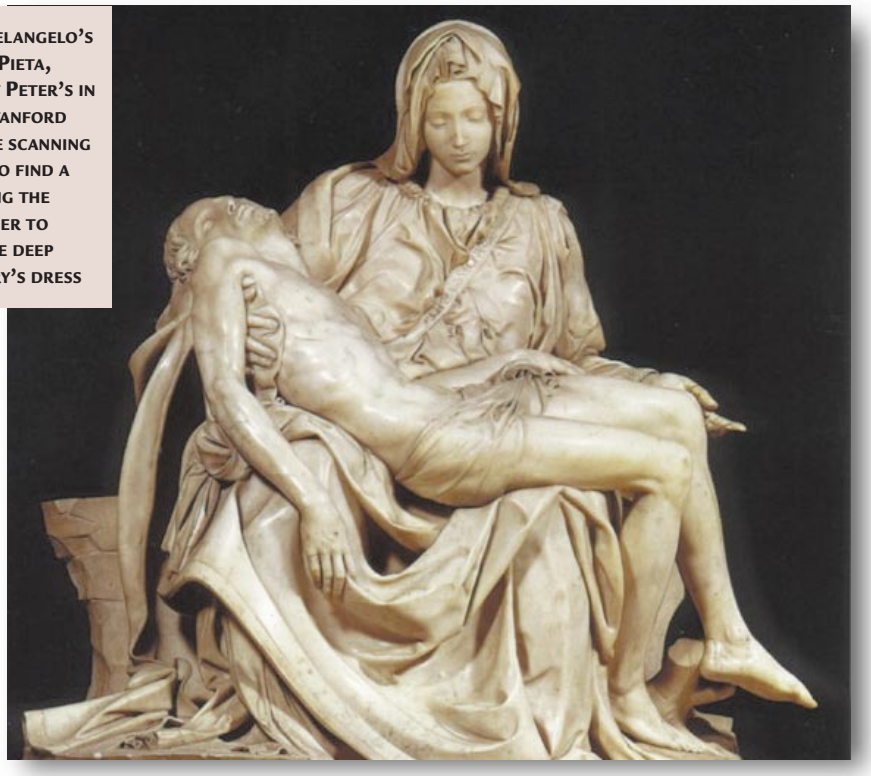


► Fig 2 A scene created by Luiz Barth using 3D Studio MAX which can be seen hanging in the www.maxhelp.com gallery. It was inspired by a Van Eyck painting (Luiz does not specify which). Photoshop was used to tweak the textures

file for users of Visual C++. You can also read a rather technical 'Physics Primer' which explains the principles of 'Rigid Body Simulation'.

The examples are quite impressive. They ran smoothly on my 300MHz Pentium II system with 64Mb and a Matrox Millenium II graphics adaptor, which is a minimal specification by today's standards. However, the graphics used in the examples are very simple and I spotted only one textured surface.

The company states that it has used simple graphics so as not to distract from the dynamics but it remains to be seen whether standard Pentium II systems will be able to cope with calculating all those interactions when the scene is as geometrically complex and highly textured as the sort you find in a game such as Tomb Raider. Also, there are a number of important features yet to be implemented, including collision detection and fluid dynamics so I will make my best effort to keep you posted as developments occur.



► FIG 4 MICHELANGELO'S MASTERPIECE, PIETA, WHICH IS IN ST PETER'S IN ROME. THE STANFORD TEAM WHO ARE SCANNING IT WILL HAVE TO FIND A WAY OF GETTING THE SCANNER'S LASER TO DELVE INTO THE DEEP FOLDS OF MARY'S DRESS

Site of the season

As part of my continuing commitment to introducing regular features to this column which appear only irregularly, here is this month's 'web site of the season'. Its address provides a good idea of what it is all about: www.maxhelp.com. Maintained by my current 3D industry pin-up, the artist and instructor Michele Bousquet, it provides a cornucopia of useful advice and links relating to 3D in general and 3D Studio MAX in particular.

I took the image shown in Fig 2 from la Bousquet's gallery. It is a scene created by Luiz Barth who has a website at www.geocities.com/SoHo/Coffeehouse/7342/ which only appears to work properly using Netscape 4.5 or above. I thought Luiz's use of atmospheric effects and the architectural detailing was particularly impressive — note the moulding around the upper parts of the wall.

◄FIG 3 THE PROTOTYPE OF THE 'RANGE' SCANNER BEING USED IN THE DIGITAL MICHELANGELO PROJECT, HERE BEING TESTED WITH AN EGYPTIAN SARCOPHAGUS

Virtual Michelangelo

Currently, one of the most exciting 3D initiatives is the Virtual Michelangelo project underway in Florence. A team at Stanford University in the US have teamed up with art historians and conservationists in Italy to create virtual versions of Michelangelo's greatest sculptures. They have developed a new type of laser scanner [Fig 3], which they use to get the basic shape, together with a jointed digitising arm and small triangulation laser scanner made by Faro Technologies and 3D Scanners 'for those hard-to-reach places'.

As you can see from the picture of one of the sculptures they intend to digitise, the sublime Pieta [Fig 4], there are lots of hard-to-reach places in Michelangelo's work. Furthermore, none of the works can be moved, so the team will have to use their ingenuity to get all the angles they need.

The team's interest arises from its pioneering work into 'range' scanning, using beams of laser light to scan large or distant objects. You can get a good idea of their progress in the field by exploring the links on the Digital Michelangelo Project website at graphics.stanford.firenze.it/projects/mich/.

PCW CONTACTS

Benjamin Woolley can be contacted via the PCW editorial office (address p14) or email 3d@pcw.co.uk