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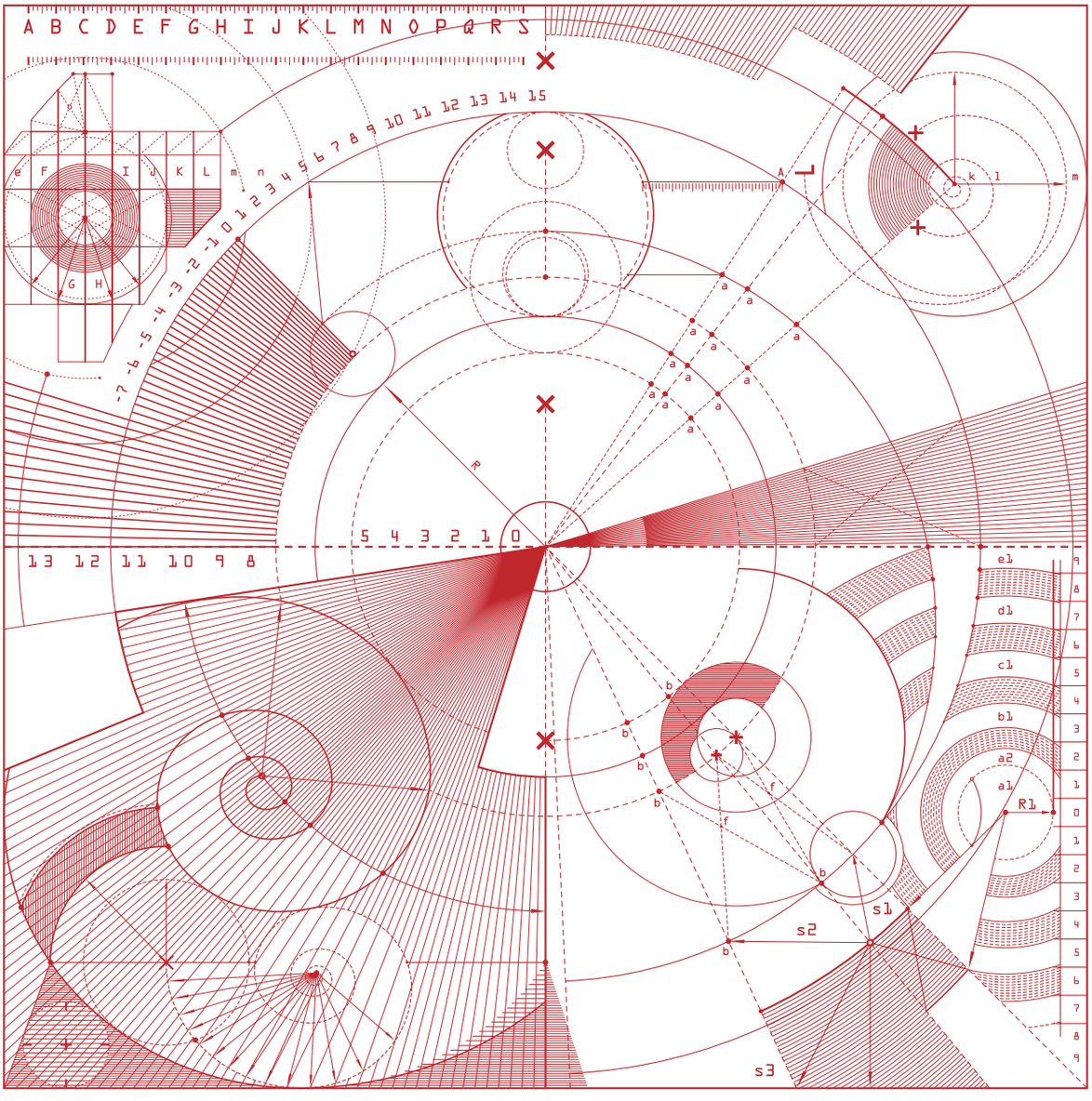

SPECIAL REPORT

PROJECT EUROPE

Research & development shaping the world's future

British Publishers
media with influence

GameTools Project – Realism and Virtual Quality for Games

The computer and console game market is a major market for Europe but pressure is on games designers to meet expectations under limiting conditions. However, an EU Project now means new methods of video games design can give our European games industry the tools to take the competitive advantage when it comes to games realism. Read on to find out how…

The games industry in Europe has an important impact on the development of the European economy but faces fierce competition from industrial giants like the US and Japan. Although the game development industry in Europe is facing rising revenues, most European game developers are also facing severe problems. Computer game companies in Europe are usually SMEs which are continually under threat because of the dominant position of North American and multinational companies. Also due to the high-risk nature of game development, shortage of funding for research and stringent deadlines in the sector, knowledge transfer from academia to industry is extremely slow. Therefore creating a channel with a steady flow of information from academia to industry represents an advantage, both for research groups and game companies.

Realistic games

The past decade has seen an enormous progress in computing power and graphics hardware and along with that a trend towards more and more 'realistic' games. Each year, the computer gamer sees an improvement in graphics quality and better simulation. Racing cars look more like real cars, sound more like real cars, and handle more like real cars. Trees are now rendered leaf by leaf. In first-person shooters today, you can not only blast the enemy, but also doors, windows, walls, and whatever objects happen to be in the room, and they will burst into shrapnel in different ways dependent on what material they are made of.

There is no doubt that realism is a very big thing in computer games today. Game developers tout it as their main selling point, and video game console manufacturers battle it out over whoever has the best graphics hardware to render the most number of polygons in the shortest time. The encounter between a massive consumer market and the computer graphics technology is significantly boosting both fields.

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Tools for games

Visibility, geometry and lighting are three of the main areas involved in the development of a computer game. Hence, the GameTools Project has developed new tools that dramatically increase the realism and visual quality of computer games in these three key areas in modern computer graphics:

- High quality, automated visibility for dynamic scenes, exploiting modern computer graphics hardware, enables the rendering of larger, more impressive scenery without costly human pre-processing.
- Intelligent geometry complexity reduction allows for unprecedented detail in the rendering of highly complex objects such as plants.
- Real-time global illumination gives previously unseen visual quality in dynamic lighting.

For videogames, this allows that larger, more realistic and impressive worlds can be presented to the player, which leads to a stronger emotional immersion in the game and therefore a better game experience.

For non-gaming high-end 3D applications, such as interactive architectural walkthroughs, the GameTools library allows a highly realistic visual representation, previously not possible in real time. The tools are being developed around the software that sits at the core of a computer game, the 3D engine.

Games for science

GTP geometry

The GTP Geometry Lib supplies a multi-resolution LOD solution that addresses the shortcomings of previous approaches by giving developers access to a complete package of solid technology which offers a continuous multi-resolution model for

1-3 Vegetation represented using the new Level of Detail techniques

4 Robust triple self reflection in a complex environment

5 Information theoretic based ambient occlusion combined with a non photorealistic rendering technique

6-7 Online culling in a terrain scene using Ogre3d

8 Pre-processed visibility in the Vienna city scene

For non-gaming high-end 3D applications, such as interactive architectural walkthroughs, the GameTools library allows a highly realistic visual representation, previously not possible in real time

static and animated meshes that includes connectivity information, avoiding those annoying interruptions between the different resolution levels for each model, and uses basic primitives like triangle strips. These features reduce dramatically the amount of information stored and overcome the bandwidth bottleneck between the main processor and the memory of the modern high performance graphic cards.

This is a new multi-resolution model specially suited for the real time rendering of trees and plants, allowing an incredible amount of close up detail. The model is able to show each leaf when the user is closer and gives automatically simplified representations when the observer moves away.

GTP illumination

The GTP approximate ray tracing module delivers ray tracing effects, such as reflections, refractions and caustics at few hundred frames per second due to their GPU implementation. The method is based on special environment mapping when the distance information is also stored in environment map texels, from which accurate localised reflections can be obtained. Exchanging the roles of the camera and light sources, the same approach is also good for rendering real-time caustics. This method brings physically correct rendering to the domain of real-time graphic. Effects included:

- Soft Shadow / Light-effects
- Dynamic Light-sources
- Indirect Illumination
- Reflections
- Real-time Radiosity
- High-Quality Materials
- Cloud Rendering

GTP visibility

The focus of the visibility is on a practical solution to visibility that can readily be used in computer games. The complexity of the content displayed in the computer game,

makes very import to ensure that only the actually visible parts of a game environment are sent to the graphics pipeline.

The Visibility Lib renders faster by only displaying the visible objects in the scenes, through:

- Fast pre-calculated visibility based on modern visibility research.
- Efficient visibility for dynamically changing scenes employing modern graphic hardware.
- Both approaches work for indoor & outdoor scenes and are much faster and flexible than existing techniques.

The GTP Visibility Library offers two robust solutions for visibility. The first solution is based on hardware occlusion queries and can therefore cope with heavily dynamic scenes by calculating visibility on the fly. The second solution is tailored towards huge scenes with large static parts and is based on pre-computing potentially visible sets for regions of space.

GameTools for enterprises

GameTools Project has brought together European computer graphics research groups and game companies from Austria, Hungary, France and Spain. The modules developed by the research groups are validated and tested by the game companies, and integrated into their in-house rendering systems to provide demonstrators showing the viability of the developed methods. Furthermore the members of the GameTools Special Interest Group (SIG) can also use the preliminary access to the project technology and C++ source code. At this moment almost thirty European game companies are using the GTP technology and have the full support by research teams.

At a glance:

After the project life in May 2007, the involved parties will continue with their work creating the GTP Spin off with its headquarters at the University of Girona, Spain. The company will provide several support services and work on the extension of libraries with new functionalities.

European developers: Get instant free access to the technology developed in the European Union GameTools Project (GTP): Become a member of the GTP Special Interest Group (SIG)!

Becoming a GTP SIG member:

Have a look at the very liberal GTP SIG membership agreement – access it at www.gamestools.org. You can also check out which companies have already joined.
Contact the GTP Community Manager, with some short information about your company, especially a link to the company webpage and your position (please feel free to also email any questions about the GTP or GTP SIG). If you are a company developing within the EU, you will get two fax numbers so you can you simply fax the filled out and signed agreement to them.

This is what you get:

- Leading edge 3D libraries supporting realtime global illumination effects, efficient plant & tree rendering, online & offline visibility, etc. Please have a look at some GTP videos, or the Jungle Rumble demogame.
- Engineered C++/Direct3D 9/OpenGL code designed to work with external 3D engines, instead of OpenGL/GLUT mini engine hacks.
- Direct support from the researchers & developers of the technology. Talk to the people who wrote the papers and implemented the code.
- A voice to criticize and give feedback and influence the future direction of the GTP and upcoming GTP 2.

www.gametools.org