GameTools Annual Report

www.gametools.org

The
GameTools Project
is an EU project from the 6th Framework Programme that brings together
leading European computer graphic experts
from universities in Austria, France, Hungary and Spain with
European industrial partners
from the fields of computer game development and virtual reality to create
next generation realtime 3D libraries
for **Geometry**, **Visibility** and **Global Illumination** for the
PC platform,
with an extension to consoles
PS2, XBox, PS3, XBox 360
planned.

In addition to the core GameTools members,
additional industrial partners
can get preliminary access to the technology by becoming members of the
GTP Special Interest Group **(SIG)**

Summary of Activities

The GTP Kick Off Meeting successfully took place in Girona on September 17th 2004. Following a pre-project evaluation process, OGRE was finally chosen as the common open source 3D framework for which the university partners will implement the GTP library modules.

According to plan, the consortium began working in WP2, System Specification. In order to fine-tune the specifications, a detailed questionnaire to collect the user-requirements was created by the universities in collaboration with AIJU. The questionnaire was sent to a number of computer games and 3D companies, and its results were summarized in a feedback report. The Adapted 3D Engine was a report that explained the different modifications which have been done to the OGRE Engine in order to fulfil the requirements of each partner to develop the project Libraries.

The core work packages of the project, WP3: Visibility, WP4: Geometry and WP5: Illumination started at month 3. For each work package, two deliverables have been submitted. The first one documented the dummy modules, which are available to the industrial partners in order to begin the integration of the module interfaces with their own products. The second one is a technical report that describes the algorithms used on the different modules.

Two Project Management Meetings have been held during this period. The first one took place in Valencia on February 25th 2005. The consortium was satisfied with the progress as due to everything being on track. There was an interesting discussion about the exploitation and dissemination of the project results. The second meeting took place in Vienna, on July 15th 2005. Again the consortium was satisfied with the project. The meeting was focussed on the upcoming first year reporting period.

Regarding the assessment of the project, a detailed set of project objectives and quantifiable indicators to measure the accomplishment of the objectives were specified at month 2. Now, at month 12, a new assessment report has been delivered to EC. This report uses the defined indicators to analyse the accomplishment of objectives up to now. During the next six months, the GameTools scientific efforts will be directed to the implementation of the working modules on visibility, geometry and illumination. At the same time, companies will focus on the integration of the available modules into their own products, solving new and already identified problems. Some preliminary results are coming out from the project, and so the effort on dissemination and exploitation will have to intensify from now on.

Work Areas

The development of next generation **Realtime 3D Libraries** is the agenda of the GameTools Project (GTP), an EU project from the 6th Framework Programme. The GTP pushes the envelope in the fields of:

- **Geometry**
- **Visibility**
- **Global Illumination**

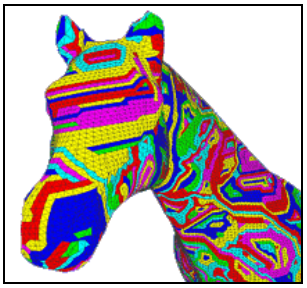
The GTP libraries are being developed for next generation **PC hardware**, with videogame consoles - PS2, XBox, PS3, XBox 360 - planned as additional hardware platforms.

Geometry

Continuous Multiresolution Models are a LOD **(level of detail) technique** in computer graphics which addresses the problem that scenes contain **too much geometry** when all of the visible objects are rendered at their full geometric resolution. While algorithms along that line have long been available, most modern game/3D-engines implement the much simpler technique of discrete LODs instead. Discrete LOD techniques are widely known for the annoying visible artifacts they produce at the moment the switch between the different resolution models occurs, a drawback unfit for the visual quality of the next generation of 3D/game applications.
The **GTP GeometryLib** supplies a **Multiresolution LOD Solution** which addresses the shortcomings of previous approaches by giving developers access to a complete package of solid technology which supplies:

1. **A fast image based simplification algorithm** to efficiently create high quality MLODs without human intervention.
2. **Multiresolution triangle strip generation** taking into account **topology** and **texture** of the base model.
   Triangle strips are the most efficient way to overcome the bandwidth bottleneck between the main processor and memory on modern high performance graphic cards, thereby vastly speeding up the rendering process.
3. A **memory & runtime efficient compressed multiresolution mesh format** that contains triangle strip information, avoiding the need for costly on-the-fly tristrip generation.
4. A new multiresolution model **specially fitted for plants** allowing for an **incredible amount of close up detail** for e.g. leaves, while at the same time supplying simplified representations for the **fast rendering of objects** which are **further away**.





Visibility

In computer graphics, **Visibility** deals with the problem of rendering faster by rendering only the objects of the scene that can be seen.
Existing solutions along that line employed in modern day 3D/game-engines are mostly based either on **Portals** or on **Quake style PVS** (potentially visible set). While these approaches have been successfully employed in commercial products for years, they nonetheless have considerable drawbacks:

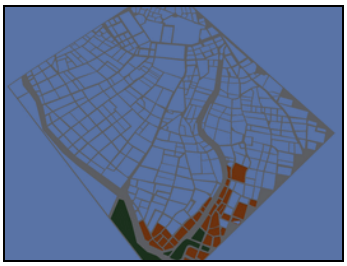
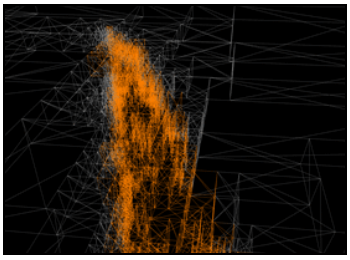
1. Both approaches are *not suited for outdoor scenes* (except scenes which are technically indoor-scenes).

2. It is *hard to automatically place portals efficiently*, so it normally has to be done by hand.
3. *Portals* are by nature a very *conservative visibility approximation.*
4. *Portals* are *not suited for dynamic occluders*.
5. For maximum efficiency *Quake style PVS* is usually done on a scene *stored in a BSP tree*, which, amongst other drawbacks, is a scene data structure *not well suited for dynamically changing scenes*.
6. *Quake style PVS* precalculation can take prohibitively long.

The **GTP VisibilityLib** will overcome these problems with a 2-phase strategy:

1. A solution which supplies **precalculated visibility** based on **modern visibility research**, also suited for **outdoor scenes**.
2. A solution which efficiently employs **modern day graphic hardware** to deliver **on-the-fly visibility** with **minimal overhead**.

Both solutions work best when used together, but can also be employed independently from one another, as to best suit the 3D/game engine in use.

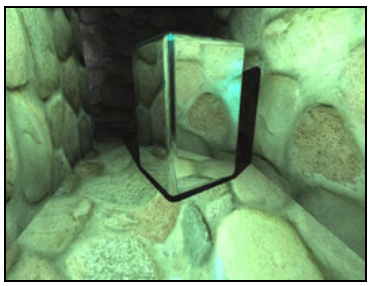
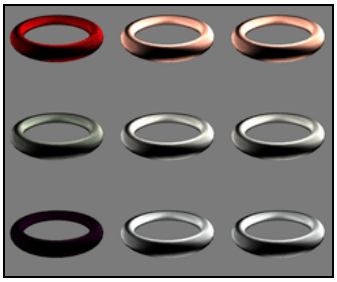
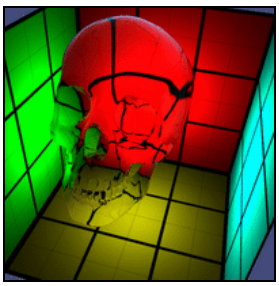




Illumination

Global Illumination is the field of computer graphics that deals with **physically correct illumination**. Usually this is associated with stochastic raytracing solutions **taking hours to calculate a single picture**.
The **GTP IlluminationLib** brings physically correct rendering to the domain of realtime graphics.

1. **Effects that will be possible include:**
2. **Soft Shadow/Lighteffects**
3. **Dynamic Lightsources**
4. **Indirect Illumination**
5. **Reflections**
6. **Realtime Radiosity**
7. **High-Quality Materials (Metal,...)**
8. **Cloud Rendering**

allowing for **previously unseen levels of realism** in 3D/game applications.

User Involvement

The project web site is available since November 2004. After iteratively designing and introducing a new, improved logo, which better expresses the GTP goals and is therefore better suited for advertising it, a full new enhanced version of the GTP webpage was created by the Community Manager, and published on February 2005. It's wording has consecutively been repeatedly used as blueprints for other GTP documents; it has since then been constantly improved to be more attractive and useful to the general public and especially to the future SIG members. All the news about GameTools, publications, papers and videos to show the results are available to the public through the web. A restricted Partners Area can be found on the website, and it hosts all the documents produced by the consortium. There is also a Forum available to the Partners to facilitate and speed up the communication among them.
Since the start of the project the CM has been repeatedly talking to game companies, and has consecutively been creating a SIG membership draft, which has been evaluated by the IPR Helpdesk. Due to the large amount of already presentable GTP material, the GTP was preliminary presented at an IGDA meeting in Vienna and advertised by the CM at the Game Developers Conference Europe 2005. At the GDCE many contacts with interested companies from all over Europe were made, in addition to talks with videogame/PC hardware & software companies such as Sony, Microsoft, NVidia, ATI, Intel and AGEIA.

Future Work

During the following year, the GameTools consortium will be focussed on the development of the visibility, geometry and illumination modules. On April 2006, working modules will be delivered, and therefore companies will begin to seriously test and integrate the plug-ins on their own platforms or demonstrators.
Regarding exploitation, a revision of the exploitation and use plan will be delivered on February 2006. The consortium will work hard in order to come up with a strong exploitation and use plan, which will be applied during the last year of the project, when the results will be strong enough to cause a good impression to the interested companies.
Regarding Community Management & the GTP Special Interest Group, a SIG membership agreement draft has already been created and approved by the PO; the short term goal will be to adapt this draft, to address feedback from potential SIG members, especially with regards to potential IP Infringement. After that, efforts will be directed to get early adaptors to join the SIG; this will give us feedback on the process of becoming a SIG member and the SIG contract, and consecutively on the technology created and the support given by the GTP WP groups. To this mean the GTP SIG support forum will also be finalized. In parallel and taking the lessons learned from the early adaptors into account, advertising methods for the GTP SIG will be evaluated and implemented.

Canditates include: visiting conferences (speaker/attendant/booth), print (GameDeveloper magazine, GameFace, Edge) & online advertising (Gamasutra, etc), classical mail advertising, merchandising (mousepads, t-shirts,...) and personal presentations at individual companies. A mean that will definitely be employed is following up on contacts made at GDCE 2005. The creation of the first GTP demo games at VUT has already begun, with more planned; These will be employed to showcase what GTP technology can do and to advertise the possibility to join the SIG to get access to the technology now. The use of the demos created by the SIG industrial consortium members for advertising will be evaluated when they become available. With regards to Shark3D, there will be ongoing efforts to keep and intensify the current good working relationship with Spinor.