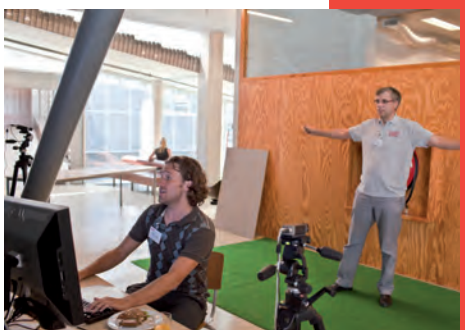
Game research for training and entertainment

Midterm Review

On July 8 the GATE project organized a symposium under the title Game Innovation. During this symposium we presented the 250 visitors with an overview of the research done during the first three years. There were lectures on research topics such as the automatic creation of virtual worlds, self-explaining artificial intelligence, animation through foot placements, and people tracking and pose recognition. We demonstrated the innovative pilots in education, healthcare and safety, and showed the first results of knowledge transfer to industry. The lunch, market and drinks provided ample opportunity for networking.

The symposium was part of the midterm review. A review committee consisting of international experts and Berenschot judged the work done during the first half of the project. Overall the review report produced was very positive about the project. As stated, during the first half of the project a large amount of work was spend in sowing, by investing in producing an international knowledge base, by setting up contacts with industry, and by organizing meetings like the yearly symposium.

Now comes the time of reaping in which the results must anchor further in the Dutch game industry. To this end we are filling in the final knowledge transfer projects such that before the end of 2010 there will be fifteen joint projects with industry that transfer the research results to industrial application. We have also produced a magazine with information about all the results obtained in the project. You can download this through the GATE website www.gameresearch.nl or you can get a paper copy by sending mail to rita@cs.uu.nl. And we are discussing commercial exploitation of the results of the pilots.



The review committee has also recommended producing for each of the four research themes in GATE a new vision statement to highlight the new challenges and opportunities. We will work on this during the coming period and want to involve the whole community in this process, which should lead to a global vision on game research and innovation for the Netherlands during the coming decade. In the next Control we will elaborate further on this.

Mark Overmars
Utrecht University
Director GATE

The GATE movies

During the symposium in July we have shown two movies about the GATE project, produced by iTZiT visuele media. The first movie gives an impression of the results of the project. The second movie contains more in-depth information about the work and its impact on industry and society. You can watch both movies here: http://gate.gameresearch.nl/index.php?pageID=111.

New Knowledge Transfer

Two new knowledge transfer project have been approved and will start in the very near future. A project with Deltares will deploy procedural modeling techniques for enriching coarse GIS data with details that are life-like and consistent with the geo-specific context. The tools and techniques developed will allow one to quickly obtain virtual worlds that are based on GIS source data and are suitable for training use.

A project with RANJ deals with behavioral modeling of Non-Player Characters in games. The goals is to develop BDI models (models based on beliefs, desires, and intentions) for practical applications and to verify whether such models indeed lead to more convincing NPCs. The context will be a game for sales training.

Creating compelling paths for virtual crowds

Control your virtual crowd

A challenge in current games is to create a large crowd of characters that behave in a visually convincing way. Recent work at Utrecht University has provided new insight toward a more realistic path planning approach.

Interactive virtual environments, such as games, are populated by more and more characters that navigate through the virtual world. Such characters may have individual goals, wander around, walk in small groups or be part of large armies. Existing solutions have difficulties to steer such a crowd of characters in an efficient and realistic way.

Mesh: collision-free space

We recently developed a fast method to steer thousands of characters at interactive rates. Our method relies on a convenient representation of the walkable space of the environment. This representation is automatically computed and forms a 2D navigation mesh. The method is fast, for example, building such a mesh for a city environment consisting of 220K triangles takes less than 0.1s. Hence, our method can be used in real-time within large environments.

Indicative Route Method

Once the mesh is constructed, our recently proposed Indicative Route Method is used to guide the movements of the characters. This method is based on the simple idea that a steering method should not produce a path but a so-called indicative route. When we plan our paths in real life we do not compute a precise route. Instead, we determine a global (indicative) route toward our desired goal. For example, we determine the streets we have to follow in order to reach our destination, but we do not decide in advance on which side of the street we will walk, or where and how we cross the streets. Similarly, given the start and the goal position of a character, an indicative route indicates the character's preferred route. This route can either be drawn manually by a level designer or computed automatically to encourage certain character behavior.

The character does not need to traverse the indicative route exactly, but rather uses it as a guide to plan its final motion. For that reason, a corridor, which is a collision-free area around the indicative route, is extracted from the mesh. This allows the character to locally adapt its route so that it can avoid collisions with other characters.

Collision avoidance

Our collision avoidance approach is based on the hypothesis that an individual adapts its route as early as possible, trying to minimize the amount of interactions with others and the energy required to solve these interactions. Building upon this hypothesis, a character predicts possible future collisions with other characters and then makes an efficient move to avoid them. Consequently, the characters do not repel each other, but rather anticipate future situations avoiding all collisions long in advance and with minimal effort. This ensures smooth avoidance behavior and reproduces emergent phenomena, such as lane formation, which have been observed in real crowds. The technique is easy to implement and is fast.

Small groups

To enhance the believability of a crowd, we also developed a novel approach that simulates the walking behavior of small groups of characters. Here, we focused on how group members interact with each other, with other groups and individuals. Our model is elaborated from recent empirical studies and has been successfully combined with the Indicative Route Method. We showed, even in challenging scenarios, that the groups safely navigate toward their goals by dynamically adapting their formations.

Realistic simulation of crowds will considerably improve the immersion in game worlds.

Roland Geraerts works as an Assistant Professor at Utrecht University. He has a PhD in Computer Science and is interested in game technology. His main research topics include path planning and crowd simulation which are embedded in the GATE work package 2.3, Natural Paths for Virtual Entities. He organizes the Creative Game Challenge, which is a game creation contest for high school students; see http://www.creativegamechallenge.nl. Roland can be reached at roland@cs.uu.nl.