Editorial **Cyber Games and Interactive Entertainment**

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Computer games and interactive entertainment have become a part of our life. The past decade has witnessed significant and fast advances in computer games technology. The boundary of 3D graphics in games has been pushed further with new and faster algorithms. Modeling of very large and complex 3D environments including buildings and terrains is a challenge. This involves efficient representations and data structures that help in the navigation and rendering of the environments in real time. Character behaviour modelling has recently gained the interest of researchers. Similar developments have been found in game physics to bring realistic behaviour to objects in a game environment. A wide range of character faces including talking heads have been deployed in games. These demand new methods to represent deformable faces. Game AI has grown rapidly with several new techniques in learning that have found applications in modern day games. Several new algorithms have also been developed recently for path planning and character behaviour in navigation. Rapid advances in technology and production skill are producing game engines that lead to the development of games content which are increasingly entertaining and impressive.

This special issue on Cyber Games and Interactive Entertainment focuses on the latest research and development work in games and interactive entertainment. This special issue presents some selected papers from the International Conference on Cyber Games 2008 (CG2008) held on 27– 30 October 2008 at Beijing, China. Authors were invited to submit revised and extended version of their papers from the conference.

Jurgelionis et al. in "Platform for distributed 3D gaming," present a new cross-platform approach for distributed 3D gaming in wired/wireless local networks. The article introduces novel system architecture and protocols used to transfer the game graphics data across the network to end devices. Simultaneous execution of video games on a central server and a novel streaming approach of the 3D graphics output to multiple end devices enable the access of games on low-cost set-top boxes and handheld devices that natively lack the power of executing a game with high-quality graphical output. This is relevant for pervasive gaming in various environments like at home, hotels, or internet cafes; it is beneficial to run games also on mobile devices and modest performance CE devices avoiding the necessity of placing a noisy workstation in the living room or costly computers/consoles in each room of a hotel.

Researchers and developers in the field of computer games usually find that the difficulty to simulate the motion of actual 3D model trees lies in the fact that the tree model itself has very complicated structure, and many sophisticated factors need to be considered during the simulation. Though there are some works on simulating 3D tree and its motion, few of them are used in computer games due to the high demand for real-time in computer games. In the article on "Real time animation of trees based on BBSC in computer games," Ao et al. propose an approach of animating trees in computer games based on a novel tree model representation-Ball B-Spline Curves (BBSCs). By taking advantage of the good features of the BBSC-based model, physical simulation of the motion of leafless trees with wind blowing becomes easier and more efficient. The method can generate realistic 3D tree animation in real-time, which meets the high requirement for real time in computer games.

Mouse picking is the most commonly used intuitive operation to interact with 3D scenes in a variety of games as well as 3D graphics applications. High performance for such operation is necessary in order to provide users with fast responses. The article on "Fast and reliable mouse picking using graphics hardware" by Zhao et al. proposes a fast and reliable mouse picking algorithm using graphics hardware for 3D triangular scenes. Their approach uses a multilayer rendering algorithm to perform the picking operation in linear time complexity. The objects-space-based ray-triangle intersection test is implemented in a highly parallelized geometry shader. After applying the hardwaresupported occlusion queries, only a small number of objects (or subobjects) are rendered in subsequent layers, which accelerate the picking efficiency.

Hu et al. in their work on "A dense point-to-point alignment method for realistic 3D face morphing and animation" present a new point matching method to overcome the dense point-to-point alignment of scanned 3D faces. Instead of using the rigid spatial transformation in the traditional iterative closest point (ICP) algorithm, the authors adopt the thin plate spline (TPS) transformation to model the deformation of different 3D faces. Because TPS is a nonrigid transformation with good smooth property, it is suitable for formulating the complex variety of human facial morphology. A closest point searching algorithm is proposed to keep one-to-one mapping, and to get good efficiency the point matching method is accelerated by a KD-tree method. Having constructed the dense point-topoint correspondence of 3D faces, the authors create 3D face morphing and animation by key-frames interpolation and obtain realistic results.

In the article "Gamer's Facial Cloning for Online Interactive Games," Sattar et al. propose a solution to solve two bottlenecks in facial analysis and synthesis for an interactive system of human face cloning for nonexpert users of computer games. The problem arises during tactical maneuvers of the gamer, which makes single camera acquisition system unsuitable to analyze and track the face due to its large lateral movements. For an improved facial analysis system, the authors propose to acquire the facial images from multiple cameras and analyze them by multiobjective 2.5D active appearance model (MOAAM). To successfully clone or retarget the gamer facial expressions and gestures on to an avatar, the authors introduce a simple mathematical link between their appearances and present results to validate the efficiency, accuracy, and robustness of their approach.

Zhang and Prakash, in the article on "Face to face: anthropometry-based interactive face shape modeling using model priors," present a new anthropometrics-based method for generating realistic, controllable face models that can model faces specific to a population group or specific race. The method establishes an intuitive and efficient interface to facilitate procedures for interactive 3D face modeling and editing. It takes 3D face scans as examples in order to exploit the variations presented in the real faces of individuals. The system automatically learns a model prior from the datasets of example meshes of facial features using principal component analysis (PCA) and uses it to regulate the naturalness of synthesized faces. Solving the interpolation problem in a reduced subspace allows them to generate a natural face shape that satisfies the user-specified constraints. At runtime, the new face shape can be generated at an interactive rate.

Zhou et al. in the article "A new 3D model retrieval method with building blocks" propose a novel method of interactive 3D model retrieval with building blocks. First, by using a cube block as the base block in a 3D virtual space, the authors construct the query model with human-computer interaction method. Then through retrieving the polygon model of the database generated by the voxel model, the authors show how to get retrieval results in real time. As the numbers of 3D models available grow in many application fields, there is an increasing need for a search method to help people find them which are not effective where traditional search techniques are not always effective for 3D data.

In Multiplayer Ubiquitous Games (MUGs), players have to interact in the real world at both physical and virtual levels. Player profiles in MUGs offer an opportunity to provide personalized services to gamers. To provide an adaptable and personal content at any moment, anywhere, and in any context, Pellerin et al. in their article on "Player profile management on NFC smart card for multiplayer ubiquitous games," use player profiles in to provide personalized services to gamers. A Java API is used to integrate Smart Cards in the development of MUGs. This user centric approach brings new forms of gameplay, allowing the player to interact with the game or with other players anytime and anywhere. Smart Cards also help improve the security, ubiquity, and the user mobility in traditional MUGs.

Finally, we would like to thank all authors who have submitted their manuscripts to this special issue and the external reviewers for their invaluable contributions to the reviewing process. We would like to thank the Editorin-Chief, Dr. Edmond Prakash, for giving us this great opportunity of organizing this special issue. We hope all researchers will enjoy and benefit from reading the articles in this IJCGT special issue on "Cyber games and interactive entertainment."

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