WSCG 2009

17th WSCG International Conference on Computer Graphics, Visualization and Computer Vision 2009

University of West Bohemia
Campus Bory

February 2 – 5, 2009

Conference Program

Abstracts

Program Co-Chairs

Min Chen, Swansea University, United Kingdom
Vaclav Skala, University of West Bohemia, Czech Republic

WSCG 2009 Conference Schedule

Registration: CENTRAL hotel, Monday, February 2, 17:30 - 21:00
Conference office will be open during breaks, only

8:30 - 10:10		10:40 - 12:00		13:00 - 14:40		15:40 - 17:00
1:40	0:30	1:20	1:00	1:40	1:00	1:40
Tuesday, February 3						
Welcome & Session A UP108	Break	Session B UP104 Session SH1 UP101	Photo & Lunch Break	Session C UP104 Session SH2 UP101	Break & Posters	Session C1 Keynote-1 Min Chen UP108
Wednesday, February 4						
Session D UP104 Session F UP101	Break	Session N NVIDIA UP108	Lunch Break	Session E UP104 Session M NVIDIA works UP101	Break & Posters	Session E1 Keynote-2 Eduard Groeller UP108
Thursday, February 5						
Session H UP104 Session L UP101	Break	Session K UP104 Session SH3 UP101	Lunch Break	Session P Czech Centers of Computer Graphics UP108	Closing session UP108	Czech Graphics Groups only

Conference Dinner: Wednesday, February 5, 19:00 – buy a ticket at the registration – offer limited

Brewery Museum: Thursday, February 5 - **guided** tour – 1st group starts 16:00 – offer limited

We recommend you:

- Monday, February 2 – Pilsner Urquell Brewery visit (you have to go directly to the Pilsner Urquell Brewery) (http://www.prazdroj.cz/en/come-and-visit/pilsen-brewery/brewery-tour)
- Tuesday, February 3 – a beer tasting - Pilsner Urquell Brewery Pub (directly in the Brewery)

Invited Speakers

- Chen,M.: Visualization in Flatland
- Groeller,E.: Visualization with Knowledge and Style

FULL Papers

Session A
- Welcome and Opening
- Ripolles,O., Gumbau,J., Chover,M., Ramos,F., Puig-Centelles,A.: View-Dependent Multiresolution Modeling on the GPU [C37]
- Bauman,G., Livny,Y., El-Sana J.: GPU-Based Adaptive-Subdivision for View-Dependent Rendering [E17]
- Taibo,J., Seoane,A., Hernández,A.: Dynamic Virtual Textures [A79]
- Lerbour,R., Marvie,J.-E., Gautron,P.: Adaptive Streaming and Rendering of Large Terrains: A Generic Solution [A19]

Session B
- Jenke,P., Huhle,B., Straßer,W.: Statistical Reconstruction of Indoor Scenes [A17]
- Boesch,J., Pajarola,R.: Flexible Configurable Stream Processing of Point Data [B07]
- Orthmann,J., Salama,Ch.R., Kolb,A.: Responsive Grass [C11]
- Emelyanov,A., Astakhov,Y.: Repairing Heavy Damaged CAD-models [B79]

Session C
- Latapie,S.: Hybrid sort-first/sort-last rendering for dense material particle systems [B41]
- Parys,R., Knittel,G.: Giga-Voxel Rendering from Compressed Data on a Display Wall [C43]
- Schwartz,Ch., Degener,P., Klein,R.: Interactive Editing of Upholstered Furniture [B37]
- Gobithaasan,R.U.,Jamaludin,M.A., Miura,K.T.: The Elucidation of Planar Aesthetic Curves [D67]
- Roth,A., Juhasz,I.: Quadrilateral mesh generation from point cloud by Monte Carlo method [B89]

Session D
- Lipski,C., Berger,K., Magnor,M.: vIsage - A visualization and debugging framework for distributed system applications [A05]
- Hermann,M., Greß,A., Klein,R.: Interactive Exploration of Large Event Datasets in High Energy Physics [B23]
- Přibyl,J.,Zemčík,P.: User Motion Prediction in Large Virtual Environments [B43]
- Malik,M.M., Heinzl,Ch., Gröller,M.E,: Computation and Visualization of Fabrication Artifacts [A61]
- Holland,J., Semwal,S.K.: Flocking Boids with Geometric Vision, Perception and Recognition [E23]

Session E
- Yoon,S.M., Malerczyk,C., Graf,H.: 3D Skeleton Extraction from Volume Data Based on Normalized Gradient Vector Flow [D31]
- Sharma,O., Anton,F.: CUDA based Level Set Method for 3D Reconstruction of Fishes from Large Acoustic Data [C79]
- Marzat,J., Dumortier,Y., Ducrot,A.: Real-Time Dense and Accurate Parallel Optical Flow using CUDA [C05]
- Lister,W., Laycock,R.G., Day,A.M.: Geometric Diversity for Crowds on the GPU [C19]
- Sunyong,P., Kyoungsu,O.: GPU-Only Height Field Rendering For Arbitrary Views [D05]

Session F
- Glanznig,M., Malik,M.M., Gröller,M.E.: Locally adaptive marching cubes through iso-value variation [A53]
- Wenger,S., Fernandez,A., Morisset,J.C., Magnor,M.: Algebraic 3D Reconstruction of Planetary Nebulae [B17]

- Csébfalvi,B., Domonkos,B.: Prefiltered Gradient Reconstruction for Volume Rendering [B31]
- Radziszewski,M., Boryczko,K., Alda,W.: An Improved Technique for Full Spectral Rendering [A43]
- Lim,T., Ryu,,J. Jeong,J.: Selective Deblocking Method Using a Tranform Table of Different Dimension DCT [A83]

Session H
- Pathan,S.S., Al-Hamadi,A., Elmezain,M., Michaelis,B.: Feature-supported Multi-hypothesis Framework for Multi-object Tracking using Kalman Filter [D79]
- Bauer,F., Stamminger,M., Meister,M.: Reconstructing Indoor Scenes with Omni-Cameras [D19]
- Kyriazis,I., Fudos,I., Palios,L.: Extracting CAD Features from Point Cloud Cross-sections [C53]
- Reif,R., Guenther,W.A.: Pick-by-Vision: An Augmented Reality supported Picking System [B29]

Session K
- Rustico,E.: Low cost finger tracking for a virtual blackboard [B47]
- Eissele,M., Sanftmann,H., Ertl, T.: Interactively Refining Object-Recognition System [A13]
- Michikawa,T., Nakazaki, S., Suzuki,H.,: Efficient Medial Voxel Extraction for Large Volumetric Models [D73]
- Elmezain,M., Al-Hamadi,A., Michaelis,B.: A Novel System for Automatic Hand Gesture Spotting and Recognition in Stereo Color Image [D53]

Session L
- Engell-Norregard,M., Erleben K.: Estimation of Joint Types and Joint Limits from Motion Capture Data [A11]
- Baudet,V., Beuve,M., Jaillet,F., Shariat,B., Zara,F.: Integrating Tensile Parameters in Hexahedral Mass-Spring System for Simulation [C59]
- Schlattmann,M., Na Nakorn,T., Klein,R.: 3D Interaction Techniques for 6 DOF Markerless Hand-Tracking [C47]
- Nestler,S., Huber,M., Echtler,F., Dollinger,A., Klinker,G.: Development and evaluation of a virtual reality patient simulation (VRPS) [D23]
- Stanek,S.: Simple emphatic user interface [D61]

Special sessions

Session M
- NVIDIA: TESLA Personal SuperComputer: Live demo & applications

Session N
- NVIDIA: TESLA GPU Computing & CUDA Parallel Programming Architecture : A Revolution in High Performance Computing and Visualization

Session P
- Czech Centers of Computer Graphics

SHORT Papers

Session SH1
- Zemčík,P., Maršík,L., Herout,A.: Point Cloud Rendering in FPGA [C83]
- Löffler,F., Rybacki,S., Schumann,H.: Error-bounded GPU-based terrain visualisation [C41]
- Vergeest,J.S.M., Song,Y.: Fitting freeform multi-parameter shapes to 3D data points - A case study [B02]
- Puig-Centelles,A., Varley,P.A.C., Ripolles,O., Chover,M.: Automatic Terrain Generation with a Sketching Interface [C29]
- Beran,V., Herout,A., Řezníček,I.: Video-Based Bicycle Detection in Underground Scenarios [E07]

Session SH2
- Haindl,M. Hatka,M.: Generalized Roller [D83]
- Knuth,M.,Kohlhammer,J.: A Hybrid Ambient Occlusion Technique for Dynamic Scenes [A31]
- Lefer,W.: Vision Aware Continuum Crowds [E02]
- Garnier,L., Belbis,B., Foufou,S.: Conversion of biquadratic rational Bézier surfaces into patches of particular Dupin cyclides: the torus and the double sphere [E19]
- Sisojevs,A., Krechetova,K., Glazs,A.: 3D Modeling of Free-Form Objects [E97]
- Yasmin,S., Talib,A.Z.: Shape Transformation of Multiple Objects Using Slices [B19]
- Yang,X., Xu,D.-Q.,Zhao,L.: Realtime Ray Tracing on GPU with improved octree [D89]

Session SH3
- Mlích,J., Zemčík,P., Jiřík,L.: Trajectory classification using HMMs [C89]
- Schoor,W., Seidl,T., Bollenbeck,F., Seiffert,U., Preim,B., Mecke,R.: Efficient Semiautomatic Segmentation of Plant Biological Objects Based on Live-wire Methods [E83]
- Cabral,I.P.S., Gonçalves,L.M.G., XavierJ.C.Jr.: WEB GIS by Ajax for Analysis and Control of Environmental Data [B53]
- Aguiar,C.R.S., Druon,S., Crosnier,A.: Pairwise Region-based scan alignment [C61]
- Benger,W., Ritter,M., Acharya,S., Roy,S., Jijao,F.: Fiberbundle-based visualization of a Stir Tank Fluid [E89]
- Lee,S.-H., Han,S.-I., Kang,M.G.: Object Detection in Low Illumination Environment [C17]
- Kim,K.R., Lee,B.G., Yoo,H.: Improvement of the DOI Technique for De-Interlacing [C67]

POSTERS

Session P1
- Rachkovskaya,G., Kharabayev,Yu.: POSTER: Geometric modeling and computer graphics of kinematic ruled surfaces on the base of complex moving one axoid along another (one-sheet hyperboloid of revolution as fixed and moving axoids) [D43]
- Liu,Y., Laycock,S.D.: POSTER: The Force-Map Haptic Rendering Algorithm for Drilling into Volume Data [C23]
- Sisojevs,A., Glazs,A.: POSTER: Efficient approach to direct B-spline surface rendering by a ray tracing [C02]
- Ji,S.-H., Park,S.-H., Ryu,D.-S., Cho,H.-G.: POSTER: A Visualization and Management System for Chat Dialogues on 3D Virtual Avatars [E61]
- Kovacs,L.: POSTER: Seamless NPR Video Painting [A89]
- Nishio,K. Takebayashi,Y. Teshima,Y. Kanaya,T. Kobori,K.: POSTER: Information Transformation for Point Cloud [E73]
- Alizadehashrafi,B., Coors,V., Schulz,T.: POSTER: 3D Navigation Systems based on Synthetic Texturing [D07]

Session P2
- Prado,J. ,Lobo,J., Dias,J.: POSTER: Robotic Visual and Inertial Gaze Control using Human Learning [D41]
- Kwon,J.H., Lee,B.G., Yoon,J., Lee,J.: POSTER: Image Deformation using Radial Basis Function Interpolation [B97]
- Stoeva,M.T., Bozhikova,V.T.: POSTER:Invariant to Transformations Image Retrieval from Image Databases using a Boundary Based Description of Object Shape [A07]
- Zinger,S., Ruijters,D., de With,P.H.N.: POSTER: iGLANCE project: free-viewpoint 3D video [E43]
- Hwang,J., Lim,D., Paik,D.: POSTER: A Composition-Based Image Retrieval Using Line Feature [E79]
- Choung,Y., Kang,K.-K., Kim, D.: POSTER: Example Based Motion Generation with Efficient Control [E59]

KEYNOTES

Keynote-1: Visualization in Flatland
Chen,M.
Abstract:
A large number of challenging problems in visualization involve three or higher dimensional data, while the majority of visualization results have been, and will continue to be, shown on two dimensional computer displays and paper media. "Flatland: A Romance of Many Dimensions", written by a headmaster and Shakespearean scholar in 1884, enlightened us about the fundamental difficulty and hindrance in visualizing such data. The speaker will draw from his experience in areas of visualization (including volume graphics and video visualization), and discuss challenges in visualization from the perspective of "Flatland", highlighting the essence of dimension reduction in several visualization techniques. To a large extent, such challenges also signify the divergence of visualization from traditional computer graphics applications. The speaker will present his answers to the following questions: when does graphics become visualization, and what would be a visualization problem (or concept or system) that is not a graphics one?

Keynote-2: Visualization with Knowledge and Style
Gröller,E.
Abstract:
Utilizing knowledge and information derived from the visualization process or from data analysis helps in generating more effective visualizations. The inclusion of knowledge and employing abstractions on various levels, generates expressive visualizations and allows user-centric interaction metaphors. The talk will cover several examples of knowledge-assisted visualizations: Importance-driven focus of attention is a concept for automatically focusing on interesting features within a volumetric data set. The user selects a focus, i.e., object of interest, from a set of pre-defined features.

The system automatically determines the most expressive view on this feature. Smooth viewpoint changes are controlled by changes in the importance distribution among features in the volume.We will explain style transfer functions which allow to combine a multitude of different shading styles in a single rendering. In the case of multiple volumetric attributes and multiple visual styles the specification of a multi-dimensional transfer function becomes challenging and non-intuitive. We describe semantic layers as a methodology for the specification of a mapping from several volumetric attributes to multiple illustrative visual styles. Semantic layers enable an expert user to specify the mapping in the natural language of her/his domain. LiveSync utilizes deformed viewing spheres for knowledge-based navigation. It is a concept to synchronize 2D slice views and 3D volumetric views of medical data sets.

FULL Papers

A05: vIsage - A visualization and debugging framework for distributed system applications
Lipski,C., Berger,K., Magnor,M.
Abstract:
We present a Visualization, Simulation, And Graphical debugging Environment (vIsage) for distributed systems. Time-varying spatial data as well as other information from different sources can be displayed and superimposed in a single view at run-time. The main contribution of our framework is that it is not just a tool for visualizing the data, but it is a graphical interface for a simulation environment. Real world data can be recorded, played back or even synthesized. This enables testing and debugging of single components of complex distributed systems. Being the missing link between development, simulation and testing, e.g., in robotics applications, it was designed to significantly increase the efficiency of the software development process.

A11: Estimation of Joint Types and Joint Limits from Motion Capture Data
Engell-Norregard,M., Erleben K.
Abstract:
It is time-consuming for an animator to explicitly model joint types and joint limits of articulated figures. In this paper we describe a simple and fast approach to automated joint estimation from motion

capture data of articulated figures. Our method will make the joint modeling more efficient and less time consuming for the animator by providing a good starting estimate that can be fine-tuned or extended by the animator if she wishes, without restricting her artistic freedom. Our method is simple, easy to implement and specific for the types of articulated figures used in interactive animation such as computer games. Other work for joint limit modeling consider more complex and general purpose models. However, these are not immediately suitable for inverse kinematics skeletons used in interactive applications.

A13: Interactively Refining Object Recognition System

Eissele,M., Sanftmann,H., Ertl, T.

Abstract:

Existing techniques for object identification often make use of a combination of multiple algorithms and sensors to achieve adequate results. In this paper we propose a real-time system to efficiently combine multiple object-recognition techniques, appropriate for mobile Augmented Reality applications. We focus on the challenge to differentiate objects with only marginal distinguishing features that can often only be identified from specific points of view, and solve this problem by interactively guiding the user during the recognition process. The system is based on a hierarchy to organize model data and control the corresponding feature-detection techniques as shown in a prototypical implementation. Furthermore, recognition techniques are chosen based on context information, e.g. feature type, reliability of sensor data, etc.

A17: Statistical Reconstruction of Indoor Scenes

Jenke,P., Huhle,B., Straßer,W.

Abstract:

In this paper we consider the problem of processing scanned datasets of man-made scenes such as building interiors and office environments. Such datasets are produced in huge quantity and often share a simple structure with sharp crease lines. However, their usual acquisition with mobile devices often leads to poor data quality and established reconstruction methods fail - at least at reconstructing sharp features. We propose to overcome the lack of reliable information by using a strong shape prior in the reconstruction method: we assume that the scene can be represented as a collection of cuboid shapes, each covering a subset of the data. The optimal configuration of cuboids is found by formulating the reconstruction problem as a discrete maximum a posteriori (MAP) optimization in a statistical sense. We propose a greedy algorithm which iteratively extracts new shape candidates and optimizes over the shape of the cuboids. A new candidate is selected by scoring its ability to reconstruct previously uncovered data points. The iteration converges at the first significant drop in the score of new candidates. Our method is fast and extremely robust to noisy and incomplete data which we show by applying it to scanned datasets acquired with different devices.

A19: Adaptive Streaming and Rendering of Large Terrains: A Generic Solution

Lerbour,R., Marvie,J.-E., Gautron,P.

Abstract:

We describe a generic solution for remote adaptive streaming and rendering of large terrains. The challenge is to ensure a fast rendering and a rapidly improving quality with any user interaction, network capacity and rendering system performance. We adapt to these constraints so loading and rendering speeds do not depend on the size of the database. We can thus use any database with any client device. Our solution relies on a generic data structure to adaptively handle data from the server hard disk to the client rendering system. The same methods apply whatever is done with these data: only the data themselves and the rendering system vary. We base our data structure on existing solutions with good properties and add new methods to handle it more efficiently. In particular we avoid loading irrelevant or redundant data and we request the most important data first. We also avoid costly data structure operations as much as possible, in favor of "in-place" data updates and selection using sample masks.

A43: An Improved Technique for Full Spectral Rendering

Radziszewski,M., Boryczko,K., Alda,W.

Abstract:

In this paper we present an improved approach to full spectral rendering. The technique is optimized for quasi-Monte Carlo ray tracing, however the underlying physical theory can be applied to any global illumination scheme. We start with explanation of the necessity of full spectral

rendering in any correct global illumination system. Then we present, step by step, a rendering scheme using full spectrum simulation. First, we give details on a random point sampling as a method of representing spectra, then we introduce improved spectral sampling technique, designed to reduce variance of image of wavelength dependent phenomena, and finally we show how to integrate the novel sampling technique with selected ray tracing algorithms.

A53: Locally adaptive marching cubes through iso-value variation
Glanznig,M., Malik,M.M., Gröller,M.E.
Abstract:
We present a locally adaptive marching cubes algorithm. It is a modification of the marching cubes algorithm where instead of a global iso-value each grid point has its own iso-value. This defines an iso-value field, which modifies the case identification process in the algorithm. The marching cubes algorithm uses linear interpolation to compute intersections of the surface with the cell edges. Our modification computes the intersection of two general line segments, because there is no longer a constant iso-value at each cube vertex. An iso-value field enables the algorithm to correct biases within the dataset like low frequency noise, contrast drifts, local density variations and other artefacts introduced by the measurement process. It can also be used for blending between different isosurfaces (e.g., skin, veins and bone in a medical dataset).

A61: Computation and Visualization of Fabrication Artifacts
Malik,M.M., Heinzl,Ch., Gröller,M.E.
Abstract:
This paper proposes a novel technique to measure fabrication artifacts through direct comparison of a reference surface model with the corresponding industrial CT volume. Our technique uses the information from the surface model to locate corresponding points in the CT dataset. We then compute various comparison metrics to measure differences (fabrication artifacts) between the two datasets. The differences are presented to the user both visually as well as quantitatively. Our comparison techniques are divided into two groups namely geometry-driven comparison techniques and visual-driven comparison techniques. The geometry-driven techniques provide an overview, while the visual-driven techniques can be used for a localized examination and for determining precise information about the differences between the datasets.

A79: Dynamic Virtual Textures
Taibo,J., Seoane,A., Hernández,A.
Abstract:
The real-time rendering of arbitrarily large textures is a problem that has long been studied in terrain visualization. For years, different approaches have been published that have either expensive hardware requirements or other severe limitations in quality, performance, or versatility. The biggest problem is usually a strong coupling between geometry and texture, both regarding database structure as well as LOD management. This paper presents a new approach to high resolution real-time texturing of dynamic data that avoids the drawbacks of previous techniques and offers additional possibilities. The most important benefits are: out-of-core texture visualization from dynamic data, efficient per-fragment texture LOD computation, total independence from the geometry engine, high quality filtering and easiness of integration with user custom shaders and multitexturing. Because of its versatility and independence from geometry, the proposed technique can be easily and efficiently applied to any existing terrain geometry engine in a transparent way.

A83: Selective Deblocking Method Using a Tranform Table of Different Dimension DCT
Lim,T., Ryu,,J. Jeong,J.
Abstract:
In this paper, we propose a selective deblocking algorithm that reduces block discontinuities in DCT domain. Our algorithm applies a deblocking procedure to each line of adjacent 3 blocks, so the block is divided into several line vectors. There are three Low Pass filters that are applied differently to 1×24 DCT values according to each condition of adjacent 3 vectors for conserving image details, and we use a transform table between different dimension DCTs (1×8 and 1×24 DCT) for reducing a computational cost. The experimental results show that the proposed algorithm makes good results on an improvement of subjective image quality and a computational efficiency.

B07: Flexible Configurable Stream Processing of Point Data

Boesch,J., Pajarola,R.

Abstract:

To efficiently handle the continuously increasing raw point data-set sizes from high-resolution laser-range scanning devices or baseline stereo and multi-view 3D object reconstruction systems, powerful geometry processing solutions are required. We present a flexible and run-time configurable system for efficient out-of-core geometry processing of point cloud data that significantly extends and greatly improves the stream-based point processing framework introduced recently. In this system paper we introduce an optimized and run-time extensible implementation, a number of algorithmic improvements as well as new stream-processing functionality. As a consequence of the novel and improved system architecture, implementation and algorithms, a dramatically increased performance can be demonstrated as shown in our experimental results.

B17: Algebraic 3D Reconstruction of Planetary Nebulae

Wenger,S., Fernandez,A., Morisset,J.C., Magnor,M.

Abstract:

Distant astrophysical objects like planetary nebulae can normally only be observed from a single point of view. Assuming a cylindrically symmetric geometry, one can nevertheless create 3D models of those objects using tomographic methods. We solve the resulting algebraic equations efficiently on graphics hardware. Small deviations from axial symmetry are then corrected using heuristic methods, because the arising 3D models are, in general, no longer unambiguously defined. We visualize the models using real-time volume rendering. Models for actual planetary nebulae created by this approach match the observational data acquired from the earth's viewpoint, while also looking plausible from other viewpoints for which no experimental data is available.

B23: Interactive Exploration of Large Event Datasets in High Energy Physics

Hermann,M., Greß,A., Klein,R.

Abstract:

In high energy physics the structure of matter is investigated through particle accelerator experiments where particle collisions (events) occur at such high energies that new particles are produced. Providing tools for interactive visual inspection of billions of such events occurring in an experiment in an intuitive way is a challenging task. In order to solve this problem we built on previous approaches for visual browsing through image databases and extend them in several ways in order to allow efficient navigation through the collision event datasets. The key features of our novel browsing technique are its applicability to the very large event datasets, a more intuitive selection method for specifying a region of interest, and finally a clustering-based technique that further simplifies and improves the navigation process. We demonstrate the potential of our novel visual inspection system by integrating it into an event display application for the COMPASS experiment at CERN.

B29: Pick-by-Vision: An Augmented Reality supported Picking System

Reif,R., Guenther,W.A.

Abstract:

Order picking is one of the most important process steps in logistics. Because of their flexibility human beings cannot be replaced by machines. But if workers in order picking systems are equipped with a head-mounted display, Augmented Reality can improve the information visualization. In this paper the development of such a system - called Pick-by-Vision - is presented. The system is evaluated in a user study performed in a real storage environment. Important logistics figures as well as subjective figures were measured. The results show that Pick-by-Vision can improve considerably order picking processes.

B31: Prefiltered Gradient Reconstruction for Volume Rendering

Csébfalvi,B., Domonkos,B.

Abstract:

The quality of images generated by volume rendering strongly depends on the applied continuous reconstruction method. Recently, it has been shown that the reconstruction of the underlying function can be improved by a discrete prefiltering. In volume rendering, however, an accurate gradient reconstruction also plays an important role as it provides the surface normals for the shading computations. Therefore, in this paper, we propose prefiltering schemes in order to increase the accuracy of the estimated gradients yielding higher image

quality. We search for discrete prefilters of minimal support which can be efficiently used in a preprocessing as well as on the fly.

B37: Interactive Editing of Upholstered Furniture

Schwartz,Ch., Degener,P., Klein,R.

Abstract:

Fast visualization of industrial parts for rapid prototyping is nowadays eased by the fact that CAD construction data is readily available in most cases. Upholstery constitutes an important exception as its shape is not given a priori but the result of complex physical interactions between hard bodies, soft cushioning and elastic sheets. In this paper we propose an interactive visualization and editing method for upholstery that infers physically plausible surfaces from a sewing pattern. Our method supports fast design decisions by allowing easy and intuitive modifications of the inferred surface at any time. We also propose a reconstruction method for point clouds that is specifically targeted at upholstery. We argue that the sewing pattern encodes important information about shape and material deformations of the final surface and consequently use it as a prior in our reconstruction algorithm. The practicability of our method is demonstrated on two real world data sets.

B41: Hybrid sort-first/sort-last rendering for dense material particle systems

Latapie,S.

Abstract:

This paper describes a solution designed for efficient visualization of large and dense sets of particles, typically generated by molecular dynamics simulations in materials science. This solution is based on a hybrid distributed sort-first/sort-last architecture, and meant to work on a generic commodity cluster feeding a tiled display. The package relies on VTK framework with various extensions to achieve statistical occlusion culling, smart data partitioning and GPU-accelerated rendering.

B43: User Motion Prediction in Large Virtual Environments

Přibyl,J., Zemčík,P.

Abstract:

Motion prediction of various objects is important for work of many people. In some cases the prediction is requested to be accurately for near time queries and in some other cases the prediction is requested to be accurately for distant time queries. For near time queries the techniques can assume the trajectory of an object can be represented by mathematical functions. These formulas are often called motion functions and they use recent movements to predict future locations of the objects. For distant time queries it is impossible to use simple mathematical formulas, because the movement trajectory between current time and the distant future time is too complicated. One of the suitable methods to describe such movement is prediction based on object's trajectory pattern. For this purpose, the movement history of the object is needed. Consequently, data mining methods can mine trajectory patterns from the historic movements and these patterns can be used to predict the future objects movements. The best contemporary methods use combination of trajectory pattern and motion functions. This means that in case no trajectory pattern is found, the motion function is used to determine object's near location. Using the trajectory pattern prediction principle a new approach to optimize communication between client and server in large virtual environments is introduced. The short time and long time prediction queries are used to minimize the overall amount of downloaded data and to deliver the probably requested parts of the scene in priority.

B47: Low cost finger tracking for a virtual blackboard

Rustico,E.

Abstract:

This paper presents a complete and inexpensive system to track the movements of a physical pointer on a flat surface. Any opaque object can be used as a pointer (fingers, pens, etc.) and it is possible to discriminate whether the surface is being touched or just pointed at. The system relies on two entry-level webcams and it uses a fast scanline-based algorithm. An automatic wizard helps the user during the initial setup of the two webcams. No markers, gloves or other hand-held devices are required. Since the system is independent from the nature of the pointing surface, it is possible to use a screen or a projected wall as a virtual touchscreen. The complexity of the algorithms used by the system grows less than linearly with resolution, making the software layer very lightweight and suitable

also for low-powered devices like embedded controllers.

B79: Repairing Heavy Damaged CAD-models
Emelyanov,A., Astakhov,Y.
Abstract:
The presented work is related to the problem of repairing incomplete reconstructed (damaged) CAD-models. To solute this problem, a general concept of the repairing that uses various types of mathematical fields is proposed. One method developed within the framework of this concept is described in details. As the base this method uses interpolation of a given successfully reconstructed surface to estimate the behavior of the corresponding missing one. Ability of the method to repair heavy damaged CAD-models has been proved. This method has a big potential for further development, because the main advantage of the presented concept is that its framework is open to adding various methods of missing surface estimation to supplement each other in the repairing process.

B89: Quadrilateral mesh generation from point cloud by Monte Carlo method
Roth,A., Juhasz,I.
Abstract:
We present a Monte Carlo method that generates a quadrilateral mesh from a point cloud. The proposed algorithm evolves an initial quadrilateral mesh towards the point cloud which mesh is constructed by means of the skeleton of the input points. The proposed technique proves to be useful in case of relatively complex point clouds that describe smooth and non-self-intersecting surfaces with junctions/branches and loops. The esulted quadrilateral mesh may be used to reconstruct the surfaces by means of tensor product patches such as B-spline or NURBS.

C05: Real-Time Dense and Accurate Parallel Optical Flow using CUDA
Marzat,J., Dumortier,Y., Ducrot,A.
Abstract:
A large number of processes in computer vision are based on the image motion measurement, which is the projection of the real displacement on the focal plane. Such a motion is currently approximated by the visual displacement field, called optical flow. Nowadays, a lot of different methods are commonly used to estimate it, but a good trade-off between execution time and accuracy is hard to achieve with standard integrations. This paper tackles the problem by proposing a parallel implementation of the well-known pyramidal algorithm of Lucas & Kanade, in a Graphics Processing Unit (GPU). It is programmed using the Compute Unified Device Architecture from NVIDIA corporation, to perform a dense and accurate velocity field at about 15 Hz with a 640x480 image definition.

C11: Responsive Grass
Orthmann,J., Salama,Ch.R., Kolb,A.
Abstract:
Large natural environments are often essential for todays computer games. Interaction with the environment is widely implemented in order to satisfy the player's expectations of a living scenery and to help increasing the immersion of the player. Within this context our work describes an efficient way to simulate a responsive grass layer with todays graphics cards in real-time. Clumps of grass are approximated by two billboard representations. GPU-based distance maps of scene objects are employed to test for penetrations and for resolving them. Adaptive refinement is necessary to preserve the shape of deformed billboards. A recovering process is applied after the deformation which restores the original that is to say the undeformed and efficient shape. The primitives of each billboard are assembled during the rendering process. Their vertices are dynamically lit within an ambient occlusion based irradiance volume. Alpha-to-Coverage completes the illusion as it is used to simulate the semitransparent nature of grass.

C19: Geometric Diversity for Crowds on the GPU
Lister,W., Laycock,R.G., Day,A.M.
Abstract:
Pure geometric techniques have emerged as viable real-time alternatives to those traditionally used for rendering crowds. However, although capable of drawing many thousands of individually animated characters, the potential for injecting intra-crowd diversity within this framework remains to be fully explored. For urban crowds, a prominent source of diversity is that of clothing and this work presents a technique to render a crowd of clothed, virtual humans whilst minimising redundant

vertex processing, overdraw and memory consumption. By adopting a piecewise representation, given an assigned outfit and pre-computed visibility metadata, characters can be constructed dynamically from a set of sub-meshes and rendered using skinned instancing. Using this technique, a geometric crowd of 1,000 independently clothed, animated and textured characters can be rendered at 40 fps.

C37: View-Dependent Multiresolution Modeling on the GPU
Ripolles,O., Gumbau,J., Chover,M., Ramos,F., Puig-Centelles,A.
Abstract:
Throughout more than a decade, researchers on level-of-detail techniques have oriented their efforts towards developing better techniques and adapting their solutions to new hardware. Nevertheless, we consider that there is still a gap for efficient yet simple multiresolution models which fully exploit the possibilities offered by current GPUs. In this paper we present a new level-of-detail framework which moves the extraction process from updating indices to updating vertices. This feature allows us to perform culling and geomorphing in a vertex-basis. Furthermore, it simplifies the update of indices to eliminate degenerate information. The model is capable of offering both uniform and variable resolution. In this sense, a silhouette-based criterion has been included. Finally, it is important to comment that the model is completely integrated in the GPU and needs no CPU/GPU communication once all the information is correctly loaded in hardware memory.

C43: Giga-Voxel Rendering from Compressed Data on a Display Wall
Parys,R., Knittel,G.
Abstract:
We present a parallel system capable of rendering multi-gigabyte data sets on a multi-megapixel display wall at interactive rates. The system is based on Residual Vector Quantization which allows us to render extremely large data sets out of the graphics memory. At 0.75 bits per voxel, such large data sets can even be kept on a consumer-level graphics card. As an example we compress the whole full color "Visible Human Female" data set, approximately 21GByte in size, down to 700 MByte. Taking advantage of the fixed code length and the extremely simple decompression scheme of RVQ, all decompression is done on the GPU at very high rates. For each frame the data set is decompressed into small subvolumes which are rendered front to back. Classification and shading can be moved into the decompression step, speeding up the rendering pass. We present the performance of the system running on a cluster of 16 PCs, each equipped with a modern graphics card including 1GByte of video memory. Each PC drives one display of a 4x4 display wall with a total resolution of 10240x6400 (65M) pixels.

C47: 3D Interaction Techniques for 6 DOF Markerless Hand-Tracking
Schlattmann,M., Na Nakorn,T., Klein,R.
Abstract:
Recently, stable markerless 6 DOF video based hand-tracking devices became available. These devices track the position and orientation of the user's hand in different postures with at least 25 frames per second. Such hand-tracking allows for using the human hand as a natural input device. However, the absence of physical buttons for performing click actions and state changes poses severe challenges in designing an efficient and easy to use 3D interface on top of such a device. In particular, solutions have to be found for clicking menu items, selecting objects and coupling and decoupling the object's movements to the user's hand (i.e. grabbing and releasing). In this paper, we introduce a novel technique for grabbing and releasing objects, an efficient clicking operation for selection purposes and last but not least a novel visual feedback in order to support the ease of using this device. All techniques are integrated in a novel 3D interface for immersive virtual manipulations. Several user experiments were performed, which show the superior applicability of this new 3D interface.

C53: Extracting CAD Features from Point Cloud Cross-sections
Kyriazis,I., Fudos,I., Palios,L.
Abstract:
We present a new method for extracting features of a 3D object targeted to CAD modeling directly from the point cloud of its surface scan. The objective is to obtain an editable CAD model that is manufacturable and describes accurately the structure and topology of the point cloud. The entire process is carried out with the least human

intervention possible. First, the point cloud is sliced interactively in cross sections. Each cross section consists of a 2D point cloud. Then, a collection of segments represented by a set of feature points is derived for each slice, describing the cross section accurately, and providing the basis for an editable feature-based CAD model. For the extraction of the feature points, we exploit properties of the convex hull and the Voronoi diagram of the point cloud.

C59: Integrating Tensile Parameters in Hexahedral Mass-Spring System for Simulation

Baudet,V., Beuve,M., Jaillet,F., Shariat,B., Zara,F.

Abstract:
Besides finite element method, mass-spring systems are widely used in Computer Graphics. It is indubitably the simplest and most intuitive deformable model. This discrete model allows to perform interactive deformations with ease and to handle complex interactions. Thus, it is perfectly adapted to generate visually plausible animations. However, a drawback of this simple formulation is the relative difficulty to control efficiently physically realistic behaviours. Indeed, none of the existing models has succeeded in dealing with this satisfyingly. We demonstrate that this restriction cannot be overpassed with the classical mass-spring model, and we propose a new general 3D formulation that reconstructs the geometrical model as an assembly of elementary hexahedral "bricks". Each brick (or element) is then transformed into a mass-spring system. Edges are replaced by springs that connect masses representing the vertices. The key point of our approach is the determination of the stiffness springs to reproduce the correct mechanical properties (Young's modulus, Poisson's ratio) of the reconstructed object. We validate our methodology by performing some numerical experiments. Finally, we evaluate the accuracy of our approach, by comparing our results with the deformation obtained by finite element method.

C79: CUDA based Level Set Method for 3D Reconstruction of Fishes from Large Acoustic Data

Sharma,O., Anton,F.

Abstract:
Acoustic images present views of underwater dynamics, even in high depths. With multi-beam echo sounders (SONARs), it is possible to capture series of 2D high resolution acoustic images. 3D reconstruction of the water column and subsequent estimation of fish abundance and fish species identification is highly desirable for planning sustainable fisheries. Main hurdles in analysing acoustic images are the presence of speckle noise and the vast amount of acoustic data. This paper presents a level set formulation for simultaneous fish reconstruction and noise suppression from raw acoustic images. Despite the presence of speckle noise blobs, actual fish intensity values can be distinguished by extremely high values, varying exponentially from the background. Edge detection generally gives excessive false edges that are not reliable. Our approach to reconstruction is based on level set evolution using Mumford-Shah segmentation functional that does not depend on edges in an image. We use the implicit function in conjunction with the image to robustly estimate a threshold for suppressing noise in the image by solving a second differential equation. We provide details of our estimation of suppressing threshold and show its convergence as the evolution proceeds. We also present a GPU based streaming computation of the method using NVIDIA's CUDA framework to handle large volume data-sets. Our implementation is optimised for memory usage to handle large volumes.

D05: GPU-Only Height Field Rendering For Arbitrary Views

Sunyong,P., Kyoungsu,O.

Abstract:
Terrain takes a very important role in making a scene more realistic. Many efforts to accurately represent terrain , however, have confined their usages to flight simulation and most of them have relied on CPU. In this paper, we present a full GPU-based real-time terrain rendering algorithm through ray-casting. Since it requires no geometrical structure like a polygonal mesh, it doesn't need any LOD(Level-Of-Detail) policies, most of which gives much burden on CPU. As a result, it enhances the whole performance of the system. Our method grants a complete freedom to the view point and its direction, so objects can move around so freely in the air or on the surface that it can be directly applied to any computer games and virtual reality system. To better the rendering quality, we applied curved patches to the height field. On the

way, we suggest a simple and useful method to evaluate a ray-patch intersection. We implemented all the processes on GPU, and obtained tens to hundreds of frame rates with a variety of resolutions of height maps: 256x256~8192x8192(texel2).

D19: Reconstructing Indoor Scenes with Omni-Cameras

Bauer,F., Stamminger,M., Meister,M.

Abstract:

We present a system similar to Debevec's Facade that improves the reconstruction of indoor scenes from photographs. With confined spaces it is often impractical to use regular photos as the base of the reconstruction. Combining pinhole cameras with fisheye shoots or photographs of any kind of reflective, parametrisable body such as light probes eases this problem. We call the later camera setup an omni-camera, because it enables us to acquire as much information as possible from a given viewpoint. Omni-cameras make it possible to reconstruct the geometry of an entire room from just one view. Removing the pinhole camera constraint invalidates some key assumptions made in Façade. This paper shows how to work around the problems arising from this approach by adding scene specific knowledge to the solver as well as using a genetic approach.

D23: Development and evaluation of a virtual reality patient simulation (VRPS)

Nestler,S., Huber,M., Echtler,F., Dollinger,A., Klinker,G.

Abstract:

In disasters and mass casualty incidents (MCIs) paramedics initially determine the severeness of all patients' injuries during the so-called triage. In order to enhance disaster preparedness continuous training of all paramedics is indispensable. Due to the fact that large disaster control exercises are laborious and expensive, additional training on a small scale makes sense. Therefore we designed and developed a virtual reality patient simulation (VRPS) to train paramedics in this disaster triage. The presented approach includes gesture based interactions with the virtual patients in order to simulate the triage process as realistically as possible. The evaluated approach focuses on the training of paramedics in disaster triage according to the mSTaRT triage algorithm on a multi-touch table top device. At Munich fire department fully-qualified paramedics performed 160 triage processes with the triage simulation. The accuracy of the triage processes was compared to previous disaster control exercises with real mimes. The presented results of this explorative evaluation will be the basis for future, larger evaluations.

D31: 3D Skeleton Extraction from Volume Data Based on Normalized Gradient Vector Flow

Yoon,S.M., Malerczyk,C., Graf,H.

Abstract:

Markerless 3D skeleton visualization of deformable bodies continues to be a major challenge in terms of providing intuitive and uncluttered renderings that allow the user to better understand their data. This paper presents a three-dimensional skeleton extraction of deformable objects based on a normalized gradient vector flow to analyze and visualize their characteristics. First, target objects are reconstructed by image-based visual hulls from known intrinsic and extrinsic camera parameters and silhouettes which are extracted by kernel density estimation based on an efficient background subtraction. Our 3D skeleton extraction methodology deploys a normalized gradient vector flow technique which is a vector diffusion approach based on partial differential equations. The markerless 3D skeletonization of deformable objects from multiple images might be applied to analyze the 3D motion of target objects enabling an indepth study from within an arbitrary viewpoint.

D53: A Novel System for Automatic Hand Gesture Spotting and Recognition in Stereo Color Image

Elmezain,M., Al-Hamadi,A., Michaelis,B.

Abstract:

Automatic gesture spotting and recognition is a challenging task for locating the start and end points that correspond to a gesture of interest in Human-Computer Interaction. This paper proposes a novel gesture spotting system that is suitable for real-time implementation. The system executes gesture segmentation and recognition simultaneously without any time delay based on Hidden Markov Models. In the segmentation module, the hand of the user is tracked using mean-shift algorithm, which is a non-parametric density estimator that optimizes the smooth similarity function to find the direction of hand gesture path. In order to spot key gesture accurately, a

sophisticated method for designing a non-gesture model is proposed, which is constructed by collecting the states of all gesture models in the system. The non-gesture model is a weak model compared to all trained gesture models. Therefore, it provides a good confirmation for rejecting the non-gesture pattern. To reduce the states of the non-gesture model, similar probability distributions states are merged based on relative entropy measure. Experimental results show that the proposed system can automatically recognize isolated gestures with 97.78% and key gestures with 93.31% reliability for Arabic numbers from 0 to 9.

D61: Simple emphatic user interface
Stanek,S.
Abstract:
We present a simple user interface combining h-Anim with Perlin's face. The main application is for exploring virtual environments especially those representing real environments with places, buildings or objects that belong to cultural heritage or those with historical past, famous story or something interesting. Therefore, information about them should be delivered to user. This kind of information is usually full of emotions and that is why the most suitable way (from user interface point of view) is to deliver it with emphatic storytelling. We are introducing our simple emphatic system (implementation uses ActiveX objects, VRML, ECMA Script, Java Script) that uses simple hardware configuration with web cams used for capturing user's presence and his/her head movements and if possible capturing position of some facial features, defined in MPEG-4 standard, and used to recognize user's simple emotions. User presence, head movements, and simple emotions are used to create simple emphatic user interface. In this paper we present our results already used in some application projects for virtual museums.

D67: The Elucidation of Planar Aesthetic Curves
Gobithaasan,R.U.,Jamaludin,M.A.,
Miura,K.T.
Abstract:
A compact formula for Logarithmic Curvature Histogram (LCH) and its gradient for planar curves have been proposed. Using these entities and the analysis of Generalized Cornu Spiral (GCS), the mathematical definition for a curve to be aesthetic has been introduced to overcome the ambiguity that occurs in measuring the beauty of a curve. In the last section, detailed examples are shown on how LCH and its gradient represented as a straight line equation can be used to measure the aesthetic value of planar curves.

D73: Efficient Medial Voxel Extraction for Large Volumetric Models
Michikawa,T., Nakazaki, S., Suzuki,H.,
Abstract:
Here we propose a method for medial voxel extraction from large volumetric models based on an out-of-core framework. The method improves upon geodesic-based approaches to enable the handling of large objects. First, distance fields are constructed from input volumes using an out-of-core algorithm. Second, medial voxels are extracted from these distance fields through multi-phase evaluation processes. Trivial medial or non-medial voxels are evaluated by the low-cost pseudo-geodesic distance method first, and the more expensive geodesic distance computation is run last. Using this strategy allows most of the voxels to be extracted in the low-cost process. This paper outlines a number of results regarding the extraction of medial voxels from large volumetric models. Our method also works in parallel, and we demonstrate that computation time becomes even shorter in multi-core environments.

D79: Feature-supported Multi-hypothesis Framework for Multi-object Tracking using Kalman Filter
Pathan,S.S., Al-Hamadi,A., Elmezain,M.,
Michaelis,B.
Abstract:
A Kalman filter is a recursive estimator and has widely been used for tracking objects. However, unsatisfying tracking of moving objects is observed under complex situations (i.e. split, merge, occlusion, and shadow) which are challenging for classical Kalman tracker. This paper describes a feature-assisted multi-hypothesis framework for tracking moving objects under complex situations using Kalman Tracker. In this framework, a hypothesis (i.e. merge, split, new) is generated on the basis of contextual association probability which identifies the status of moving objects in the respective occurrences. The association among moving objects is measured by multi-featured similarity criteria which include spatial size,

color and trajectory. Color similarity probability is measured by the proposed correlation-weighted histogram intersection (CWHI). The probabilities of size and trajectory similarities are computed and combined with fused normalized color correlation. The accumulated association probability results in online hypothesis generation. This hypothesis assists Kalman tracker when complex situations appear in real-time tracking (i.e. traffic surveillance, pedestrian tracking).Our algorithm achieves robust tracking with 97.3% accuracy, and 0.07% covariance error in different real-time scenarios.

E17: GPU-Based Adaptive-Subdivision for View-Dependent Rendering
Bauman,G., Livny,Y., El-Sana J.
Abstract:
In this paper, we present a novel view-dependent rendering approach for large polygonal models. In an offline stage, the input model is simplified to reach a light coarse representation. Each simplified face is then assigned a displacement map, which resembles the geometry of the corresponding patch on the input model. At runtime, the coarse representation is transmitted to the graphics hardware at each frame. Within the graphics hardware, the GPU subdivides each face with respect to the view-parameters, and adds fine details using the assigned displacement map. Initial results show that our implementation achieves quality images at high frame rates.

E23: Flocking Boids with Geometric Vision, Perception and Recognition
Holland,J., Semwal,S.K.
Abstract:
In the natural world, we see endless examples of the behavior known as flocking. From the perspective of graphics simulation, the mechanics of flocking has been reduced down to a few basic behavioral rules. Reynolds coined the term Boid to refer to any simulated flocking, and simulated flocks by collision avoidance, velocity matching, and flock centering. Though these rules have been given other names by various researchers, implementing them into a simulation generally yields good flocking behavior. Most implementations of flocking use a forward looking visual model in which the boids sees everything around it. Our work creates a more realistic model of avian vision by including the possibility of a variety of geometric vision ranges and simple visual recognition based on what boids can see. In addition, a perception algorithm has been implemented which can determine similarity between any two boids. This makes it possible to simulate different boids simultaneously. Results of our simulations are summarized.

SHORT Papers

A31: A Hybrid Ambient Occlusion Technique for Dynamic Scenes
Knuth,M., Kohlhammer,J.
Abstract:
In this paper we present a hybrid technique for illuminating a dynamic scene with self shadowing. Our goal is to perform the necessary calculations with real-time or interactive frame rates. The main idea is to split up the self shadowing process into a global and a local part. This separation allows us to choose combinations of completely independent algorithmic approaches. The global part calculates the light occlusion of the entire scene. Since it has to process the whole scene, it has a high computational cost, but a coarse approximation of the global occlusion can be created in a short time. On the other hand the local part deals with fine details which have local impact to the scene. It only processes a relevant subset of the scene. In our case this subset is given by the part of the scene, which is currently visible on the screen. Our idea is to use a GPU based approach for this part, which completely works inside image space and is independent from the scene complexity.

B02: Fitting freeform multi-parameter shapes to 3D data points - A case study
Vergeest,J.S.M., Song,Y.
Abstract:
We present an approach of geometric fitting of freeform shapes to 3D data points, where the size of the fitting problem is relatively large. The shapes studied represent ship propeller blades of dimension up to 3m, with precision requirements of few mm. Moreover, the shapes are freeform and designed using a geometric model dependent on hundreds of numerical

parameters. For the ship industry it is crucial to optimally deal with the shape parameters in order to judge whether or not a particular manufactured part fits within the tolerances. We have developed a method to evaluate the shapes numerically and we report on the approach we took. The sensitivity of a deviation objective function with respect to critical design parameters could be acquired. Also some procedures for automated optimization were explored.

B19: Shape Transformation of Multiple Objects Using Slices

Yasmin,S., Talib,A.Z.

Abstract:

3D shape transformation is usually confined to transformation between a pair of objects. The objective of this paper is to look at shape transformation from a different perspective: instead of binding this concept between two objects, the technique is extended to the concept of incorporating the characteristics of a number of objects in one body at a time. Equal number of slices are generated from all objects. Slices may be parallel to each other or each slice may have different orientation. Traversal of a data along its longitudinal direction may generate slices which are differently oriented from each other. When multiple objects are transformed to one and is used as an influence shape, it also works as incorporating multiple influence shapes at a time during transformation between two objects. The paper shows the ease of implementation of this concept in sliced data and also discusses its extendibility.

B53: WEB GIS by Ajax for Analysis and Control of Environmental Data

Cabral,I.P.S.,Gonçalves,L.M.G., Xavier,J.C.Jr.

Abstract:

The use of Geographic Information Systems (GIS) has becoming very important in fields where detailed and precise study of earth surface features is required. Environmental protection is such an example that requires the use of GIS tools for analysis and decision by managers and enrolled community of protected areas. In this specific field, a challenge that remains is to build a GIS that can be dynamically fed with data, allowing researchers and other agents to recover actual and up to date information. In some cases, data is acquired in several ways and come from different sources. To solve this problem, we propose a tool that includes a model for spatial data treatment on the Web, that we named System for Integrated Monitoring - SIM. The research issues involved in this tool start with the dealing of satellite images of protected areas. It is followed by acquisition and processing of different types of video and images as Small Format Aerial Images, or simply SFAI, acquired by a radio controlled helicopter, used for construction of mosaics to be fed in the GIS, and underwater geo-referenced pictures, acquired in-loco by researchers for better analyzing a given area. The SIM continues with the feeding and processing of environmental control data collected in-loco as biotic and geological variables and finishes with the presentation of all information on the Web. For this dynamic processing, we have developed tools that make MapServer more flexible and dynamic, allowing data uploading by the proper users. As example, on the top of SIM, we have developed a module that uses interpolation to aiming spatial data analysis. A very complex application that has validated our research is to feed the system with data coming from coral reef regions located in northeast of Brazil.

C17: Object Detection in Low Illumination Environment

Lee,S.-H., Han,S.-I., Kang,M.G.

Abstract:

We propose a motion detection algorithm which works well in low illumination environments. By using the level set based bimodal motion segmentation, the algorithm obtains an automatic segmentation of the motion region and the spurious regions due to the large CCD noise in low illumination environment are removed effectively. Based on a noise analysis, we will show how to obtain the required parameters automatically. Experimental results verify the stableness of the proposed algorithm in low illumination conditions.

C29: Automatic Terrain Generation with a Sketching Interface

Puig-Centelles,A., Varley,P.A.C., Ripolles,O., Chover,M.

Abstract:

Virtual environments should offer the user a deep interactive experience with both large worlds to explore and a higher degree of perceived realism. The main goal of our work is to provide the final user with an easy-to-use accurate terrain generation

application, which allows non-professional users to design their own desired terrain. In this paper we consider the creation of islands to be used in computer games. We introduce a simple terrain algorithm and we also consider its integration into a sketching application. The application will offer both a 2D and a 3D representation of the terrain, in order to simplify the interface and provide the user with more interactive feedback about the island that has been designed. Our framework offers real-time algorithms for both creating and modifying terrain features, thus improving the final results with more realism and greater customization by the user.

C41: Error-bounded GPU-based terrain visualisation

Löffler,F., Rybacki,S., Schumann,H.

Abstract:

The interactive visualisation of digital terrain datasets deals with there interrelated issues: quality, time and resources. In this paper a GPU-supported rendering technique is introduced, which finds a tradeoff between these issues. For this we use the projective grid method as the foundation. Even though the method is simple and powerful, its most significant problem is the loss of relevant features. Our contribution is a definition of a view-dependent grid distribution on the view-plane and an error-bounded rendering. This leads to a better approximation of the original terrain surface compared to previous GPU-based approaches. A higher quality is achieved with respect to the grid resolution. Furthermore the combination with an error metric and ray casting enables us to render a terrain representation within a given error threshold. Hence, high quality interactive terrain rendering is guaranteed, without expensive preprocessing.

C61: Pairwise Region-based scan alignment

Aguiar,C.R.S., Druon,S., Crosnier,A.

Abstract:

In this paper, we present a new algorithm for the alignment of two 3D scans. The approach uses a region-based matching technique. Regions are described by a probability density function (pdf) computed from low dimensional surface descriptors (curvature or normal cone). Region correspondence is found using similarity function based on the comparison of regions pdf and under geometry constraints. Results on raw scan data sets are presented to illustrate the algorithm.

C67: Improvement of the DOI Technique for De-Interlacing

Kim,K.R., Lee,B.G., Yoo,H.

Abstract:

This paper presents an improved method for the direction-oriented interpolation (DOI) method. The technique of DOI is considered to be a very strong tool for intraframe-based deinterlacing in the literature. However, the DOI still have a problem to use wrong edge direction. To remedy this problem, we embed three steps in the DOI method to interpolate missing lines more efficiently and robustly than existing methods. In the proposed method, the spatial direction vector (SDV) data are reused and processed to prevent them utilizing in next interpolation step, resulting in the more accurate de-interlacing method. We carry out experiments to compare the proposed method with the existing methods including the edge-based line averaging (ELA) and DOI. Experimental results show that the proposed method gives better performance in objective and subjective quality than the existing de-interlacing methods.

C83: Point Cloud Rendering in FPGA

Zemčík,P., Mařík,L., Herout,A.

Abstract:

This contribution describes recent development in ongoing work focused on point cloud rendering algorithm implementation usable in environments containing programmable or custom hardware. The approach described in this paper is based on the idea that direct point cloud rendering, which is in the principle not too complicated, can be efficiently implemented in programmable or custom hardware. Such implementation can be useful not only for its performance but especially for the possibility to include it into solutions that require 3D graphics output in non PC environments and in embedded solutions with low power consumption, etc. This contribution describes the overall approach and the current results.

C89: Trajectory classification using HMMs

Mlích,J., Zemčík,P., Jiřík,L.

Abstract:

This paper focuses on evaluation of motion of objects through classification of their trajectories. The objects used for evaluation

of the presented method are objects tracked in video sequence but the method can be used for more general trajectories. The main potential application of the presented method is detection of abnormal behavior of humans, hand gesture detection and recognition, etc. Hidden Markov Models (HMMs) are used as the classification mechanism. The paper contains description of the method, description of experiments and their results, and conclusions.

D83: Generalized Roller
Haindl,M., Hatka,M.
Abstract:
This paper describes a generalization of our previously published simple roller method for seamless enlargement of colour textures such as natural bidirectional texture functions (BTF) that realistically represent appearance of given material surfaces. The generalized roller allows automatic detection of major texture periodicity directions which do not need to be aligned with coordinate axes. The roller exture synthesis method is based on the overlapping tiling and subsequent minimum error boundary cut. One or several optimal double toroidal BTF patches are seamlessly repeated during the synthesis step. While the method allows only moderate texture compression it is extremely fast due to complete separation of the analytical step of the algorithm from the texture synthesis part. The method is universal and easily implementable in a graphical hardware for pe of static or dynamic textures.

D89: Realtime Ray Tracing on GPU with improved octree
Yang,X., Xu,D.-Q., Zhao,L.
Abstract:
Recent GPU ray tracers can already achieve performance competitive to that of their CPU counterparts. Nevertheless, these systems can not yet fully exploit the capabilities of modern GPUs and can only handle medium sized, static scenes. We present an octree construction algorithm for the GPU that achieves real-time performance by heavily exploiting the hardware, which has been observed to give superior performance in ray tracing compared to other acceleration structures. We use streaming construction with the surface area heuristic (SAH) that significantly increase the coherence of memory accesses during construction of the octree.

E02: Vision Aware Continuum Crowds
Lefer,W.
Abstract:
Crowd simulation has received increasing attention for two decades because potential applications of crowd simulators can be found in various societal domains. The continuum crowd model allows to integrate all information useful for the decision-making process in a single equation, which can then be solved by a Fast Marching Method approach. In this paper we propose several improvements to the continuum crowd model: a new governing equation, a new collision avoidance method, and, our major contribution, we add vision capabilities to the characters, thus making them able to collect new information about their surrounding environment and to reconsider path planning according to up-to-date data.

E07: Video-Based Bicycle Detection in Underground Scenarios
Beran,V., Herout,A., Řezníček,I.
Abstract:
Bicycle detection approach covered by this paper aims to cope with highly-noisy low-resolution data, to use simple image-processing methods and to work in real time. Although the method itself does not constitute a generally usable object detector, it covers several interesting aspects which can be re-used in tasks similar to the given one. Low-level features extracted from the video used for wheel-candidate classification are described in detail. The system is applied and evaluated on real data and the results are discussed.

E19: Conversion of biquadratic rational Bézier surfaces into patches of particular Dupin cyclides: the torus and the double sphere
Garnier,L., Belbis,B., Foufou,S.
Abstract:
Toruses and double spheres are particular cases of Dupin cyclides. In this paper, we study the conversion of rational biquadratic Bézier surfaces into Dupin cyclide patches. We give the conditions that the Bézier surface should satisfy to be convertible, and present a new conversion algorithm to construct the torus or double sphere patch corresponding to a given Bézier surface, some conversion examples are illustrated and commented.

E83: Efficient Semiautomatic Segmentation of Plant Biological Objects Based on Live-wire Methods
Schoor,W., Seidl,T., Bollenbeck,F., Seiffert,U., Preim,B., Mecke,R.
Abstract:
This paper presents a novel method for efficient semiautomatic multi-label segmentation of plant biological image data. The approach extends live-wire methods in order to facilitate exact user-steered segmentations for atlas generation. By integrating a segmentation-specific user interaction model into the live-wire formulation i) more exact segmentations, ii) increased computational efficiency, iii) without loss of generality are achieved. The concept of mutual influence of image feature based path costs and user input uncertainty are consistently combined. By incorporating user behavior into cost based delineation a more intuitive user interface is obtained also yielding in a more accurate segmentation. We introduce path-based methodologies, specific user interaction models and propose the combination of both of them. The purposefulness of the method is shown in an application comprising segmentation of histological section data supporting the generation of 3-D atlases.

E89: Fiberbundle-based visualization of a Stir Tank Fluid
Benger,W., Ritter,M., Acharya,S., Roy,S., Jijao,F.
Abstract:
We describe a novel approach to treat data from a complex numerical simulation in a unified environment using a generic data model for scientific visualization. The model is constructed out of building blocks in a hierarchical scheme of seven levels, out of which only three are exposed to the end-user. This generic scheme allows for a wide variety of input formats, and results in powerful capabilities to connect data. We review the theory of this data model, implementation aspects in our visualization environment, and its application to computational fluid dynamic simulation covering a fluid in a stir tank. The computational data are given as a vector field and a scalar field describing pressure on 2088 blocks in curvilinear coordinates

E97: 3D Modeling of Free-Form Objects
Sisojevs,A., Krechetova,K., Glazs,A.
Abstract:
This work describes an efficient method of 3D object modeling. The method is applied for solving biomedical engineering tasks. The method is based on interpolation model creation. The model is built using Coons surface basis. For further implementation of the model the Coons surface basis is transformed to Bezier surface model. This work also describes a method of volume estimation of the reconstructed 3D model. Example of practical implementation is solving various biomedical tasks.

POSTERS to be presented

A07: Invariant to Transformations Image Retrieval from Image Databases using a Boundary Based Description of Object Shape
Stoeva,M.T., Bozhikova,V.T.
Abstract:
The basic problem of the methods for shape description of image objects is their dependence on the graphical transformations. In this paper we give boundary based method for shape description based on a multi-step criterion. We present a new approach for similarity shape retrieval from image database that achieves invariance of results with respect to transformations. We define and use a criterion to achieve invariant image object representation with respect to rotation. The approach includes original description of image objects shape in type of multi-metric attribute stored in image database and a similarity distance definition for image retrieval processing that is invariant to reflection too. Our approach achieves results that are invariant with respect to arbitrary compositions of graphical transformations.

A89: Seamless NPR Video Painting
Kovacs,L.
Abstract:
The paper presents a method for automatic transformation of ordinary videos into non-photorealistic graphical representations, for achieving painterly effects. The primary goal is the non-interactive transformation of videos, with the intended use as a service in community video databases (an extension to content based retrieval). There are no restrictions on the types of videos. The main steps involve scene separation, color segmentation, foreground and focus area

extraction, and vector graphical transformation of selected frames.

B97: Image Deformation using Radial Basis Function Interpolation

Kwon,J.H., Lee,B.G., Yoon,J., Lee,J.

Abstract:

Image deformation technique is widely used in the field of computer animation, image editing, medical imaging, and other applications in 2D & 3D computer graphics. All the algorithms aim to provide simple user interface, most of which need the user to drag the control points, lines or polygon. The deformation process and the final position of the controlling points should be smooth and precise respectively, and it should also run in real-time. This paper provides a simple image deformation method using the radial basis function interpolation in approximation theory. Radial basis function is a very popular and convenient tool for data representation problems. The proposed method using radial basis function is fast and easy to use more than previous deformation methods. Experiments indicate that the algorithm is stable and well performed.

C02: Efficient approach to direct B-spline surface rendering by a ray tracing

Sisojevs,A., Glazs,A.

Abstract:

There are different approaches to B-spline surfaces visualization by ray tracing methods. But these methods of the computer graphics do not solve this task at an expected level. Therefore in this paper authors propose to use a new approach for B-spline surfaces visualization by a ray tracing method to render objects with high accuracy and quality.

C23: The Force-Map Haptic Rendering Algorithm for Drilling into Volume Data

Liu,Y., Laycock,S.D.

Abstract:

With the developments of volume visualization technology for complex data sets comes new challenges in terms of user interaction and information extraction. Volume haptics has proven itself to be an effective way of extracting valuable information by providing an extra sense from which to perceive three dimensional data. The work presented in this paper introduces a Force-Map method that combines the benefits of the indirect and the direct haptic rendering approaches. Users can select from a variety of virtual tools to gain continuous and smooth force feedback during the drilling of volumetric data which increases the applicability of the approach.

D07: 3D Navigation Systems based on Synthetic Texturing

Alizadehashrafi,B., Coors,V., Schulz,T.

Abstract:

Navigation system is the order of the day to pilot people to their destination. This paper focus on the uses of mobile devices such as PDA's and smart phones without additional H/W to direct pedestrians by using synthetic texturing for the aim of 3D modeling. Each façade is reconstructed by means of arraying small sized textures in respect to their geometries in different layers. In the process of texture generation cropping, rectifying, removing disturbing objects and exposure setting should be done in advance. Unlimited number of layers with different priorities and their horizontal and vertical pulse functions and texture files can be utilized for creating a similar looking facade. Each 3D model is created by mapping the synthetic textures on the 3D geometries of each building 3D model. The processes to create the synthetic textures as well as their usage in mobile context are described in detail in this paper.

D41: Robotic Visual and Inertial Gaze Control using Human Learning

Prado,J., Lobo,J., Dias,J.

Abstract:

Humans make use of inertial and vision cues to determine ego-motion. Bayesian models can be used to represent the human behavior to be used in a robot. An environment may be composed by an infinite number of variables and humans deal with some of them each time a motor decision needs to be taken.

D43: Geometric modeling and computer graphics of kinematic ruled surfaces on the base of complex moving one axoid along another

Rachkovskaya,G., Kharabayev,Yu.

Abstract:

In concordance with logical structure "Geometrical Model of Interaction" of two contacted surfaces during the movement of one ruled surface along another - Corresponding Mathematical Transformations of Surfaces "New Kinematic Ruled Surfaces" a new geometrical model of

complex moving one axoid along another for the case of one-sheet hyperboloid of revolution as fixed and moving axoids has been proposed. The main condition of constructing kinematic ruled surfaces is that moving axoid contact with fixed axoid along one their common generating line in each of their positions during complex moving one axoid along another. A case when the axes of fixed and moving axoids are crossed, has been considered in this research. Analytical development and computer graphics of the new kinematic surfaces are realized for three types of complex moving. (1)The outside surface of the fixed axoid is revolved slipping-free by the outside surface of the corresponding moving axoid. (2)The interior surface of the fixed axoid is revolved slipping-free by the outside surface of the corresponding moving axoid. (3)The outside surface of the fixed axoid is revolved slipping-free by the interior surface of the corresponding moving axoid. Computer graphics of the constructed surfaces have been performed by the previously developed software application.

E43: iGLANCE project: free-viewpoint 3D video

Zinger,S., Ruijters,D., de With,P.H.N.

Abstract:
The iGLANCE project aims at researching the methods of receiving and rendering of free-view 3D-TV sequences. We describe the ongoing iGLANCE project and introduce the iGLANCE decoding and rendering system. It consists of free viewpoint video interpolation and coding. One of the key components of this system is view interpolation and its related challenges. There are two main application fields within iGLANCE: consumer and medical systems. In this article we discuss an example use case for a medical application that illustrates the need for the research and development in the iGLANCE framework.

E59: Example Based Motion Generation with Efficient Control

Choung,Y., Kang,K.-K., Kim, D.

Abstract:
This paper presents a motion generation technique for arbitrary morphologies with the user defined correspondences between joints. Users can define the controlling part in the source character and the part to be controlled in the target character in our system. To remove the restriction in the morphology of the target character, we use the pair of example posture sets. In our system, in order to provide the correspondence regardless of the number of joints, the deformed part in the target character is simplified into the direction vector. The final postures are then generated with the weighted sum of the examples. Our experimental results demonstrate that our approach can generate motions for various target characters and can control the user defined joints. Exploiting this correspondence between joints, our system can reflect the intention of animators efficiently and reduce their manual efforts.

E61: A Visualization and Management System for Chat Dialogues on 3D Virtual Avatars

Ji,S.-H., Park,S.-H., Ryu,D.-S., Cho,H.-G.

Abstract:
Chat is one of basic features in current virtual world communication. So tracking of chat dialogue is an important issue. However most chat programs only provide textual history transcripts based on the temporal sequence, without any explicit relationship tags. In this poster, we propose a novel data structure, Chatting Flow Graph, which keeps track of the all chatting dialogues among virtual agents. On this CFG we newly propose one visualization method for managing Chat Dialog efficiently and hierarchically.

E73: Information Transformation for Point Cloud

Nishio,K. Takebayashi,Y. Teshima,Y. Kanaya,T. Kobori,K.

Abstract:
We propose a method of Information transformation for point cloud, which reduces information amount of three dimensional point data. Our method generates clusters and spiral chain lists. These chain lists are consists of three dimensional points. After that, we adopt a predictive encoding to compress these chain lists. In addition, we will show effectiveness of our method with same experimental results. In these experiments, our method reduces the information amount of point cloud coordinate to 31.7% of original model.

E79: A Composition-Based Image Retrieval Using Line Feature

Hwang,J., Lim,D., Paik,D.

Abstract:
In this paper, we propose an image retrieval

scheme that retrieves compositionally similar images with the query image from the line-used image set. To develop effective similarity measure, we remarked properties of line feature such that discriminative in similarity, and investigated the relation between the value of the property and the degree of the compositional similarity. Stand on the observed results, we developed a similarity measure and compared effectiveness with a simple similarity measure in the sense of recall and precision. The result shows that proposed scheme provides higher effectiveness.