The Advanced Programme
iV2012 & cgiv2012 - DIGITAL ART GALLERY
Online Exhibition
July 2012 - June 2013

VIRTUAL GALLERY VENUE
www.graphicslink.co.uk/DART.htm

Exhibiting Artists:

Alison Clifford
Angela Ferraiolo
Anna Chupa
Anna Ursyn
Astrid Almkhlaafy
Brenden Quesenberry
Carol Radsprecher
Cody Gallagher
Corinne Whitaker
Cris Orfescu
Daniela Sirbu
Dena Elisabeth Eber
Gabriele Peters
Gloria DeFilipps Brush
James Richardson

Jason Nelson
Jing Zhou
John Corbett
John Labadie
John Miller
Katie John
Leonard Rodriguez
Mimi Cabell
Peter Petersen
Philip Galanter
Robert Krawczyk
Sarawut Chutiwongpeti
Stefan Riebel
Taehee Kim
Vladimir Geroimenko
A full-day Event: Tuesday 16th August 2011, Time: 9:30 - 17:00

Computer Graphics, Imaging and Visualisation

DOCTORAL RESEARCH WORKSHOP

Organised by
Visualisation & Graphics Research Unit of LSBU, UK
National Chiao Tung University, Hsinchu, Taiwan

Computer Graphics, Imaging and Visualization – CGIV- Forum is an annual forum that is held for 9 year running. This year CGIV forum in collaboration with the Visualisation & Graphics Research Unit of LSBU, UK and the Department of Computer Systems, National Chiao Tung University, Hsinchu, Taiwan are pleased to announce Doctoral Research Workshop within the scope of the 8th International conference on Computer Graphics, Imaging and Visualization (CGIV2012). This workshop provides an opportunity for PhD students to present their work, receive feedback and to meet other researchers working in CGIV area. The focus of this workshop will be on the pros and cons of various Computer Graphics, Imaging and Visualization ideas and solutions and its potential impact on both the research community and the industry in general.

All doctoral students involved in Computer Graphics, Imaging and Visualization research area are welcome to attend. The event is organised in four sessions with up to four PhD students per session. Presenters, which are PhD students at various stages of their PhD, will give an outline of their PhD research in order to benefit from feedback about their work and methodology from a combined industry & research panel.

Doctoral Research workshop
This workshop focuses on the issues that doctoral students face during their studies and includes following interactive sessions:

- Introduction to “What is a PhD?” from panel members
- A short tutorial on one of the key aspects that PhD issues
- Case studies - Presentation of number of case studies from PhD students candidates to the workshop with aim that highlights the issues that facing in the course of their studies.
- Expert panel feedback - Each presentation is followed by discussion and suggestion not only from panem members but from fellow researchers.
- Expert tips on individual PhD student presentation and research.
**Wednesday 25, July 2012**

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<tr>
<th>Time</th>
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<td>09:30</td>
<td>Registration</td>
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<td>10:00</td>
<td><strong>Opening &amp; Welcome</strong></td>
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<td><strong>Conference Chair:</strong> Prof. Chun-Cheng Lin, National Chiao Tung University, Taiwan</td>
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<td><strong>Session cgiv2012_1.1: Computer Graphic, Visualisation and Imaging Application</strong></td>
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<td><strong>Chair:</strong> Prof. Sai-Keung Wong (National Chiao Tung University, Taiwan)</td>
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<td><em>The Anatomy of a Graph Visualization System</em></td>
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<td>Giuseppe Liotta</td>
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<td>Professor of computer Science at the Faculty of Engineering of the University of Perugia</td>
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<td><em>Window to the Soul: Tracking Eyes to Inform the Design of Visualizations</em></td>
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<td>Weidong Huang</td>
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<td>CSIRO ICT Centre, Australia</td>
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<td>11:15</td>
<td><strong>Morning Coffee Break / Photograph Session</strong></td>
<td>&lt; Taiwan - NCTU – Lecture Room Foyer &gt;</td>
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<td>12:00</td>
<td><strong>Session cgiv2012_1.2: Computer Graphic, Visualisation and Imaging Application</strong></td>
<td>&lt; Taiwan - NCTU – Lecture Room &gt;</td>
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<td><strong>Chair:</strong> Prof. Dr. Weidong (Tony) Huang, CSIRO, Australia</td>
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<td><strong>Oriented Animal-mask Decoration Pattern Generation</strong></td>
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<td>Ming-Te Chi, Wei-Cheng Liou</td>
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<td><strong>Mouth Image Controlled Web Page</strong></td>
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<td>Yuan-Fei Cheng</td>
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<td>Meiho University, Taiwan</td>
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<td><strong>Context-aware Camera Planning for Interactive Storytelling</strong></td>
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<td>Chia-Hou Chen, Tsai-Yen Li</td>
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<td>13:00</td>
<td><strong>Lunch Break</strong></td>
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### Session cgiv201_1.3: Computer Graphics
Chair: Prof. Dr. Weidong (Tony) Huang, CSIRO, Australia

- **Real-time Hand Gesture Recognition from Depth Image Sequences**
  Hong Min Zhu, Chi Man Pun
  University of Macau, Macau

- **Approximating Online Hand-Written Image by Bezier Curve**
  Taweechai Nuntawisuttiwong, Natasha Dejdumrong
  King Mongkut's University of Technology Thonburi, Thailand

- **GPU Ray Tracing Based on Reduced Bounding Volume Hierarchies**
  Sai-Keung Wong, Yu-Chun Cheng, Shing-Yeu Lii
  National Chiao Tung University, Taiwan

- **An Approach to the Approximation of Rational Bezier Curve**
  Tanatep Techopittayakul, Chitsanuphon Thanutong, Natasha Dejdumrong
  King Mongkut's University of Technology Thonburi, Thailand

#### Break

### Session cgiv201_1.4: Digital Art, Animation, & Multimedia
Chair: Prof. Sheung-Hung Poon (National Tsing Hua University, Taiwan)

- **Modeling of Bézier Curves Using a Combination of Linear and Circular Arc Approximations**
  Pongrapee Kaewsaiha, Natasha Dejdumrong
  King Mongkut's University of Technology Thonburi, Thailand

- **The Rational Quadratic Trigonometric Bézier Curve with Two Shape Parameters**
  Muhammad Abbas, Uzma Bashir, Ahmad Abd Majid, Jamaludin Md Ali
  University Sains Malaysia, Penang Malaysia, Malaysia

- **A Sketch-based Skeletal Figure Animation Tool for Novice Users**
  Satoshi Yonemoto
  Kyushu Sangyo University, Japan

### Session cgiv201_1.5: Animation, Special Effects and Multimedia Show
Chair: Bannatyne, Prof. Mark, IUPUI, USA
17:30 - 18:30

cgiv2012 Special Interest Group: Collaborative Research Meeting (invited only)

19:30 - 21:30

cgiv2012 Social Event
Conference Dinner
<To be finalised>
# Thursday 26, July 2012

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<td>09:00</td>
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<td>09:00</td>
<td>A half-day Event: Thursday 26&lt;sup&gt;th&lt;/sup&gt; July 2012, Time: 09:00 -13:00</td>
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<tr>
<td>09:00</td>
<td><strong>Computer Graphics, Imaging and Visualisation</strong></td>
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<td>10:00</td>
<td><strong>Discussion on Doctoral Research Theme</strong></td>
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<td>10:00</td>
<td>An introduction from Doctoral Research Workshop chair and organiser</td>
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<td>11:15</td>
<td>Break</td>
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<td>12:00</td>
<td>Lunch Break</td>
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<td>14:00</td>
<td>Social Networking Event</td>
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**Panel members:** Dr. Tony Huang, prof. Giuseppe Liotta and Prof. Chun-Cheng Lin
## Friday 27, July 2012

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<th>Time</th>
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<tr>
<td>09:00</td>
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<td>09:30</td>
<td><strong>Session cgiv2012_3.6: Imaging</strong>&lt;br&gt;Chair: Prof. Chun-Cheng Lin, National Chiao Tung University, Taiwan&lt;br&gt;A Geometric Invariant Digital Image Watermarking Scheme Based on Robust Feature Detector and Local Zernike Moments&lt;br&gt;<strong>Xiao Chen Yuan, Chi Man Pun</strong>&lt;br&gt;University of Macau, Macau&lt;br&gt;Thai Font Type Recognition using SIFT&lt;br&gt;<strong>Pitchaya Jamjuntr, Natasha Dejdomrong</strong>&lt;br&gt;King Mongkut's University of Technology Thonburi, Thailand&lt;br&gt;An Automated Adaption of K-means Based Hybrid Segmentation System into Direct Volume Rendering Object distinction Mode for Enhanced Visualization Effect&lt;br&gt;<strong>Arash Azim Zadeh Irani, Bahari Belaton</strong>&lt;br&gt;University Sains Malaysia, Penang Malaysia, Malaysia&lt;br&gt;The Quartic Trigonometric Bézier Curve with Two Shape Parameters&lt;br&gt;<strong>UZMA BASHIR, Muhammad Abbas, Jamaludin MD Ali</strong>&lt;br&gt;University Sains Malaysia, Penang Malaysia, Malaysia&lt;br&gt;Research on Knowledge Competencies for Digital Media Design&lt;br&gt;<strong>Ren Ming Qiao, Dong Han, Shasha Wang</strong>&lt;br&gt;Tianjin University, China</td>
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<td>11:00</td>
<td>Break</td>
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**Back to Taiwan - NCTU – Lecture Room Foyer**
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<tr>
<td>11:30</td>
<td><strong>Session cgiv2012_3.7: CGIV</strong>&lt;br&gt;Chair: Prof. Giuseppe Liotta, Università degli Studi di Perugia, Italy&lt;br&gt;&lt;keynote lecture&gt; Migratory Raptors Counting by using Remote Sensing and Image Processing Techniques&lt;br&gt;WONG CHOW JENG&lt;br&gt;University Sains Malaysia, Penang Malaysia, Malaysia&lt;br&gt;&lt;keynote lecture&gt; Deriving Structure of Images via Dictionary and Bayesian Network Learning&lt;br&gt;Wen-Liang Hwang&lt;br&gt;Institute of Information Science, Academia Sinica, Taiwan&lt;br&gt;&lt;keynote lecture&gt; Visualization of Hierarchical Information on Mobile Screens&lt;br&gt;Kang Zhang&lt;br&gt;Professor and Director of Visual Computing Lab, The University of Texas at Dallas, USA</td>
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<td>Conference Closing from cgiv2012 committee:&lt;br&gt;Co-Chairman: Prof. Chun-Cheng Lin, National Chiao Tung University, Taiwan&lt;br&gt;Prof. Ebad Banissi, VGRU, LSBU, UK&lt;br&gt;Prof. Dr. Weidong (Tony) Huang, CSIRO, Australia</td>
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<td>13:00</td>
<td>Lunch Break&lt;br&gt;&lt;keynote lecture&gt;  &lt;Taiwan - NCTU – Lecture Room – Foyer &gt;</td>
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<td>13:30</td>
<td>cgiv2013-Committee Members Meeting  &lt;Taiwan - NCTU – Lecture Room &gt;  Close</td>
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<td>14:00</td>
<td><strong>CGIV2012_Special Interest Group: Technical visit to The NCTU</strong></td>
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**Abstracts**

Session: cgiv2012_1.1: Computer Graphic, Visualisation and Imaging Application
Chair: Prof. Sai-Keung Wong (National Chiao Tung University, Taiwan)

*<keynote lecture>*
The Anatomy of a Graph Visualization System
Giuseppe Liotta
Professor of computer Science at the Faculty of Engineering of the University of Perugia

Graph visualization addresses the problem of efficiently conveying the structure of relational information, which is typically modeled by networks. Therefore, graph visualization systems are largely used for information exploration and knowledge discovery, particularly in those applications that need to manage, process and analyze large sets of data. The design of a graph visualization systems typically addresses questions that belong to the intersection of different disciplines, such as graph algorithms, data mining, software engineering, algorithm engineering, and visual analytics. In this talk I will shortly review some common and emerging graph visualization paradigms, discuss general design principles present application examples, and compare different models for the realization of effective graph visualization systems.

Giuseppe Liotta received a Ph.D. degree in computer engineering from the University of Rome "La Sapienza" in 1995. After two years of post-doc at Brown University, he first joined the University of Rome "La Sapienza" as assistant professor (1996-1998) and then the University of Perugia as associate professor (1998-2002). Since 2002 he is a professor of computer engineering at the Faculty of Engineering of the University of Perugia. His research interests are mainly directed at the analysis and design of algorithms and systems that have applications in the fields of graph theory and graph drawing, information visualization and visual analytics, and computational geometry. On these topics he edited special issues, wrote book chapters and surveys, published more than 150 research papers, and gave lectures worldwide. He regularly serves as PC member or as general chair of international conferences, is steering committee member of the International Symposium of Graph Drawing, and managing editor of the Journal of Graph Algorithms and Applications. During the years, his research has been funded by several public and private sponsors

*<keynote lecture>*
Window to the soul: tracking eyes to inform the design of visualizations
Tony Huang
CSIRO ICT Centre, Australia

A picture is worth a thousand words. To take advantage of powerful human vision, we generate visualizations for people to view and to understand the underlying data. However, these a thousand words do not necessarily tell the truth about the data. A good visualization can make the data understanding process effective, while a bad visualization may hinder the process, even convey misleading information. To produce effective visualizations, it is important to have a good understanding of how people actually perceive and process the visual information. People view visualizations using their eyes, and tracking their eye movements can be a useful method for this purpose. In this talk, I will present a series eye tracking studies on how people read graphs. These studies demonstrate that: 1) eye tracking is an effective method for gaining insights into how people read graphs, and 2) how obtained insights from eye tracking can be used to inform the design of visualizations.

Dr. Tony Huang is a research scientist at CSIRO ICT Centre, Australia. He is one of the leading researchers in the User Interaction and Collaboration group. His research interests lie in human-cantered computing in general, and HCI, human factors and visual perception and cognition in particular. He has published a number of quality papers in these areas. Currently, he is
Session cgiv201_2.2: Computer Graphic, Visualisation and Imaging Application
Chair: Prof. Dr. Weidong (Tony) Huang, CSIRO, Australia

Oriented Animal-mask Decoration Pattern Generation
Ming-Te Chi, Wei-Cheng Liou
National Chengchi University, Taiwan

Oriented Animal-mask on the bronze vessels in the Shang and Zhou dynasty is an art of abstraction and stylization from animal face. The non-photorealistic rendering technology tries to establish a system to reproduce the style after analyzing how people create artworks. In this paper, we develop a pattern generation method for the animal-mask decorations. By analyzing the structure and identifying association between animals and animal-mask decorations, we generate facial features from employing a structural matching method to find correspondence from an sample database. For pattern stylization, we propose a modified reaction-diffusion method to stylize the input image patterns and enhance the features in animal-mask decoration. And the proposed reaction-diffusion method can also simulate the diffusion alone user designated flow vectors to generate background decoration patterns. Combining the processes above, we can generate an animal-mask decoration style image. We demonstrate results with a number of animal input images.

Mouth Image Controlled Web Page
Yuan-Fei Cheng
Meiho University, Taiwan

This paper introduces a particular mouth image controlled hyper-link method that is used in web page switching. The traditional switching method is by computer mouse click or screen touched. This method is not convenient compared to the traditional method, but can be used by the handicapped people, who are not able to use the computer mouse or touch the computer screen to switch the web pages.

Context-aware Camera Planning for Interactive Storytelling
Chia-Hou Chen, Tsai-Yen Li
National Chengchi University, Taiwan

In the application of 3D interactive narratives, virtual camera is a crucial element for appropriate presentation of scenarios happening dynamically. In this work, we have designed a virtual cinematographic system to generate appropriate camera plans automatically in a virtual environment for interactive storytelling. In such a system, not only the story line but also the relative positions between the actors may be changed at run time due to interaction with the user. Therefore, a camera plan that can reflect the changes in dynamic scenarios needs to be generated automatically at run time. We have also designed a scripting language to describe the directive details of the story and implemented a camera planning system to generate camera configurations according to the scenario descriptions. We will use an example to illustrate the idea of interactive narratives in 3D environment and how appropriate camera motions can be generated according to the result of interaction.

Session cgiv2012_3.3: Computer Graphics
Chair: Prof. Dr. Weidong (Tony) Huang, CSIRO, Australia

Real-time Hand Gesture Recognition from Depth Image Sequences
Hong Min Zhu, Chi Man Pun
University of Macau, Macau

As a certain case in the domain of human actions, hand gestures can be expressed by the motion of user’s hand to provide nature interaction in many applications. In this paper we proposed a real-time hand gesture recognition system based on robust hand tracking from depth image sequences. Using hidden markov models (HMM) with varying states, gesture models are trained online along with user’s feedback, and the
real-time classification is taken simultaneously. A gesture may be falsely classified as the models are trained insufficiently at beginning, in which case we provide a feedback and update the gesture model with this gesture sample. The performance of the system can always be improved by more updating, and in our experiment we give an appropriate result after a reasonable number of samples are used for training.

Applying Online Hand-Written Image by Bezier Curve
Taweechai Nuntawisuttiwong, Natasha Dejdumrong
King Mongkut's University of Technology Thonburi, Thailand

In this paper, Bezier curve is used to represent a hand-written shape in the forms of continuous rasterized format. First, an online hand-written curve will be formulated into a vectored curve by using Newton-Lagrange interpolation from its input sampling points. Although Newton-Lagrange curve can be used well to approximate the hand-written curve, their polynomials are not suitable in the applications for computer aided geometric design (CAGD). Therefore, Newton-Lagrange curve will then be converted into a corresponding Bezier curve since it has been widely used in geometric modeling field. Ultimately, the final result from the conversion will be expressed in the forms of the Bezier control points. As a result, these control points represent the hand-written curve image.

GPU Ray Tracing Based on Reduced Bounding Volume Hierarchies
Sai-Keung Wong, Yu-Chun Cheng, Shing-You Li
National Chiao Tung University, Taiwan

We present a bounding volume hierarchy construction based on a culling technique for performing ray tracing on manycore GPUs. The objects are divided into view-sets of triangles with respect to a set of view targets (including the camera and the light sources). A bounding volume hierarchy, namely reduced bounding volume hierarchy (RBVH), is then constructed for each view-set. Each RBVH contains a portion of the triangles of the objects. The ray traversal is improved for primary and shadow rays, leading to a net improvement of ray tracing. We also handle multiple lights that are close to each other. Our method has been implemented on manycore GPUs and evaluated for dynamics scenes.

Experimental results show that our method improves ray tracing for primary and shadow rays.

An Approach to the Approximation of Rational Bezier Curve
Tanatep Techopittayakul, Chitsanupong Thanutong, Natasha Dejdumrong
King Mongkut’s University of Technology Thonburi, Thailand

Based on the works of scan conversion of Bezier curve, they have been proved that using degree elevation with Bresenham’s line algorithm to construct a Bezier curve is the fastest way. We applied this idea to construct a rational Bezier curve by using conversion from rational Bezier points into non-rational Bezier points. Then, we use the degree elevation method to construct this non-rational Bezier curve. This method is proven to be faster than any existing methods for rational Bezier curve e.g. rational Bernstein basis function. Moreover, our method is scan conversion. Thus, it is suitable for raster display device.

Session cgiv2012_1.4: Digital Art, Animation, & Multimedia
Chair: Prof. Sheung-Hung Poon (National Tsing Hua University, Taiwan)

Modeling of Bézier Curves Using a Combination of Linear and Circular Arc Approximations
Pongrapee Kaewsaiha, Natasha Dejdumrong
King Mongkut’s University of Technology Thonburi, Thailand

This paper presents the new approach of the Bézier curve rendering using linear and circular arc approximations, instead of a recursive method that calculates all points on the curve pixel by pixel. The new developed algorithm also works better than a pure-linear approximation which generates rough output, and a pure-circular-arc approximation which involves with too many parameters. The purposed algorithm subdivides the curve into a series of lines and arcs satisfying the user-defined tolerance. This new method can reduce the number of points involved with
the calculation and also decrease the computational time since the software built-in line and arc functions calculate faster than the recursive method. This algorithm is based on the monomial form approach which can provides more efficiency and flexibility, compare with traditional methods that are mostly based on a polynomial basis or the de Casteljau’s algorithm.

The Rational Quadratic Trigonometric Bézier Curve with Two Shape Parameters
Muhammad Abbas, Uzma Bashir, Ahmad Abd Majid, Jamaludin Md Ali
University Sains Malaysia, Penang Malaysia, Malaysia

In this paper, a newly constructed rational quadratic trigonometric Bézier curve with two shape parameters is presented. The purposed curve enjoys all the geometric properties of the traditional rational quadratic Bézier curve. The local control on the shape of the curve can be attained by altering the values of the shape parameters as well as the weight. The curve exactly represents some quadratic trigonometric curves such as the arc of an ellipse and the arc of a circle and best approximates the ordinary rational quadratic Bézier curve.

A Sketch-based Skeletal Figure Animation Tool for Novice Users
Satoshi Yonemoto
Kyushu Sangyo University, Japan

Our goal is to develop a sketch-based animation tool which is simple enough to use for novice users. The animation process begins with sketching an object to be animated. Our tool consists of object sketching and motion sketching. In object sketching, user sketches an object and then modifies the sketch segment using modeling and animation operations such as rigid transformation and grouping. An animated motion is then created for the sketched object by motion sketching. Motion sketching provides two motion creation techniques: a sketch-based motion path setting and a skeletal motion setting which can add articulated structure and its motion to the sketched object.
A half-day Event: Thursday 26th July 2012, Time: 09:00 - 13:00

Computer Graphics, Imaging and Visualisation

Doctoral Research Workshop

Chair: Professors Ebad Banissi, Visualisation & Graphics Research Unit, UK
Panel members: Dr. Tony Huang, prof. Giuseppe Liotta and Prof. Chun-Cheng Lin

09:00 **An introduction from Doctoral Research Workshop chair and organiser**

09:15 Muhammad Abbas, University Sains Malaysia, Malaysia

09:30 Hong Min Zhu, University of Macau, Macau, China

09:45 Pitchaya Jamjuntr, King Mongkut’s University of Technology, Thailand

10:00 **Discussion on Doctoral Research Theme**

10:15 Ren Ming Qiao, Tianjin University, Tianjin University, China

10:30 UZMA BASHIR, Universiti Sains Malaysia, Malaysia

10:45 Pongrapee Kaewsaaha, King Mongkut’s University of Technology, Thailand

11:00 **Discussion on Doctoral Research Theme**

11:15 **Break**

11:45 Taweechai Nuntawisuttiwong, King Mongkut’s University of Technology, Thailand

12:00 Xiao Chen Yuan, University of Macau, China

12:15 Tanatep Techopittayakul, King Mongkut’s University of Technology, Thailand

12:30 **Discussion on Doctoral Research Theme**
**Session cgiv2012_3.6: Imaging**

**Chair:** Prof. Chun-Cheng Lin, National Chiao Tung University, Taiwan

**A Geometric Invariant Digital Image Watermarking Scheme Based on Robust Feature Detector and Local Zernike Moments**

Xiao Chen Yuan, Chi Man Pun
University of Macau, Macau

A robust and geometric invariant digital image watermarking scheme based on robust feature points detector and local Zernike transform is proposed in this paper. The robust feature points detector is proposed based on SIFT algorithm to extract circular patches. A local Zernike moments-based watermarking scheme is raised. Each extracted circular patch is decomposed into a collection of binary patches and Zernike transform is applied to the appointed binary patches. Experimental results show that the proposed scheme is very robust against geometric distortions and common signal processing.

**Thai Font Type Recognition using SIFT**

Pitchaya Jamjuntr, Natasha Dejdumrong
King Mongkut's University of Technology Thonburi, Thailand

This paper presents a Thai font type recognition on Thai document by using Scale-invariant feature transform (SIFT). The features are extracted by Scale-invariant feature transform (SIFT) that is widely used in image processing. Sift is an algorithm for detecting local features in order to find similar objects. Our system contains ten fonts and ten text images in each font. We use ten text images each font total one hundred images for our experiment. Our results show accuracy for 97.13% for ten Thai fonts.

**An Automated Adaption of K-means Based Hybrid Segmentation System into Direct Volume Rendering Object distinction Mode for Enhanced Visualization Effect**

Arash Azim Zadeh Irani, Bahari Belaton
University Sains Malaysia, Penang Malaysia, Malaysia

Ray Casting is a direct volume rendering technique for visualizing 3D arrays of sampled data. It has vital applications in medical and biological imaging. Nevertheless, it is inherently open to cluttered classification results. It suffers from overlapping transfer function values and lacks a sufficiently powerful voxel parsing mechanism for object distinction. In this work, we are proposing an image processing based approach towards enhancing ray casting technique for object distinction process. The rendering mode is modified to accommodate masking information generated by a K-means based hybrid segmentation system. An effective set of image processing techniques are creatively employed in construction of a generic segmentation system capable of generating object membership information. Preprocessing, initialization of cluster centers, clustering, statistical optimization, edge detection & analysis and spatial adjustment are respectively the six main segmentation phases.

**The Quartic Trigonometric Bézier Curve with Two Shape Parameters**

UZMA BASHIR, Muhammad Abbas, Jamaludin MD Ali
University Sains Malaysia, Penang Malaysia, Malaysia

A quadratic trigonometric Bézier curve with two shape parameters based on newly constructed trigonometric basis functions is presented in this paper. The curve is drawn by using end point curvature conditions and carries all the geometric features of the ordinary quartic Bézier curve. The presence of shape parameters provides an opportunity to adjust the shape of the curve by simply altering their values. The G2 and C2 continuity under appropriate conditions is achieved by joining two pieces of trigonometric curve.

**Research on Knowledge Competencies for Digital Media Design**

Ren Ming Qiao, Dong Han, Shasha Wang
Tianjin University, China

The paper identifies and analyses the factors and characteristics of human's thinking structure based on the background training, and work field. We propose the conceptual graph to represent the Knowledge Competencies (KC) for the specific area of Digital Media Design. The scope of the Knowledge Competencies is represented visually using graphs, illustrating the relevance of different subjects to digital media design. The paper provides a reference basis for learners and scholars in the general area of digital media design, and thereby promote the new interdisciplinary area of Digital Media Design. The paper finally uses a
case study to evaluate the knowledge requirements of digital media design for different subject areas.

Session cgiv2012_3.7: CGIV
Chair: Prof. Giuseppe Liotta, Università degli Studi di Perugia, Italy

REMOTE SENSING AND IMAGE PROCESSING TECHNIQUES

CHOW JENG, WONG
Universiti Sains Malaysia, Malaysia

Migratory raptor counting has been widely conducted in many countries for years. The surveys are conducted yearly during migratory season for the purpose of conservation and bird flu prevention. However, the accuracy of the ground count is affected by many parameters, including the distance of the flock from the observer, the size of the species, the light intensity, the interval distance between members of the flock, the migratory birds’ speed, and the speed of wandering of individuals. This method also strongly depends on the individual experience and skills of the observer. Therefore, it is important to have an effective method to solve these problems. In this study, we developed a migratory raptor counting system by using Digital Single Lens Reflex (DSLR) camera and image processing techniques. DSLR camera was used as a remote sensor to capture the migratory raptors images. The developed software system will analyse each raptor image and count the migratory raptors in the image. This counting system has been validated with the manual count method for the accuracy. The results show that the Pearson correlation coefficient of the system is 97.3%. The results show that this monitoring system can provide an alternative way for counting migratory raptors.

<keynote lecture>
Deriving Structure of Images via Dictionary and Bayesian Network Learning

Wen-Liang Hwang
Institute of Information Science, Academia Sinica, Taiwan

The most important descriptor of an image is its structure. Image processing researchers have developed several methods to derive the low-dimensional structure of images; examples include using the Fourier transform to represent oscillatory components in images, a wavelet transform to represent piecewise smooth images, and a pre-defined dictionary for sparse representation. Such approaches have achieved a certain degree of success in deriving image structures and solving low-level problems, such as compression, and restoration; however, there is now a growing trend towards data-driven approaches that exploit data-adaptive algorithms to retrieve image structures.

In this talk, I will present two data-adaptive methods: one learns an image's structure via dictionary adaptation, and the other learns a Bayesian network from transform coefficients. I will show that the state-of-the-art K-SVD dictionary learning algorithm can be improved by using the proximal-point method; and by exploring the structures of wavelet coefficients, I will show that the Bayesian network approach outperforms assembly. He worked as a Factory Manager in Varitronix EC, Penang (Subsidiary of Magna Donnelly-USA), as an Industrial Engineering Department Manager in SONY Electronics, Penang, as a Quality Assurance Senior Engineer in HITACHI Semiconductor, Penang, and as a Research & Development Engineer in SIEMENS Semiconductor, Penang. In 1990, Wong successfully redesigned, built and tested a plasma focus fusion device for ICTP (International Centre of Theoretical Physics) in Italy. He also successfully carried out some researches in ICTP. http://www2.ictp.it/NewSIS/personnel_details.mhtml?pk=WONGGGCHOW001m Currently, his research interests include remote sensing application for air pollution monitoring via networking. In year 2006, this project was chosen to participate in the competition of 17th International Invention, Industrial Design & technology Exhibition 2006 at KLCC, Kuala Lumpur. This project won three awards in this competition. He has published more than Sixty articles on these areas at national and international proceedings. Eight of his publication was selected to published in the Smithsonian/NASA Astrophysics Data System hosted by the Harvard-Smithsonian Center.

<keynote lecture>

Wong Chow Jeng (黄召仁) has studied Physics in Universiti Malaya, Kuala Lumpur, Malaysia. Over 15 years of working experience in multinational manufacturing companies for semiconductors and electronics
the state-of-the-art BM3D denoising algorithm, particularly on texture images.

Dr. Wen-Liang Hwang was awarded a B.S. degree in Nuclear Engineering by National Tsing Hua University, Hsinchu, Taiwan in 1981, an M.S. degree in Electrical Engineering by Polytechnic University, Brooklyn, New York in 1988, and Ph.D. degree in computer science from New York University, New York in 1993. In 1995, he joined the Institute of Information Science, Academia Sinica, Taiwan, where he is now a research fellow.

Dr. Hwang's research area include wavelet analysis, and signal and image processing. As well as co-authoring one book and contributing a chapter to another book, he has published several technical papers in the leading journals and conferences of the IEEE Society. In 2001, he received a national award for distinguished junior researchers in Taiwan.

<knote lecture>
Visualization of Hierarchical Information on Mobile Screens
Kang Zhang
Visual Computing Lab, The University of Texas at Dallas, USA

Visualizing and exploring a hierarchical structure on small screen devices, such as mobile phones, is a challenge. On the screens of desktop PCs and laptops, such hierarchical structures are often shown in a tabular view. Due to the size particularly the width restriction, a tabular view is not suited for mobile screens. This talk discusses a visualization technique that displays multiple levels of a hierarchy on a single view and allows users to explore the hierarchical structure rapidly through touch input. The visualization technique makes full use of the available space and flexibly allocates the space for individual nodes according to the application criteria. The approach adapts the selection and display of relevant information based on the user's query habit, by hiding less important information to maximize the utilization of the space.

Kang Zhang is Professor and Director of Visual Computing Lab, Department of Computer Science at the University of Texas at Dallas. He is also a Board Director of Vital Art and Science Inc., USA. He holds a B.Eng, degree in Computer Engineering from University of Electronic Science and Technology of China, a Ph.D. degree from University of Brighton, UK, and an Executive MBA degree from the University of Texas at Dallas. Prior to joining UT-Dallas, he held various academic positions in the UK, Australia, and China. Dr. Zhang's current research interests include information visualization, visual languages, aesthetic computing, and managerial aesthetics; and has published over 180 papers and 5 books in these areas. He is also accomplished artist, having won various awards. Dr Zhang is on the Editorial Boards of Journal of Visual Languages and Computing, International Journal of Software Engineering and Knowledge Engineering, and International Journal of Advanced Intelligence. His home page is at www.utdallas.edu/~kzhang.
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