



Program and Book of Abstracts

The 2011 Joint Symposia on

Computational Aesthetics (CAe)

Non-Photorealistic Animation and Rendering (NPAR)

Sketch-Based Interfaces and Modelling (SBIM)

August 5 – 7, 2011.

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Vancouver, BC, Canada.**

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Friday 5 August		
	Room A	Room B
08:30	Registration desk opens. Coffee.	
09:00	Welcome	
09:15	SBIM Keynote - Jeff Han	
10:15	Coffee	
10:45	S1: Evaluation and Aesthetics <ul style="list-style-type: none"> Sympathetic Guitar: Human Social Response to Remote Interaction Paradigms in Abstract, Expressive Contexts Evaluating emotional responses to non-photorealistic images Is the iPad useful for sketch input? A comparison with the Tablet PC Towards ground truth in geometric textures 	S2: Sketch based 3D Modelling <ul style="list-style-type: none"> Combining bimanual manipulation and pen-based input for 3D modelling 3D Modeling with a Symmetric Sketch Immersion and Embedding of Self-Crossing Loops Reconstructing surfaces from sketched 3D irregular curve
12:30	Lunch	
14:00	S3: Illusions <ul style="list-style-type: none"> Images from Self-Occlusion Hidden Images Generating Op Art Lines 	S4: Symmetry and Geometry <ul style="list-style-type: none"> Symmetry Hybrids Snaxels on a Plane StereoBrush: Interactive 2D to 3D Conversion Using Discontinuous Warps
15:15	Tea	
15:45	S5: Sketching & Design <ul style="list-style-type: none"> A Sketch-Based System for Highway Design Building "The Plotter" – an Aesthetic Exploration with Drawing Robots Gesture-based design of 2D contours: an alternative to sketching? Sketch-Based Modeling of Smooth Surfaces using Adaptive Curve Networks 	S6: Rendering and Abstraction <ul style="list-style-type: none"> Stylization-based ray prioritization for guaranteed framerate Image and Video Abstraction by Multi-scale Anisotropic Kuwahara Filtering Aesthetic Agents: Swarm-based Non-photorealistic Rendering using Multiple Images Image Simplification and Vectorization
17:30	Reception (Art Show, Posters, Demos). Ends 19:30.	

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Saturday 6 August		
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08:30	Registration desk opens. Coffee.	
	NPAR Keynote – Andrew Pearce “Stylistic Approximations of Realism in DreamWorks’ Animated Films”	
09:00	Coffee	
10:00	S7: Animation	S8: Enhancing Sketching
10:30	<ul style="list-style-type: none"> • TexToons: Practical Texture Mapping for Hand-drawn Cartoon Animations • Double Meandering Algorithm: From Drawing Game to Automated Animation • Spatio-temporal Analysis for Parameterizing Animated Lines • Temporal Noise Control for Sketchy Animation 	<ul style="list-style-type: none"> • Defining Precise Measurements with Sketched Annotations • Artistic Canvases for Gestural and Non-linear Typography • Sketch Express: Facial Expressions Made Easy • Continuous Recognition and Visualization of Pen Strokes and Touch-Screen Gestures
12:15	Lunch	
13:45	S9: Classification	S10: Light and Shadow
	<ul style="list-style-type: none"> • Quick\$: Application of Hierarchical Clustering to Gesture Recognition • ClassySeg: A Machine Learning Approach to Automatic Stroke Segmentation • Combining Corners from Multiple Segmenters 	<ul style="list-style-type: none"> • Dynamic Stylized Shading Primitives • Chromatic Shadows for Improved Perception • Performing Animator Instrument for Live Media
15:00	Tea	
15:30	S11: Perception	S12: Artistic Stylization
	<ul style="list-style-type: none"> • gamutHeatMap: Visualizing the Colour Shift of Rendering Intent Transformations • Simple Motion Textures for Ambient Affect • Predicting Stereoscopic Viewing Comfort Using a Coherence-Based Computational Model • Now or Later: An Initial Exploration into User Perception of Mathematical Expression Recognition Feedback 	<ul style="list-style-type: none"> • ColourVis: Exploring Colour Usage in Paintings Over Time • Portrait Painting Using Active Templates • Artistic Tessellations by Growing Curves • Customizing Painterly Rendering Styles Using Stroke Processes
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12:15	Closing Remarks	
14:00	<i>SIGGRAPH 2011 Starts</i>	

Sympathetic Guitar: Human Social Response to Remote Interaction Paradigms in an Abstract, Expressive Context (CAe Technical)

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There seems to be an inherent sociality of computers which is somehow related to their interactivity. However, existing research on this topic is limited to direct interaction, semantic information, clear goals and the visual modality. This work replicates and extends a previous study on politeness toward computers in the context of musical performance with a guitar. Results suggest that the quality of interactivity of a system contributes to its sociality, demonstrating the relevance of an existing body of literature on social responses to technology to the aesthetic of abstract, expressive systems such as video games, artistic tools, ambient systems, media art installations, and mobile device applications. Secondary findings suggest the inherent social presence of an interface can be influenced through informed design decisions, but direct investigation is needed.



Evaluating emotional responses to non-photorealistic images (NPAR)

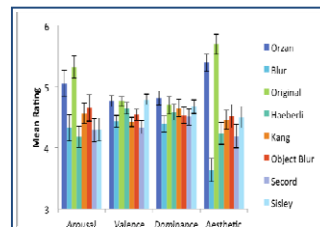
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Non-photorealistic rendering (NPR) algorithms are used to produce stylized images, and have been evaluated on the aesthetic qualities of the resulting images. NPR-produced images have been used for aesthetic and practical reasons in media intended to produce an emotional reaction in a consumer (e. g., computer games, films, advertisements, and websites); however, it is not understood how the use of these algorithms affects the emotion portrayed in an image. We conducted a study of subjective emotional response to five common NPR approaches, two blurring techniques, and the original image with 42 participants, and found that the NPR algorithms dampened participants' emotional responses in terms of arousal (activation) and valence (pleasure).



Interactive Modeling of Muqarnas (CAe Technical)

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Muqarnas are a mesmerizing 3D feature of Islamic architecture that exhibit intricate geometry. They are composed of several basic structures combined in successive layers, producing complicated 3D surfaces. In this paper we propose a new approach for interactive modelling of muqarnas based on their layered structure. As guidance for the modeling workflow, floor plans are used. We also discuss how to edit the resulting models and how to automatically generate new forms.



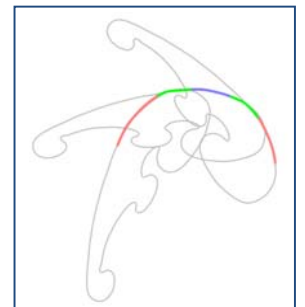
Neatening sketched strokes using piecewise French Curves (SBIM)

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We apply traditional bimanual curve modeling using French curves to the problem of automatic neatening of sketched strokes. Given a sketched input stroke and a set of template French curves we present an approach that fits the stroke using an optimal number of French curve segments. Our algorithm operates in both curvature and point space, reconstructing the salient curvature profiles of French curve segments, while limiting error accumulation resulting from curvature integration. User-controlled parameters allow the neatened stroke to model G2 continuous curves, capture G1 discontinuities, define closed curves and explore the trade-off between fitting error and the number of French curve segments used. We present an interactive sketch stroke neatening implementation to demonstrate the real-time performance of our algorithm and evaluate the quality of its results.

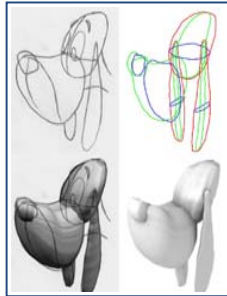


Single-View Sketch Based Modeling (SBIM)

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This paper presents a new sketch modeling system that is able to generate complex objects drawn from a unique viewpoint. The user draws the model in an iterative manner, adding simple parts to the existing object until completion. Each part is constructed from two construction lines (lines on the surface of the object that are planar and perpendicular to each other) whose orientation in the 3D space is uniquely determined by the system, and an optional silhouette. The system is then able to produce rough 3D reconstructions of drawings very easily by tracing over a sketch for example. Such models are perfectly suited to investigate their shade or shadow and they can be used as substitutes for more detailed models when the need for quick models is present. The user can also explore shapes directly on the system, refining the shape on the go in a oversketching way. The creation of models is very efficient, as the user models the shapes directly in the correct pose and orientation. Results show that the system is able to create complex objects without ever having to change the viewpoint.



Towards automatic concept transfer (NPAR)

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This paper introduces a novel approach to automatic concept transfer; examples of concepts are “romantic”, “earthy”, and “luscious”. The approach modifies the color content of an input image given only a concept specified by a user in natural language, thereby requiring minimal user input. This approach is particularly useful for users who are aware of the message they wish to convey in the transferred image while being unsure of the color combination needed to achieve the corresponding transfer. The user may adjust the intensity level of the concept transfer to his/her liking with a single parameter. The proposed approach uses a convex clustering algorithm, with a novel pruning mechanism, to automatically set the complexity of models of chromatic content. It also uses the Earth Mover’s Distance to compute a mapping between the models of the input image and the target chromatic concept. Results show that our approach yields transferred images which effectively represent concepts, as confirmed by a user study.



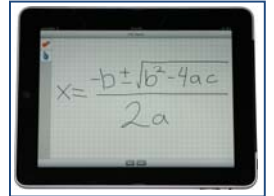
Is the iPad useful for sketch input? A comparison with the Tablet PC (SBIM)

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 George Labahn
 Edward Lank

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Despite the increasing prevalence of touch-based tablet devices, little attention has been paid to what effects, if any, this form factor has on sketch behaviours in general and on sketch recognizers in particular. We investigate the title question through an empirical study in the context of mathematical expression recognition. Using a corpus of thirty expressions drawn on Tablet PC and iPad by thirty writers, we show that characteristics of sketching and drawing differ depending on platform. While recognition is most accurate on the Tablet PC due to its technical superiority, recognition is feasible on mobile touch-based devices. However, there are characteristics of sketching on multitouch tablets that differ, and these physical characteristics of writing impact recognition accuracy. Together, our observations inform the broader Sketch Recognition community as they design systems targeted to multi-touch tablets.

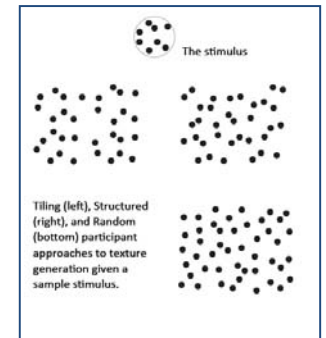


Towards ground truth in geometric textures (NPAR)

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Two-dimensional geometric texture synthesis is the geometric analogue of raster-based texture synthesis. An absence of conventional evaluation procedures in recent synthesis attempts demands an inquiry into the visual significance of synthesised results. In this paper, we report on two psychophysical experiments that explore how people understand notions of similarity in geometric textures. We present perceptual metrics and human texture generation features that are crucial for future researchers when developing and assessing the success of their algorithms.



Combining bimanual manipulation and pen-based input for 3D modelling (SBIM)

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Multitouch enabled surfaces can bring advantages to modelling scenarios, in particular if bimanual and pen input can be combined. In this work, we assess the suitability of multitouch interfaces to 3D sketching tasks. We developed a multitouch enabled version of ShapeShop, whereby bimanual gestures allow users to explore the canvas through camera operations while using a pen to sketch. This provides a comfortable setting familiar to most users. Our contribution focuses on comparing the combined approach (bimanual and pen) to the pen-only interface for similar tasks. We conducted the evaluation helped by ten sketching experts who exercised both techniques. Results show that our approach both simplifies workflow and lowers task times, when compared to the pen-only interface, which is what most current sketching applications provide.

**3D Modeling with a Symmetric Sketch (SBIM)**

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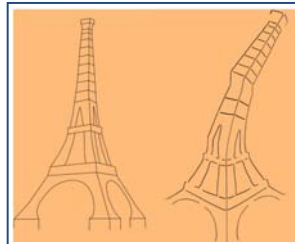
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We propose a method that allows geometric operations such as view change, deformation, simulation, or symmetrization on a single off-line sketch via a proxy geometry reconstructed directly from the sketch. The reconstruction captures the overall shape of the object depicted by making use of the global relationships of the curves and the assumption that the sketched object is bilaterally symmetric. After cleaning the sketch and extracting the curves, topological and geometric properties of a set of identified points are used to derive robust correspondence and pairwise constraints. These constraints are considered all at once in a spectral algorithm to get the optimum matching of the curves. Depths of points on the matched curves are extracted by utilizing the symmetry assumption. They are then used to reconstruct a smooth geometry. The whole process is automatic except for a few seconds of user interaction.

**Animation for Ancient Tile Mosaics (NPAR)**

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In mosaic art, tiles of unique color, material, and shape are arranged on a plane to form patterns and shapes. Although previous research has been carried out on creating static mosaic-like images from non-mosaic input, mosaic animation requires a method to maintain the temporal coherence of tiles. Here we introduce a method that creates mosaic animations from videos by applying a temporally and spatially coherent tile-arrangement technique. We extract coherent feature lines from video input using video segmentation, and arrange tiles based on the feature lines. We then animate tiles along the motion of video, add and delete tiles to preserve the tile density, and smooth tile color via frames.

**EMVIZ: The Poetics of Movement Quality Visualization (CAe Arts)**

Pattarawut Subyen

Diego Maranan

Thecla Schiphorst

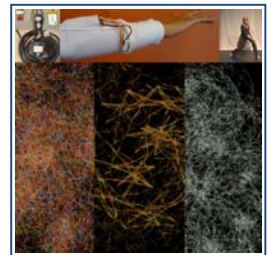
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This paper describes the design of an interactive visualization prototype, called EMVIZ, that generates abstract expressive visual representations of human movement quality. The system produces dynamic visual representations of Laban Basic-Efforts which are derived from the rigorous framework of Laban Movement Analysis. Movement data is obtained from a real-time machine-learning system that applies Laban Movement Analysis to extract movement qualities from a moving body. EMVIZ maps the Laban Basic-Efforts to design rules, drawing parameters, and color palettes for creating visual representations that amplify audience ability to appreciate and differentiate between movement qualities. EMVIZ was demonstrated in a gallery context. The audience reported that the system produces evocative and meaningful visual representations of Laban Basic-Efforts. This paper describes the metaphoric mapping process used to design and implement the visualization system and discusses the aesthetics of the resulting visual style.

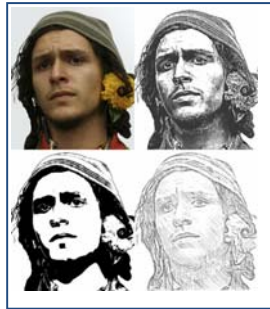


XDoG: Advanced Stylization of Images with Difference-of-Gaussians (NPAR)

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Recent extensions to the standard Difference-of-Gaussians (DoG) edge detection operator have rendered it less susceptible to noise and increased its aesthetic appeal for stylistic depiction applications. Despite these advances, the technical subtleties and stylistic potential of the DoG operator are often overlooked. This paper reviews the DoG operator, including recent improvements, and offers many new results spanning a variety of styles, including pencilshading, pastel, hatching, and binary black-and-white images. Additionally, we demonstrate a range of subtle artistic effects, such as ghosting, speed-lines, negative edges, indication, and abstraction, and we explain how all of these are obtained without, or only with slight modifications to an extended DoG formulation. In all cases, the visual quality achieved by the extended DoG operator is comparable to or better than those of systems dedicated to a single style.

**ActionPlot: A Visualization Tool for Contemporary Dance Analysis (CAe Arts)**

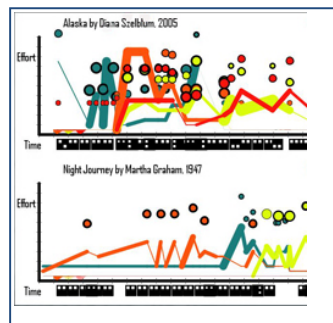
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This paper illustrates a prototype for visualizing contemporary dance through a movement analysis tool, entitled ActionPlot. Contemporary dance is an experiential and time based art form with few available analysis techniques. Our design facilitates structural analysis of dance performance by codifying and plotting expert viewer information. ActionPlot is then useful to experts familiar with choreographic strategies and illustrates three levels; viewing for interpretation or meaning, for structural or performative information or for detailed movement information. Plotted elements include the number of performers, the performer's attention and intention, the amount of effort used, tempo of the effort, the balance of the movement within the body and the time the action is performed. This process conveys information about the viewing experience in context, allowing the user to see structural and performative patterns, similarities and differences while comparing between two works.

**Immersion and Embedding of Self-Crossing Loops (SBIM)**

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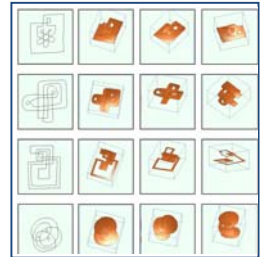
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The process of generating a 3D model from a set of 2D planar curves is complex due to the existence of many solutions. In this paper we consider a self-intersecting planar closed loop curve, and determine the 3D layered surface P with the curve as its boundary. Specifically, we are interested in a particular class of closed loop curves in 2D with multiple *self-crossings*, which bound a surface homeomorphic to a topological disk. Given such a self-crossing closed loop curve in 2D, we find the deformation of the topological disk whose boundary is the given loop. Further, we find the surface in 3D whose orthographic projection is the computed deformed disk, thus assigning 3D coordinates for the points in the self-crossing loop and its interior space. We also make theoretical observations as to when, given a topological disk in 2D, the computed 3D surface will self-intersect.

**Reconstructing surfaces from sketched 3D irregular curve networks (SBIM)**

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This paper presents a system for designing free-form surfaces starting from a sketched 3D irregular curve network. By simply dragging a smart-pen device in space, the user draws and refines arbitrary 3D style-curves that define an outline of the desired shape. Unlike previous touch-based sketching systems, the user-drawn strokes can both stay on the model surface to reconstruct parts of an existing object, or freely sketch 3D style-lines of non-existing parts to design new geometry. The wireless smart-pen device is supported by an active stereo acquisition system which makes use of two infrared cameras. For a given set of 3D curves, the system automatically constructs a low resolution mesh that is naturally refined to produce a smooth surface which preserves curvature features defined by the user on the curve network. The interpolating surface is obtained by applying a high-order diffusion flow. We present an efficient two step approach that first diffuses curvature values preserving the curvature constraints, and then corrects the surface to fit the resulting curvature vector field and interpolating the 3D curve network. This leads to fast implementation of a feature preserving fourth order geometric flow. We show several examples to demonstrate the ability of the proposed advanced design methodology to create sophisticated models possibly having sharp creases and corners.



Images from Self-Occlusion (CAe Technical)

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We propose a complete system for designing, simulating, and fabricating surfaces with shading due to self-occlusion that induce desired input images. Our work is based on a simple observation: consider a cylindrical hole in a planar surface. As the depth of the hole increases, the radiance emitted from the surface patch that contains the hole decreases. First, we propose a measurement-based approach that derives a mapping between albedo of a surface patch and the hole depth. Given this mapping and an input image, we show how to produce a distribution of holes with varied depth that approximates the image well. We demonstrate that by aligning holes with image features we obtain reproductions that look better than those resulting from regular hole patterns. We validate this method on a variety of images and corresponding surfaces.

**Hidden Images** (NPAR)

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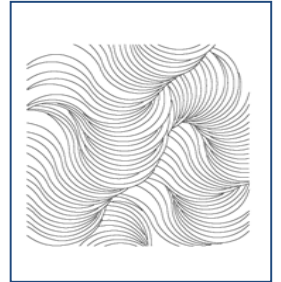
A hidden image is a form of artistic expression in which one or more secondary objects are hidden within a primary image. Features of the primary image, especially its edges and texture, are used to portray a secondary object. People can recognize both the primary and secondary intent in such pictures, although the time taken to do so depends on the prior experience of the viewer and the strength of the clues. Here, we present a system for creating such images. It relies on the ability of human perception to recognize an object, e.g. a human face, from incomplete edge information, especially within its interior, rather than its outline. Our system detects the edges of the object to be hidden, and then finds a place in the scene to embed it, together with a suitable transformation for doing so, by optimizing an energy based on edge differences. Embedding is done using a modified Poisson blending approach, which strengthen the matched edges of the host image with the edges of the objects. We show various hidden images generated by our system.

**Artistic Tessellations by Growing Curves** (NPAR)

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In this paper we propose to tessellate a region by growing curves. We use a particle system, which flexibly provides good controls over final effects by variations of the initial placement, the placement order, curve direction, and curve properties. We also propose an automatic image-based mosaic method which has good texture indication, using a smoothed vector field to guide particle movement. The final irregular tessellation simulates stained glass and the elongated curved tiles faithfully express the large-scale flow in highly textured areas. We give some additional applications, some of which resemble naturally occurring irregular patterns such as cracks and scales. We also notice that stacking a set of curves in a structured way can give the illusion of a 3D shape.

**Customizing Painterly Rendering Styles Using Stroke Processes** (NPAR)

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In this paper, we study the stroke placement problem in painterly rendering, and present a solution named stroke processes, which enables intuitive and interactive customization of painting styles by mapping perceptual characteristics to rendering parameters. Using our method, a user can adjust styles (e.g., Fig.1) easily by controlling these intuitive parameters. Our model and algorithm are capable of reflecting various styles in a single framework, which includes point processes and stroke neighborhood graphs to model the spatial layout of brush strokes, and stochastic reaction-diffusion processes to compute the levels and contrasts of their attributes to match desired statistics. We demonstrate the rendering quality and flexibility of this method with extensive experiments.



ColourVis: Exploring Colour Usage in Paintings Over Time (CAe Technical)

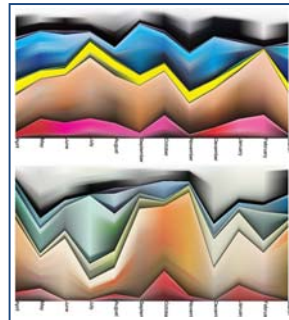
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The colour palette of painters over history has been of interest to many, including: art historians, archeologists, and art lovers. Colour usage in art changes from culture to culture and season to season and is often thought of as reflecting or inspiring mood and ambience. We present ColourVis: a visualization that supports exploration of colour usage in digital images. In particular, we use as a case study European art over the last six centuries. Visualizing this relatively unexplored area offers insights into such questions as: How blue was Picasso's blue period?; How do realist painters' colour choices compare to that of surrealist painters; or How has the usage of colours changed over time? Through ColourVis we offer an exploration and comparison tool for individual paintings, groups of paintings and trends in colour usage over time.

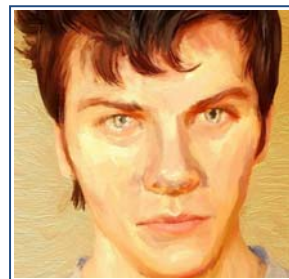
**Portrait Painting Using Active Templates** (NPAR)

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Portraiture plays a substantial role in traditional painting, yet it has not been studied in depth in painterly rendering research. The difficulty in rendering human portraits is due to our acute visual perception to the structure of human face. To achieve satisfactory results, a portrait rendering algorithm should account for facial structure. In this paper, we present an example-based method to render portrait paintings from photographs, by transferring brush strokes from previously painted portrait templates by artists. These strokes carry rich information about not only the facial structure but also how artists depict the structure with large and decisive brush strokes and vibrant colors. With a dictionary of portrait painting templates for different types of faces, we show that this method can produce satisfactory results.

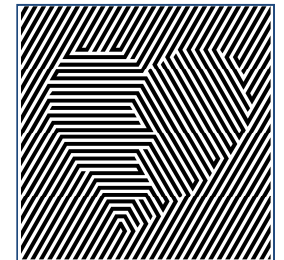
**Generating Op Art Lines** (CAe Technical)

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A common technique in Op Art is the use of parallel lines to depict simple shapes such as circles and squares. Some artists have attempted to create more complex images using this technique but faced the problem of producing undesirable artifacts such as line breaks and T-junctions within their artworks. To this end, we developed a novel algorithm that takes an arbitrary image and automatically generates the corresponding Op Art composition of this style. For 2-colour images, the algorithm produces artworks without any unwanted artifacts; for images with more colours, the basic algorithm cannot guarantee the removal of all artifacts, but we use a global optimization technique to minimize the number of artifacts. The results have applications in graphics design, data visualization, puzzle creation and line drawings.

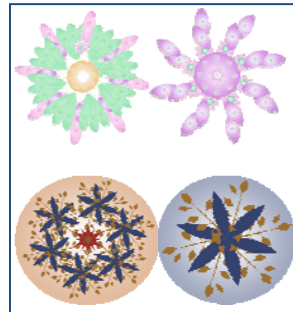


Symmetry Hybrids (CAe Technical)

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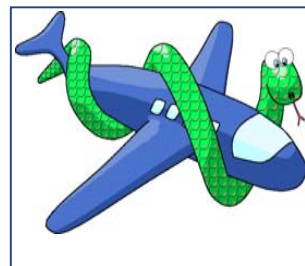
How we perceive the world is strongly governed by symmetry. Symmetry presents itself in both natural and man-made structures giving aesthetic appeal to the world. This paper presents an approach to form intuitive tree based representations that minimally describe input patterns. We explore how new hybrid patterns can be generated by grafting different symmetry trees together. A new algorithm is proposed to generate new hybrid patterns that maintain the overall appearance of the inputs while allowing control over the amount of variation generated.

**Snaxels on a Plane** (NPAR)

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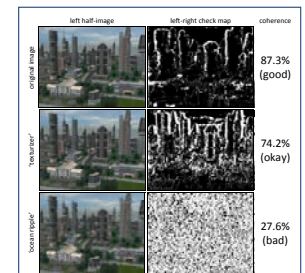
While many algorithms exist for tracing various contours for illustrating a meshed object, few algorithms organize these contours into region-bounding closed loops. Tracing closed-loop boundaries on a mesh can be problematic due to switchbacks caused by subtle surface variation, and the organization of these regions into a planar map can lead to many small region components due to imprecision and noise. This paper adapts "snaxels," an energy minimizing active contour method designed for robust mesh processing, and repurposes it to generate visual, shadow and shading contours, and a simplified visual-surface planar map, useful for stylized vector art illustration of the mesh. The snaxel active contours can also track contours as the mesh animates, and frame-to-frame correspondences between snaxels lead to a new method to convert the moving contours on a 3-D animated mesh into 2-D SVG curve animations for efficient embedding in Flash, PowerPoint and other dynamic vector art platforms.

**Predicting Stereoscopic Viewing Comfort Using a Coherence-Based Computational Model** (CAe Technical)

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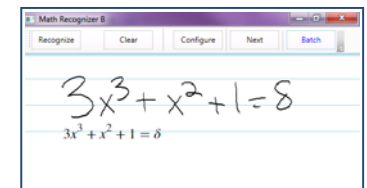
We introduce a novel computational model for objectively assessing the visual comfort of stereoscopic 3D imagery. Our model integrates research in visual perception with tools from stereo computer vision to quantify the degree of stereo coherence between both stereo half-images. We show that the coherence scores computed by our model strongly correlate with human comfort ratings using a perceptual study of 20 participants rating 80 images each. Based on our experiments, we further propose a taxonomy of stereo coherence issues which affect viewing comfort, and propose a set of computational tools that extend our model to identify and localise stereo coherence issues from stereoscopic 3D images.

**Now or Later: An Initial Exploration into User Perception of Mathematical Expression Recognition Feedback** (SBIM)

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Mathematical handwriting recognition is an important method of mathematics input for computers. While strides in recognition have been made in recent years, recognition is still at a level where mistakes are common and often inexplicable from the user's point-of-view. As a result, recognition mistakes can cause user distraction and frustration. We examine how user preference for real-time or batch recognition mode is affected by recognition accuracy and the number of expressions entered. Our results show that users prefer real-time recognition when working with multiple expressions; however, with high accuracy recognition, users did not prefer one recognition mode over the other.



gamutHeatMap: Visualizing the Colour Shift of Rendering Intent Transformations (CAe Technical)

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When a photograph is printed, its original colours are converted to those of the output medium using a rendering intent transformation. This process takes into consideration the colour properties of the paper and the printer used. gamutHeatMaps are a visualization that highlights the perceptual difference between a soft-proof of a photograph in the intended output medium, and its original. They can be used to compare different output media to determine the one that most accurately renders the colours of a given photograph.



Simple Motion Textures for Ambient Affect (CAe Technical)

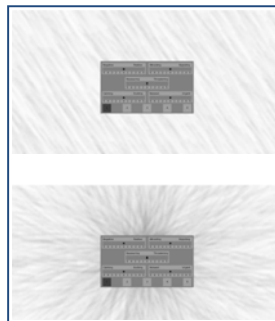
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The communication of emotion and the creation of affect are core to creating immersive and engaging experiences, such as those in performance, games and simulation. The design of such ambient visual cues for affect is an elusive topic that has been studied by painters and artists for years. Research shows that simple motions have the capacity to be both perceptually efficient and powerfully evocative, and motion textures – patterns of ambient motion throughout the scene – are frequently used to imbue the atmosphere with affect. To date there is little empirical evidence of what properties of motion texture are most influential in this affect. In this paper we report the results of a study of simple, abstract motion textures that show path curvature, speed and texture layout can influence affective impressions such as valence, comfort, urgency and intensity.



StereoBrush: Interactive 2D to 3D Conversion Using Discontinuous Warps (SBIM)

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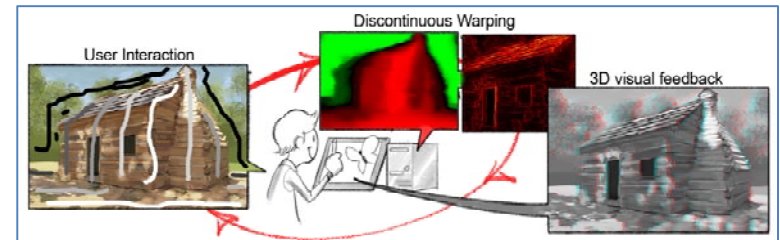
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We introduce a novel workflow for stereoscopic 2D to 3D conversion in which the user “paints” depth onto a 2D image, instantaneously receiving intuitive 3D feedback. This workflow is enabled by the introduction of a discontinuous warping technique that creates stereoscopic pairs from sparse, possibly erroneous user input. Our method assumes a piecewise continuous depth representation, preserving visual continuity in most areas while creating sharp depth discontinuities at important object boundaries. As opposed to prior work that relies strictly on a per pixel depth map, our scribbles operate entirely on image domain disparity, allowing for relaxed input requirements. This formulation also allows us to compute a disparity-and-content-aware stretching of background areas to automatically fill disoccluded regions with valid stereo information. We integrate all steps into a single optimization framework, which can then be solved on a GPU at interactive rates. The instant feedback received while painting depth allows even untrained users to quickly create compelling 3D scenes from single-view footage.



A Sketch-Based System for Highway Design (SBIM)

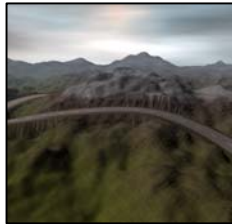
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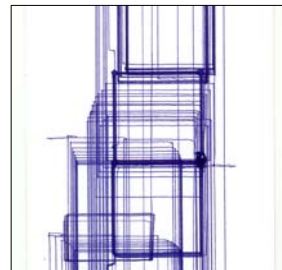
To create traffic simulations of high visual-fidelity, each road needs to be designed and modelled in great detail to conform with the governing rules and regulations of highway design. Roads could be created manually, but this can become a time-consuming and laborious process when modelling large-scale networks. Therefore, automated techniques for generating road networks efficiently, without any prior user knowledge of road design principles and practices, is highly desirable in both urban-planning and entertainment industries. In our paper, we present a novel sketch-based tool to semi-automate the design, creation and visualisation of realistic road networks across both flat and undulating terrains. Our tool is guided by input sketches and a combination of prioritised constraints, including the curvature of roads, their inclination, and the volume of ground that would be displaced.

**Building “The Plotter” – an Aesthetic Exploration with Drawing Robots (CAe Arts)**

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 Canada

This paper presents the drawing robot “The Plotter” and an exploratory preliminary study with other drawing robots. Around notions of authorship, control and “Eigensinn”, the paper describes these artworks and situates them in a context of generative art and abstract expressionism. Relating to Brooks’ subsumption architecture for Artificial Intelligence, this paper addresses the question, if the chosen setup is capable of evoking particular aesthetics that lie beyond the control of the programmer. The paper concludes with describing potential visual attributes of such aesthetics.

**Performing Animator Instrument for Live Media (CAe Arts)**

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In this paper we discuss the design of Performing Animator, an expressive instrument for live media, we developed in support of our situated interdisciplinary performance practice. The concept of a cinema of braided processes is introduced as a basic structure for media instrument design. This media performance instrument is described in terms of its conceptual, design and performative aspects. The Performing Animator Instrument is analogous to a musical instrument that enables generative animation, film editing and compositing, tailored for improvisational expression of projected visual media elements. Our instrument presents the performer with a large set of techniques that enable flexible media manipulation and generation. The paper also addresses issues related to the tensions between narrative structure and performative expression, live and recorded media and the structuring of improvised media.



Dynamic Stylized Shading Primitives (NPAR)

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Shading appearance in illustrations, comics and graphic novels is designed to convey illumination, material and surface shape characteristics at once. Moreover, shading may vary depending on different configurations of surface distance, lighting, character expressions, timing of the action, to articulate storytelling or draw attention to a part of an object. In this paper, we present a method that imitates such expressive stylized shading techniques in dynamic 3D scenes, and which offers a simple and flexible means for artists to design and tweak the shading appearance and its dynamic behavior. The key contribution of our approach is to seamlessly vary appearance by using shading primitives that take into account lighting direction, material characteristics and surface features. We demonstrate their flexibility in a number of scenarios: minimal shading, comics or cartoon rendering, glossy and anisotropic material effects; including a variety of dynamic variations based on orientation, timing or depth. Our prototype implementation combines shading primitives with a layered approach and runs in real-time on the GPU.

**Chromatic Shadows for Improved Perception (NPAR)**

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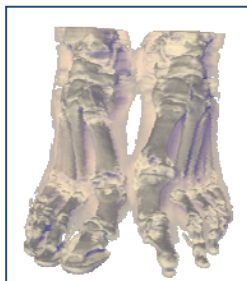
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Soft shadows are effective depth and shape cues. However, traditional shadowing algorithms decrease the luminance in shadow areas. The features in shadow become dark and thus shadowing causes information hiding. For this reason, in shadowed areas, medical illustrators decrease the luminance less and compensate the lower luminance range by adding color, i.e., by introducing a chromatic component. This paper presents a novel technique which enables an interactive setup of an illustrative shadow representation for preventing overdarkening of important structures. We introduce a scalar attribute for every voxel denoted as shadowiness and propose a shadow transfer function that maps the shadowiness to a color and a blend factor. Typically, the blend factor increases linearly with the shadowiness. We then let the original object color blend with the shadow color according to the blend factor. We suggest a specific shadow transfer function, designed together with a medical illustrator which shifts the shadow color towards blue. This shadow transfer function is quantitatively evaluated with respect to relative depth and surface perception.

**Gesture-based design of 2D contours: an alternative to sketching? (SBIM)**

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In addition to being a very expressive media, 2D sketches representing the contour of a shape are commonly used as a basis for 3D sketch-based modeling. This paper investigates an alternative to the standard way of creating such sketches: instead of carefully following the contour with a pen and erasing or over-sketching, the user progressively shapes the contour from a simple input curve, only through intuitive deformation gestures. No menus or sliders are used. This is achieved by providing an automatic selection mechanism between a minimal set of deformation operators, inspired from Michael Leyton's perceptual theory of shapes. The shape representation and the active operator parameters are kept transparent to the user. This enables user to focus on the design and makes the system immediately usable by anybody. We validate this new paradigm through a user study that includes a comparison with standard sketching.

**Sketch-Based Modeling of Smooth Surfaces using Adaptive Curve Networks (SBIM)**

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We present a new 3D surface modeling method that enables a rapid creation and modification of globally smooth surfaces from curve networks. The key feature of the proposed method is that it assumes the sketched curve networks to be malleable rather than rigid, thus enabling mediation between curve interpolation versus surface smoothness. In the first step, the user sketches a network topology in the form of cubic feature edges. The curve network serves as an initial control mesh, from which a subdivision surface is computed. The subdivision surface is then iteratively modified to make the limit surface interpolate the original curve network at an arbitrary number of points, while minimizing the curvature variation energy of the surface. For networks in which this forced interpolation causes undesirable distortions to the surface, the network is automatically adjusted to make it conform to a smoothed version of the surface. This approach enables a concurrent modeling of the curve network and the underlying surface, thus eliminating the need for a laborious, iterative adjustment of the curve network for smooth surface creation.



Stylization-based ray prioritization for guaranteed framerates (NPAR)

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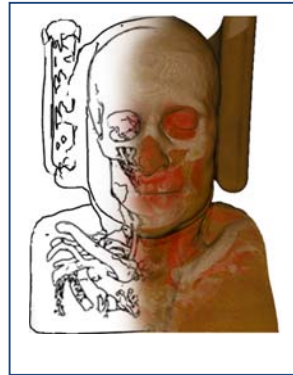
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This paper presents a new method to control graceful scene degradation in complex ray-based rendering environments. It proposes to constrain the image sampling density with object features, which are known to support the comprehension of the three-dimensional shape. The presented method uses Non-Photorealistic Rendering (NPR) techniques to extract features such as silhouettes, suggestive contours, suggestive highlights, ridges and valleys. To map different feature types to sampling densities, we also present an evaluation of the features' impact on the resulting image quality. To reconstruct the image from sparse sampling data, we use linear interpolation on an adaptively aligned fractal pattern. With this technique, we are able to present an algorithm that guarantees a desired minimal frame rate without much loss of image quality. Our scheduling algorithm maximizes the use of each given time slice by rendering features in order of their corresponding importance values until a time constraint is reached.

**Image and Video Abstraction by Multi-scale Anisotropic Kuwahara Filtering (NPAR)**

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The anisotropic Kuwahara filter is an edge-preserving filter that is especially useful for creating stylized abstractions from images or videos. It is based on a generalization of the Kuwahara filter that is adapted to the local structure of image features. In this work, two limitations of the anisotropic Kuwahara filter are addressed. First, it is shown that by adding thresholding to the weighting term computation of the sectors, artifacts are avoided and smooth results in noise-corrupted regions are achieved. Second, a multi-scale computation scheme is proposed that simultaneously propagates local orientation estimates and filtering results up a low-pass filtered pyramid. This allows for a strong abstraction effect and avoids artifacts in large low-contrast regions. The propagation is controlled by the local variances and anisotropies that are derived during the computation without extra overhead, resulting in a highly efficient scheme that is particularly suitable for real-time processing on a GPU.

**Combining Corners from Multiple Segmenters (SBIM)**

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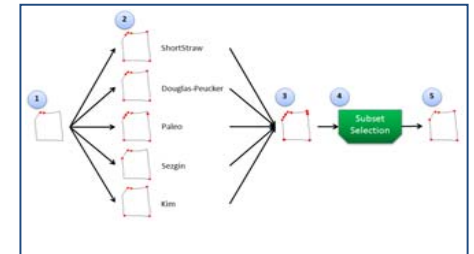
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Pen-based interfaces utilize sketch recognition in order to allow users to sketch complex systems with intuitive input. In order to allow users to freely draw their ideas without constraints, the low-level techniques involved with sketch recognition must be perfected because poor low-level accuracy can impair a user's interaction experience. Stroke segmentation algorithms often employ single, specific techniques in their attempts to splice

We introduce a technique to combine polyline corner results from different segmenters by using a variation of feature subset selection. Our feature subset selection algorithm uses a sequential floating backward selection with a mean-squared error objective function in order to find the best subset of corners. By utilizing our combination method, we were able to achieve all-or-nothing accuracies of 0.926 on polyline stroke data.



Quick\$: Application of Hierarchical Clustering to Gesture Recognition (SBIM)

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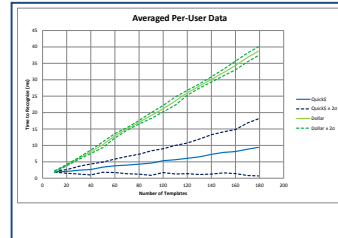
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We present Quick\$ (QuickBuck), an extension to the Dollar Recognizer designed to improve recognition efficiency. While the Dollar Recognizer must search all training templates to recognize an unknown symbol, Quick\$ employs hierarchical clustering along with branch and bound search to do this more efficiently. Experiments have demonstrated that Quick\$ is almost always faster than the Dollar Recognizer and always selects the same best-match templates.

**ClassySeg: A Machine Learning Approach to Automatic Stroke Segmentation (SBIM)**

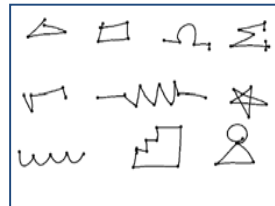
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We present ClassySeg, a technique for segmenting hand-drawn pen strokes into lines and arcs. ClassySeg employs machine learning techniques to infer the segmentation intended by the drawer. The technique begins by identifying a set of candidate segment points, consisting of all curvature maxima. Features of these points are used to train a statistical classifier to identify which points are true segment points. The features are adapted from numerous prior segmentation approaches, effectively combining their strengths. ClassySeg is more accurate than previous techniques for user-independent training conditions, and is as good as the current state-of-the-art algorithm for user-optimized conditions. More importantly, ClassySeg represents a movement away from prior heuristic-based approaches.

**Aesthetic Agents: Swarm-based Non-photorealistic Rendering using Multiple Images (CAe Arts)**

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The creation of expressive styles for digital art is one of the primary goals in non-photorealistic rendering. In this paper, we introduce a swarm-based multi-agent system that is capable of producing expressive imagery through the use of multiple digital images. At birth, agents in our system are assigned a digital image that represents their 'aesthetic ideal'. As agents move throughout a digital canvas they try to 'realize' their ideal by modifying the pixels in the digital canvas to be closer to the pixels in their aesthetic ideal. When groups of agents with different aesthetic ideals occupy the same canvas, a new image is created through the convergence of their conflicting aesthetic goals. We use our system to explore the concepts and techniques from a number of Modern Art movements. The simple implementation and effective results produced by our system makes a compelling argument for more research using swarm-based multi-agent systems for non-photorealistic rendering.

**Image Simplification and Vectorization (NPAR)**

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We present an unsupervised system which takes digital photographs as input, and generates simplified, stylized vector data as output. The three component parts of our system are image-space stylization, edge tracing, and edge-based image reconstruction. The design of each of these components is specialized, relative to their state of the art equivalents, in order to improve their effectiveness when used in such a combined stylization / vectorization pipeline. We demonstrate that the vector data generated by our system is often both an effective visual simplification of the input photographs, and an effective simplification in the sense of memory efficiency, as judged relative to state of the art lossy image compression formats.



Implicit Color Field (NPAR)

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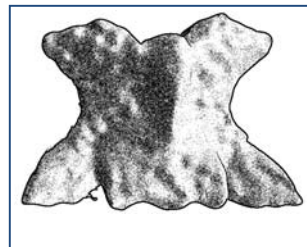
We present a digital painting method for creating color gradients with rich structure in two-dimensional image space. In our method, a collection of planar primitives, such as points and splines, are placed by the user. Then, each primitive's color field is spread out following a user-defined emitting color spectrum and an implicit field function. The final color of each pixel is determined by a weighted average of field values from overlapping primitives. Our method allows fast generation of complex, overlapping color gradients with an intuitive user interface, automating a formerly time-consuming task with traditional digital painting techniques. Our method also has the capability of rasterizing the painted image to desired high resolution without losing details. Artwork composed using our method is shown on the right.

**Surface reconstruction and artistic rendering of small paleontological specimens (NPAR)**

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An important domain of paleontological research is the creation of hand-drawn artistic images of small fossil specimens. In this paper we discuss the process of writing an adequate tool to semi-automatically create the desired images and export a reconstructed 3d-model. First we reconstruct the three-dimensional surface entirely on the GPU from a series of images. Then we render the virtual specimen with Non-Photorealistic-Rendering algorithms that are adapted to recreate the impression of manually drawn images. These algorithms are parameterized with respect to the requirements of a user from a paleontological background.

**Sketch Express: Facial Expressions Made Easy (SBIM)**

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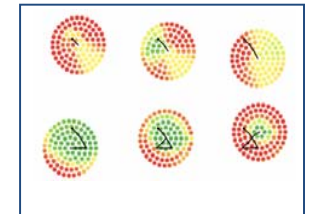
Finding an effective control interface to manipulate complex geometric objects has traditionally relied on experienced users to place the animation controls. This process, whether for key framed or for motion captured animation, takes a lot of time and effort. We introduce a novel sketching interface control system inspired in the way artists draw, in which a stroke defines the shape of an object and reflects the user's intention. The strokes can be easily stored and reused in other characters, allowing retargeting of poses. Our interactive approach is illustrated using facial models of different styles. As a result, we allow rapid manipulation of 3D faces on the fly in a very intuitive and interactive way. Our informal study showed that first time users typically master the system within seconds, creating appealing 3D poses and animations in just a few minutes.

**Continuous Recognition and Visualization of Pen Strokes and Touch-Screen Gestures (SBIM)**

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Pen strokes and touch-screen gestures are becoming increasingly popular in user interface designs. We present an incremental recognition algorithm that provides probability distributions over template classes as a function of users' partial or complete stroke articulations. We show that this algorithm can predict users' intended template classes with high accuracy on several different datasets. We use the algorithm to design two new visualizations that reveal various aspects of the recognition process to users. We then demonstrate how these visualizations can help users to understand how the recognition process interprets their input and how interactions between different template classes affect recognition outcomes.



Defining Precise Measurements with Sketched Annotations (SBIM)

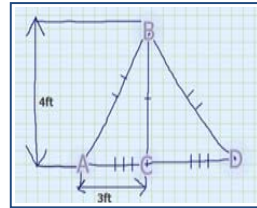
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Technology has been largely employed in the modern education system but rarely fosters natural communication between the human and the machine. We wish to explore the use of sketch recognition based software as a medium for student computer interaction within the context of computer assisted tutoring systems. Mechanix is a sketch recognition based tutoring system that provides immediate feedback for engineering statics problems. In order to extend Mechanix to support free response problems, the software needs to know the precise physical properties of sketched elements. We introduce measurement mechanisms such that, with minimal effort, a user may specify the precise measurements of a truss, so that Mechanix can create and solve systems of equations to determine how forces are distributed throughout the truss. Therefore, given a sketched truss and measurements as a response to a free response questions, the system may determine whether the structure satisfies the requirements of the question.



Artistic Canvases for Gestural and Non-linear Typography (CAe Arts)

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This paper presents an exploration of gestural and non-linear typography through the production of two software applications, TextDraw and Typels. Both were created through a media-art-research practice, wherein extended periods of development and artistic practice were exclusive of one another. This approach yielded applications which challenge contemporary typesetting methodologies, and produced new artistic works which exemplify gestural and non-linear typesetting techniques. This paper discusses the development of both software applications, the artworks made possible through their use, and situates the work within a history of experimental western typography in the 20th century.



Style Transferring Using GIST (NPAR)

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We present a new technique for artistic style transferring by considering the perceptual structure matching between source image and target images.

Given a photograph, our technique first searches for an existing art work on a similar scene through using the computational model of GIST perception and then transfers both the color and brush texture from it by considering the structure matching between two images. The proposed method is fully automatic and can be used for transferring any styles.



CSTutor: A Pen-Based Tool for Visualizing Data Structures (SBIM)

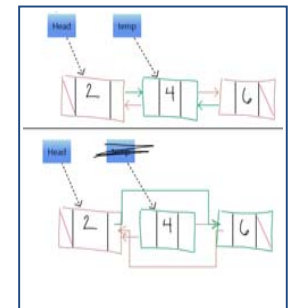
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We present CSTutor, a pen-based application for data structure visualization that lets users manipulate data structures through the recognition of handwritten symbols and gestures as well as edit the corresponding code. The UI consists of a sketching area where the user can draw a data structure in a way that is as natural as pen and paper. Running in parallel with the visualization is a code view where users can make changes to the source code and add functions which manipulate the data structure on the canvas in real time.



Results of an observational study on sketching (SBIM)

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We present the results of an observational study on sketching. Artists were asked to sketch a small number of objects and comment on how and why they made the marks they did. We summarize these findings, from low-level details on individual marks through the drawing construction order. Based on these observations we provide suggestions for future research directions in 3D sketching.

**Sketched Symbol Recognition with Few Examples Using Particle Filtering (SBIM)**

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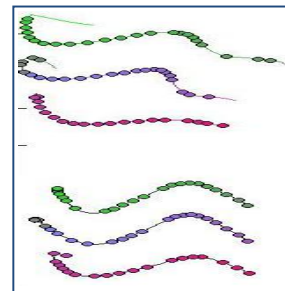
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Sketching is a natural form of user interface that is employed in a variety of areas, such as engineering drawings or classroom teaching. Recognition of hand drawn sketches is a challenging problem due to the variability in hand drawing, variability in the drawing order of strokes, and the similarity of sketch classes. In this work, we present a system that can classify hand drawn symbols using few examples. The quality of the alignment between two symbols is measured and used to assess the similarity between these symbols. We present recognition experiments using the COAD and the Niclcon databases with promising results.

**Spatio-temporal Analysis for Parameterizing Animated Lines (NPAR)**

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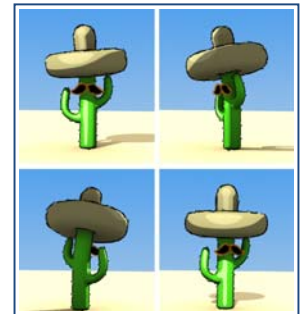
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We describe a method to parameterize lines generated from animated 3D models in the context of animated textured line drawings. Cartoons and mechanical illustrations are popular subjects of non-photorealistic drawings and are often generated from 3D models. Dynamic visibility events and the evolving shape of the lines raise issues that have been only partially explored so far. At the core of our method is a geometric formulation of the problem as a parameterization of the space-time surface swept by a 2D line during the animation. We decompose the surface into charts with a disc topology and parameterize each chart using an energy formulation in the least-squares sense. By adjusting a few weights in the energy, we obtain an artifact-free animated motion in a variety of styles.

**Temporal Noise Control for Sketchy Animation (NPAR)**

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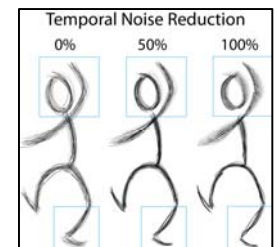
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We propose a technique to control the temporal noise present in sketchy animations. Given an input animation drawn digitally, our approach works by combining motion extraction and inbetweening techniques to generate a reduced-noise sketchy animation registered to the input animation. The amount of noise is then controlled by a continuous parameter value. Our method can be applied to effectively reduce the temporal noise present in sequences of sketches to a desired rate, while preserving the geometric richness of the sketchy style in each frame. This provides the manipulation of temporal noise as an additional artistic parameter, e.g. to emphasize character emotions and scene atmosphere, and enables the display of sketchy content to broader audiences by producing animations with comfortable noiselevels. We demonstrate the effectiveness of our approach on a series of rough hand-drawn animations.



TexToons: Practical Texture Mapping for Hand-drawn Cartoon Animations (NPAR)

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We present a novel and practical texture mapping algorithm for hand-drawn cartoons that allows the production of visually rich animations with minimal user effort. Unlike previous techniques, our approach works entirely in the 2D domain and does not require the knowledge or creation of a 3D proxy model. Inspired by the fact that the human visual system tends to focus on the most salient features of a scene, which we observe for hand-drawn cartoons are the contours rather than the interior of regions, we can create the illusion of temporally coherent animation using only rough 2D image registration. This key observation allows us to design a simple yet effective algorithm that significantly reduces the amount of manual labor required to add visually complex detail to an animation, thus enabling efficient cartoon texturing for computer-assisted animation production pipelines. We demonstrate our technique on a variety of input animations as well as provide examples of post-processing operations that can be applied to simulate 3D-like effects entirely in the 2D domain.

**Double Meandering Algorithm: From Drawing Game to Automated Animation (CAe Technical)**

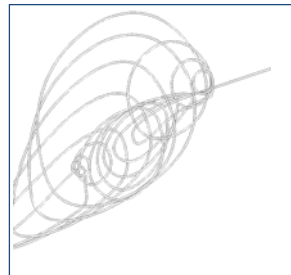
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We introduce artist Lucy Pullen's Double Meandering Algorithm, first in its original form as a pen-and-paper drawing algorithm and then as a procedurally generated animation. We utilize a chain of cubic Bézier curves to represent the characteristic spiraling line, assigning each control point according to a pseudo-randomized algorithm. The resulting curves are then animated segment by segment, reflecting the artist's process of creating the pen-and-paper drawing. By digitizing the Double Meandering Line drawing, we can also reveal the process of creation through animation, granting us the ability to exhibit a fundamental part of the drawing that is lost in the traditional pen-and-paper presentation.

**A Sketch-Based Algorithm for Generating Roads (SBIM)**

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To create traffic simulations of high visual-fidelity, each road needs to be designed and modelled in great detail to conform with the governing rules and regulations of highway design. Roads could be created manually, but this can become a time-consuming and laborious process when modelling large-scale networks. Therefore, automated techniques for generating road networks efficiently, without any prior user knowledge of road design principles and practices, is highly desirable in both urban-planning and entertainment industries. In our paper, we present a novel sketch-based algorithm to generate roads across both flat and undulating terrains, focussing on techniques to create junctions. Our algorithm is guided by input sketches and a combination of prioritised constraints, including the curvature of roads, their inclination, and the volume of ground that would be displaced during construction.

**Sketch based 3D Modeling with Curvature Classification (SBIM)**

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In this work, we present a new approach for sketching 3D models in arbitrary topology. Using this approach, we have developed a system to convert silhouette sketches to 3D meshes that mostly consists of regular quadrilaterals. Because of their regular structures, these 3D meshes can effectively be smoothed using Catmull-Clark subdivision.



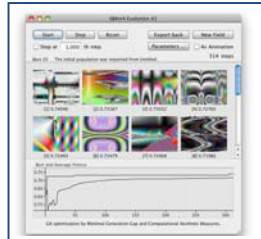
Our approach is based on correspondence function that allows to identify corresponding points on a set of parametric curves. Using the structure of correspondences on the curves, we can partition curves into junction, cap and tubular regions. Based on this classification, it is easy to construct "mostly regular" quadrilateral meshes.

SBArt4 – Breeding and Evolving Abstract Images and Animations (CAe)

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Some extensions of computational aesthetic measures are proposed for a domain of evolutionary art in order to be embedded in a simulated breeding system, SBArt. Combination among five measures for still images and one measure for animations are examined. Information theoretic complexity was borrowed from previous works. Global contrast factor and color histogram were extensions of previous works. One-dimensional brightness distribution and distance from favorable saturation were newly developed. Distance from favorable amount of motion was also newly developed for animation. In our experiences of the combination of breeding and evolution, it is effective to reduce the time of production for interesting abstract images and animations.

**Aesthetics of serendipity: Muta-morphosis (CAe)**

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Creativity is stochastic and assumptive in nature. The importance of randomness in the creative process must not be ignored, underestimated or intentionally disregarded in a condescending way. Notions of chance, randomness, or unpredictability are much important, especially when it comes to artistic creation. In addition to above notions, serendipity can be seen as the expected contribution for making expedient discoveries by coincidence, by chance. To put serendipity into work, there is need for acquaintance with already existing answers, and their use in daily life. Only when this knowledge is present, 'chance' can take its part in establishing the perfect milieu for the 'problem' and the 'solution' to find each other. If there is already a great deal of knowledge accrued in our minds about the problem and the requisites for the solution, chance adds the final piece to the puzzle.



During the joint poster session and art show, demonstrations of the following SBIM work will also be presented:

"LIFEisGAME - An Interactive Serious Game for Teaching Facial Expression Recognition", T. Fernandes, J. Miranda, X. Alvarez¹, V. Orvalho.

"A Demonstration of Continuous Recognition and Visualization of Pen Strokes and Touch-Screen Gestures", P.O. Kristensson, L.C. Denby.

"Demonstration: Is the iPad useful for sketch input? A comparison with the Tablet PC", S. MacLean, D. Tausky, G. Labahn, E. Lank, and M. Marzouk

"Sketch Express: Facial Expressions Made Easy", J. Carlos Miranda, X. Alvarez, J. Orvalho, D. Gutierrez, A. Augusto Sousa, V. Orvalho.

"Sketch-Based Modeling of Smooth Surfaces Using Adaptive Curve Networks", G. Orbay, L. Burak Kara

"A sketch based system to embed an immersible self-crossing planar loop in 3D", U. Mukherjee, M. Gopi, J. Rossignac

Example-Based Hairstyle advisor (CAe)

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Hairstyles are one of the most important features people use to characterize one's appearance. Whether a hairstyle is suitable or not is said to be closely related to one's facial shape. This paper proposes a new technique for automatically finding a suitable hairstyle through learning the relationship between facial shapes and suitable hairstyles from a collection of successful hairstyle examples. A method of hair-face image composition utilizing modern matting technique was also developed to synthesize realistic hairstyle images. The effectiveness of the proposed technique was validated through an evaluation experiments.

**Surface Covering Curves (CAe)**

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In this work, we present the concept of surface covering curves. We show that any mesh surface can be converted to a closed 3D curve that follows the shape of the mesh surface. Taubin showed that every connected manifold quadrilateral mesh can be represented as a single triangle strip cycle.. We connect centers of triangles in the triangle strip to obtain a control polygon in 3D that is used to obtain a smooth curve. We have developed two methods to construct 3D ribbons and treads from the mesh structure and the connectivity of this curve. The first method constructs equal thickness ribbons (or equal diameter threads). The second method, which is based on projection, creates ribbons with changing thickness (or threads with changing diameter) that can densely cover the mesh surface. Figure shows Stanford Bunny covered with chaging thickness ribbons. Curves occluded by original mesh are not drawn for cleaner image.



Kindalike Cubism: Using Programmable Cameras for Photography in More Dimensions (CAe)

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We use a widely-available, programmable digital camera to create four-dimensional volumes of images that become part of an interactive art installation. The four dimensions we use are the two spatial dimensions of the camera image plane, plus focus and camera position. Analyzing the subject from multiple vantage points, we capture hierarchies of information about our subject. This visual data is then reconstituted into viewable two dimensional images from the four-dimensional volume. The resultant images bear a resemblance to cubist art in which the informational sum of the individual parts is greater than any single photograph.



Analysis of Video Accompanied by Audio Employing Gaze Tracking (CAe)

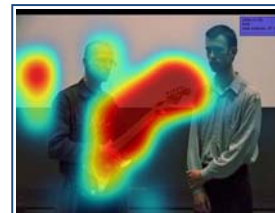
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The objectivization process of carrying out correlation tests in the audio-visual domains employing gaze-tracking system was outlined. The reliability of tested subjects was checked with the statistical analysis of test results. Comparing outcomes of the dynamic heat maps generated by the gaze tracking system with the associated movie samples, it was observed that the localization of the fixation point representing view direction is directly related to the localization of the virtual sound source in the stereo phantom basis. Experiments performed show that visual objects attract the viewers' attention, thus sound sources perceived seem to be localized closer, centrally to the screen. It was also possible to analyze whether the subject's attention remains stable through the tests.



Processing and Advanced Networking in Art (CAe)

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We have become accustomed to the rapid, global exchange of vast amounts of information via computer networks. It is natural for artists, who want to create artworks that directly reflect changes in society, to have an interest in live data. This research focuses on the programming language, Processing, to visualize information gathered through computer networks and apply it to fine art. For the final artwork, I explored the social and political impact of the accident at the Fukushima nuclear power plant. In my work, entitled "Zero", the screen initially displays the Japanese stock market index in real-time. When the camera detects a viewer, the program starts to calculate the amount of radiation exposure in Fukushima based on real-time information. When the amount exceeds the natural amount of radiation exposure, the viewer's image dissolves into black and white and leaves a negative shadow. As a result, the artwork dynamically links and captures the turbulence of society and addresses the impact of the accident. The real-time process of image rendering and data-gathering enables artists to express a new realism in this digital era and to create a new interaction between art and society.



Investigating the style and art forms in the Book of Kells (CAe)

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The Book of Kells, the work of Celtic Monks ca. 800 AD., is an artwork with few parallels. In keeping with the recent spurt of effort in the area of digitisation of cultural artefacts, we outline our ongoing efforts in bringing the Book to a digital platform. On a broader scale, in collaboration with art historians, we are in the process of creating a framework of tools for analysis, comparison, high-fidelity reconstruction, interactive visualisation of manuscripts and similar art work.

Using Computer vision & visualisation techniques, it is hoped that the Book would be given a more quantitative treatment, enabling more objective reasoning about its history, and defining the Book of Kells' style from a statistical perspective.

