14th International Symposium on Visual Computing (ISVC'19)

October 7-9, 2019, Lake Tahoe, Nevada, USA

Contents

Registration Desk Hours:

Sunday 4pm – 6pm
Monday – Wednesday 8:00am – 5:00pm

Monday, October 7th

8:50 – 9:00	*Welcome* – **George Bebis, University of Nevada, Reno**		
9:00–10:00	*Keynote:* ***Ajmal Mian*****, University of Western Australia, Australia** (Sand Harbor II)		
	Parallel Sessions		
10:10-12:10	**Deep Learning I** Chair: Christophoros Nikou (Sand Harbor II)		**Computer Graphics I** Chair: Christian Eckhardt (Tahoe D to Tahoe C)
	10:10	Application of Image Classification for Fine-Grained Nudity Detection *Cristian Ion and Cristian Minea*	Bioinspired Simulation of Knotting Hagfish *Yura Hwang, Theodore Uyeno and Shinjiro Sueda*
	10:30	DeepGRU: Deep Gesture Recognition Utility *Mehran Maghoumi and Joseph J. LaViola Jr.*	Interactive 3D Visualization for Monitoring and Analysis of Geographical Traffic Data of Various Domains *Daniil Rodin, Oded Shmueli and Gershon Elber*
	10:50	Delineation of Road Networks Using Deep Residual Neural Networks and Iterative Hough Transform *Pinjing Xu and Charalambos Poullis*	Propagate and Pair: A Single-Pass Approach to Critical Point Pairing in Reeb Graphs *Junyi Tu, Mustafa Hajij and Paul Rosen*
11:10-11:30	*Coffee Break*		
	11:30	DomainSiam: Domain-Aware Siamese Network for Visual Object Tracking *Mohamed Abdelpakey and Mohamed Shehata*	Real-Time Ray Tracing with SphericallyProjected Object Data *Bridget Makena Winn, Reed Garmsen, Irene Humer and Christian Eckhardt*
	11:50	Reconstruction Error Aware Pruning for Accelerating Neural Networks *Koji Kamma and Toshikazu Wada*	Underwater Photogrammetry Reconstruction: GPU Texture Generation from Videos Captured via AUV *Kolton Yager, Zoë Wood, Christopher Clark and Timmy Gambin*
10:10-12:10	**Segmentation/Recognition** Chair: Alireza Tavakkoli (Sand Harbor I)		**N/A**
	10:10	Adaptive Attention Model for Lidar Instance Segmentation *Peixi Xiong, Xuetao Hao, Yunming Shao and Jerry Yu*	
	10:30	View Dependent Surface Material Recognition *Stanislav Mikeš and Michal Haindl*	
	10:50	3D Visual Object Detection from Monocular Images *Qiaosong Wang and Christopher Rasmussen*	
11:10-11:30	*Coffee Break*		
	11:30	Skin Texture Classification Using Deep Convolutional Neural Networks *Mahdi Maktab Dar Oghaz, Vasileios Argyriou and Paolo Remagnino*	
	11:50	Resolution-independent meshes of superpixels *Phillip Smith and Vitaliy Kurlin*	
12:10-1:30	*Lunch* (on your own)		

1:30-2:30	*Keynote:* ***James Ahrens***, **Los Alamos National Laboratory, USA** (Sand Harbor II)		
	Parallel Sessions		
2:40-4:40	**Video Analysis and Event Recognition** Chair: Paolo Remagnino (Sand Harbor II)		**Visualization** Chairs: Juliana Felix (Tahoe D to Tahoe C)
	2:40	Automatic Video Colorization using 3D Conditional Generative Adversarial Networks *Panagiotis Kouzouglidis, Giorgos Sfikas and Christophoros Nikou*	Information Visualization for Highlighting Conflicts in Educational Timetabling Problems *Wanderley de Souza Alencar, Hugo Nascimento, Walid Jradi, Fabrizzio Soares and Juliana Felix*
	3:00	Improving Visual Reasoning With Attention Alignment *Komal Sharan, Ashwinkumar Ganesan and Tim Oates*	ContourNet: Salient Local Contour Identification for Blob Detection in Plasma Fusion Simulation Data *Martin Imre, Jun Han, Julien Dominski, Michael Churchill, Ralph Kube, Choong-Seock Chang, Tom Peterka, Hanqi Guo and Chaoli Wang*
	3:20	Multi-Camera Temporal Grouping for Play/Break Event Detection in Soccer Games *Chunbo Song and Christopher Rasmussen*	Mutual Information-Based Texture Spectral Similarity Criterion *Michal Haindl and Michal Havlicek*
3:40-4:00	*Coffee Break*		
	4:00	Trajectory Prediction by Coupling Scene-LSTM with Human Movement LSTM *Manh Huynh and Gita Alaghband*	Accurate Computation of Interval Volume Measures for Improving Histograms *Cuilan Wang*
	4:20	Augmented Curiosity: Depth and Optical Flow Prediction for Efficient Exploration *Juan Carvajal, Thomas Molnar, Eugenio Culurciello and Lukasz Burzawa*	Ant-SNE: Tracking Community Evolution of Multivariate Outliers via Animated t-SNE *Ngan Nguyen and Tommy Dang*
2:40-4:40	**ST: Computational Vision, AI and Mathematical Methods for Biomedical and Biological Image Analysis** Chair: Sokratis Makrogiannis (Sand Harbor I)		**N/A**
	2:40	Automated Segmentation of the Pectoral Muscle in Axial Breast MR Images *Sahar Zafari, Mazen Diab, Tuomas Eerola, Summer Hanson, Greg Reece, Gary Whitman, Mia Markey, Krishnaswamy Ravi-Chandar, Alan Bovik and Heikki Kälviäinen*	
	3:00	ML-Angio: Cerebral Perfusion Angiography with Machine Learning *Ebrahim Feghhi, John Tran, Yinsheng Zhou, David Liebeskind and Fabien Scalzo*	
	3:20	Learning Graph Cut Class Prototypes for Thigh CT Tissue Identification *Taposh Biswas and Sokratis Makrogiannis*	
3:40-4:00	*Coffee Break*		
	4:00	Automatic Estimation of Arterial Input Function in Digital Subtraction Angiography *Alexander Liebeskind, Adit Deshpande, Julie Murakami and Fabien Scalzo*	
	4:20	Conformal Welding for Brain-Intelligence Analysis *Liqun Yang, Muhammad Razib, Kenia Chang He, Zhong-Lin Lu, Xianfeng Gu and Wei Zeng*	

Tuesday, October 8th

9:00-10:00	*Keynote:* **Sheldon Andrews**, **École de Technologie Supérieure, Université du Quebec, Canada** (Sand Harbor II)		
	Parallel Sessions		
10:10-12:10	**Biometrics** Chair: Andrea Salgian (Sand Harbor II)		**Virtual Reality I** Chair: Amela Sadagic (Tahoe D to Tahoe C)
	10:10	One-Shot-Learning for Visual Lip-Based Biometric Authentication *Carrie Wright and Darryl Stewart*	Estimation of the distance between fingertips using silhouette and texture information of dorsal of hand *Takuma Shimizume, Takeshi Umezawa and Noritaka Osawa*
	10:30	Age Group and Gender Classification of Unconstrained Faces *Jelil Olatunbosun Agbo-Ajala and Serestina Viriri*	Measuring Reflectance of Anisotropic Materials using Two Handheld Cameras *Zar Zar Tun, Seiji Tsunezaki, Takashi Komuro, Shoji Yamamoto and Norimichi Tsumura*
	10:50	Efficient 3D Face Recognition in Uncontrolled Environment *Yuqi Ding, Nianyi Li, S. Susan Young and Jinwei Ye*	FunPlogs - A Serious Puzzle Mini-Game for Learning Fundamental Programming Principles Using Visual Scripting *Robin Horst, Ramtin Naraghi-Taghi-Off, Savina Diez, Tobias Uhmann, Arne Müller and Ralf Doerner*
11:10-11:30	*Coffee Break*		
	11:30	Pupil Center Localization Using SOMA and CNN *Radovan Fusek, Eduard Sojka and Michael Holuša*	Automatic camera path generation from 360° video *Hannes Fassold*
	11:50	Real-Time Face Features Localization with Recurrent Refined Dense CNN Architectures *Nicolas Livet*	Highlighting Techniques for 360 Degree Virtual Reality and Their Immersive Authoring *Robin Horst, Savina Diez and Ralf Doerner*
10:10-12:10	**Applications I** Chair: Mircea Nicolescu (Sand Harbor I)		**N/A**
	10:10	Jitter-free registration for Unmanned Aerial Vehicle Videos *Pierre Lemaire, Carlos Fernando Crispim-Junior, Lionel Robinault and Laure Tougne*	
	10:30	Heart Rate Based Face Synthesis for Pulse Estimation *Umur Ciftci and Lijun Yin*	
	10:50	Light-weight Novel View Synthesis for Casual Multiview Photography *Inchang Choi, Yeong Beum Lee, Dae R. Jeong, Insik Shin and Min H. Kim*	
11:10-11:30	*Coffee Break*		
	11:30	DeepPrivacy: A generative adversarial network for face anonymization *Håkon Hukkelås, Rudolf Mester and Frank Lindseth*	
	11:50	Swarm Optimization Algorithm for Road Bypass Extrapolation *Michael Rowland, Glenn Suir, Michael Mayo and Austin Davis*	
12:10-1:30	*Lunch* (on your own)		

1:30-3:40	**Poster Session** (Sand Harbor II) (set-up 12:10pm – 1:30pm)		
3:40 – 4:00	*Coffee Break*		
	Parallel Sessions		
4:00-5:20	**ST: Vision for Remote Sensing and Infrastructure Inspection** Chair: Hung La (Sand Harbor II)		**Computer Graphics II** Chair: Jun Yi (Tahoe D to Tahoe C)
	4:00	Concrete Crack Pixel Classification using an Encoder Decoder Based Deep Learning Architecture *Umme-Hafsa Billah, Alireza Tavakkoli and Hung La*	Intrinsic Decomposition by learning from Varying Lighting Conditions *Gregoire Nieto, Mohammad Rouhani and Philippe Robert*
	4:20	A Geometry-based Method for the Spatio-temporal Detection of Cracks in 4D-Reconstructions *Carl Matthes, Adrian Kreskowski and Bernd Froehlich*	Pixel2Field: Single Image Transformation to Physical Field of Sports Videos *Liang Peng*
	4:40	An AutomaticLandscape Terrain Generation Technique for Terrestrial Sensing and Virtual Reality Applications *Lee Easson, Alireza Tavakkoli and Jonathan Greenberg*	UnrealLAB: Using Unreal Engine to Generate Ground Truth Datasets *Thomas Pollok, Lorenz Junglas, Boitumelo Ruf and Arne Schumann*
	5:00	Rebar Detection and Localization for Non-Destructive Infrastructure Evaluation using Deep Residual Networks *Habib Ahmed, Hung La and Gokhan Pekcan*	Fast Omnidirectional Depth Densification *Hyeonjoong Jang, Daniel S. Jeon, Hyunho Ha, and Min H. Kim*
4:00-5:20	**Applications II** Chair: Daniela Ushizima (Sand Harbor I)		**N/A**
	4:00	Dual Snapshot Hyperspectral Imaging System for 41-band Spectral Analysis & Stereo Reconstruction *Fatih Tanriverdi, Dennis Schuldt and Jörg Thiem*	
	4:20	Joint Optimization of Convolutional Neural Network and Image Preprocessing Selection for Embryo Grade Prediction in In Vitro Fertilization *Kento Uchida, Shota Saito, Panca Dewi Pamungkasari, Yusei Kawai, Ita Fauzia Hanoum, Filbert Hilman Juwono and Shinichi Shirakawa*	
	4:40	Enhanced Approach for Classification of Ulcerative Colitis Severity in Colonoscopy Videos using CNN *Sure Venkata Leela Lakshmi Tejaswini, Bhuvan Mittal, Junghwan Oh, Wallapak Tavanapong, Johnny Wong and Piet C. de Groen*	
	5:00	Infinite Gaussian Fisher Vector to support video-based Human Action Recognition *Jorge Fernández-Ramírez, Andrés Álvarez-Meza and Álvaro Órozco*	
6:30-9:30	*Banquet Dinner* (Sand Harbor III) *Keynote:* **David Forsyth, University of Illinois at Urbana-Champaign, USA**		

Wednesday, October 9th

9:00-10:00	*Keynote:* **Punam Saha**, **University of Iowa, USA** (Sand Harbor II)		
	Parallel Sessions		
10:10-12:10	**Deep Learning II** Chair: Emily Hand (Sand Harbor II)		**Virtual Reality II** Chair: Alireza Tavakkoli (Tahoe D to Tahoe C)
	10:10	Do Humans Look Where Deep Convolutional Neural Networks "Attend"? *Mohammad K. Ebrahimpour, J. Ben Falandays, Samuel Spevack and David C. Noelle*	Designing VR and AR Systems with Large Scale Adoption in Mind *Amela Sadagic, Jesse Attig, John Gibson, Faisal Rashid, Nicholas Arthur, Floy Yates, and Cody Tackett*
	10:30	Point Auto-Encoder and Its Application to 2D-3D Transformation *Wencan Cheng and Sukhan Lee*	VRParaSet: A Virtual Reality model for visualizing multidimensional data *Ngan Nguyen, Lino Virgen and Tommy Dang*
	10:50	U-net based architectures for document text detection and binarization *Filipp Nikitin, Vladimir Dokholyan, Ilia Zharikov, and Vadim Strijov*	Occlusion and Collision Aware Smartphone AR using Time-of-Flight Camera *Yuan Tian, Yuxin Ma, Shuxue Quan and Yi Xu*
11:10-11:30	*Coffee Break*		
	11:30	Face detection in thermal images with YOLOv3 *Gustavo Silva, Rui Monteiro, André Ferreira, Pedro Carvalho and Luís Corte-Real*	Augmenting Flight Imagery from Aerial Refueling *Scott Nykl, James Anderson and Thomas Wischgoll*
	11:50	3D Object Recognition with Ensemble Learning --- A Study of Point Cloud-Based Deep Learning Models *Daniel Koguciuk, Łukasz Chechliński and Tarek El-Gaaly*	
10:10-12:10	**Object Recognition/Detection/Categorization** Chair: Amanda Fernandez (Sand Harbor I)		**N/A**
	10:10	Hierarchical Semantic Labeling With Adaptive Confidence *Jim Davis, Tong Liang, James Enouen and Roman Ilin*	
	10:30	A Dual-Camera Robotic Vision System Based on the Concept of Active Perception *S. Pourya Hoseini A., Janelle Blankenburg, Mircea Nicolescu, Monica Nicolescu and David Feil-Seifer*	
	10:50	Background Modeling through Spatiotemporal Edge Feature and Color *Byeongwoo Kim, Adin Ramirez Rivera, Oksam Chae and Jaemyun Kim*	
11:10-11:30	*Coffee Break*		
	11:30	Fast Object Localization via Sensitivity Analysis *Mohammad K. Ebrahimpour and David C. Noelle*	
	11:50	On the Salience of Adversarial Examples *Amanda Fernandez*	
12:10-1:30	*Lunch* (on your own)		

1:30-2:30	*Keynote:* **Sabarish Babu, Clemson University, USA** (Sand Harbor II)

	Tutorial 1
2:40-4:40	**Analysis and visualization of 3D data in Python** Instructors: Daniela Ushizima, Alexandre de Siqueira, and Stéfan van der Walt (Sand Harbor I)
4:40-5:00	*Coffee Break*
5:00-6:30	**Analysis and visualization of 3D data in Python (cont'd)** Instructors: Daniela Ushizima, Alexandre de Siqueira, and Stéfan van der Walt (Sand Harbor I)

	Tutorial 2 – Cancelled (low participation)
2:40-4:40	**Computer Vision for Underwater Environmental Monitoring** Instructors: Alexandra Branzan Albu and Maia Hoeberechts (Tahoe D to Tahoe C)
4:40-5:00	*Coffee Break*
5:00-6:00	**Computer Vision for Underwater Environmental Monitoring (cont'd)** Instructors: Alexandra Branzan Albu and Maia Hoeberechts (Tahoe D to Tahoe C)

	Tutorial 3
2:40–4:40	**Visual Object Tracking Using Deep Learning** Instructors: Mohamed H. Abdelpakey & Mohamed S. Shehata (Sand Harbor II)
4:40-5:00	*Coffee Break*
5:00-6:30	**Visual Object Tracking Using Deep Learning (cont'd)** Instructors: Mohamed H. Abdelpakey & Mohamed S. Shehata (Sand Harbor II)

Poster Session (Sand Harbor II)

Tuesday, October 8th (1:30pm-3:40pm)

Set-up: 12:10pm – 1:30pm

Entropy Projection Curved Gabor with Random Forest and SVM for Face Recognition *Eucassio G. Lima, Luis H. S. Vogado, Ricardo A. L. Rabelo, Cornelia J. P. Passarinho, and Daniela M. Ushizima*
Guitar Tablature Generation using Computer Vision *Brian Duke and Andrea Salgian*
A Parametric Perceptual Deficit Modeling and Diagnostics Framework for Retina Damage using Mixed Reality *Aniruddha Prithul, Nasif Zaman, Alireza Tavakkoli and Stewart Zuckerbrod*
Topologically-Guided Color Image Enhancement *Junyi Tu and Paul Rosen*
A Visual Analytics Approach for Analyzing Technological Trends in Technology and Innovation Management *Kawa Nazemi and Dirk Burkhardt*
A Framework for Collecting and Classifying Objects in Satellite Imagery *Aswathnarayan Radhakrishnan, Jamie Cunningham, Jim Davis and Roman Ilin*
Moving Objects Segmentation Based on DeepSphere in Video Surveillance *Sirine Ammar, Thierry Bouwmans, Nizar Zaghden and Mahmoud Neji*
Benchmarking Video With The Surgical Image Registration Generator (SIRGn) Baseline *Michael Barrow, Nelson Ho, Alric Althoff, Tueller Peter and Ryan Kastner*
Towards Fine-grained Recognition: Joint Learning for Object Detection and Fine-grained Classification *Qiaosong Wang and Christopher Rasmussen*
Foreground Object Image Masking via EPI and Edge Detection for Photogrammetry with Static Background *Chawin Sathirasethawong, Changming Sun, Andrew Lambert and Murat Tahtali*
Lidar-Monocular Visual Odometry with Genetic Algorithm for Parameter Optimization *Adarsh Sehgal, Ashutosh Singandhupe, Hung La, Alireza Tavakkoli and Sushil Louis*
Residual CNN Image Compression *Kunal Deshmukh and Chris Pollett*
CNNs and Transfer Learning for Lecture Venue Occupancy and Student Attention Monitoring *Antonie Smith and Barend Van Wyk*
Evaluation of the Interpolation Errors of Tomographic Projection Models *Csaba Olasz, László G. Varga and Antal Nagy*
Skin Lesion Segmentation Based on Region-Edge Markov Random Field *Omran Salih, Serestina Viriri and Adekanmi Adegun*
Evaluating fiber detection models using Neural Networks *Silvia Miramontes, Daniela Ushizima and Dilworth Parkinson*
A Computational System for Structural Visual Analysis of Labor Accident Data *Mateus Rodrigues, Luciana Brito and Jose Gustavo S. Paiva*

Poster Session (cont'd) (Sand Harbor II)

Tuesday, October 8th (1:30pm-3:40pm)

Set-up: 12:10pm – 1:30pm

Centerline Extraction from 3D Airway Trees Using Anchored Shrinking *Kalman Palagyi and Gabor Nemeth*
Residual CNN Image Compression *Kunal Deshmukh and Chris Pollett*
CNNs and Transfer Learning for Lecture Venue Occupancy and Student Attention Monitoring *Antonie Smith and Barend Van Wyk*
Evaluation of the Interpolation Errors of Tomographic Projection Models *Csaba Olasz, László G. Varga and Antal Nagy*
Resolution-independent meshes of superpixels *Phillip Smith and Vitaliy Kurlin*
Skin Lesion Segmentation Based on Region-Edge Markov Random Field *Omran Salih, Serestina Viriri and Adekanmi Adegun*
Centerline Extraction from 3D Airway Trees Using Anchored Shrinking *Kalman Palagyi and Gabor Nemeth*
A 360 Degree Video Virtual Reality Room Demonstration *Robin Horst, Savina Diez and Ralf Doerner*
Fast Contextual View Generation in 3D Medical Images using a 3D Widget User Interface and Super-ellipsoids *Ken Lagos and Tim McInerney*
A Virtual Reality Framework for Training Incident First Responders and Digital Forensic Investigators *Umit Karabiyik, Christos Mousas, Daniel Sirota and Takahide Iwai*
Tactical Rings : A Visualization Technique for Analyzing Tactical Patterns in Tennis *Shiraj Pokharel and Ying Zhu*
Cross-Media Sentiment Analysis in Brazilian Blogs *Greice Pinho, Henrique Santos, Isabel Manssour, Renata Vieira and Soraia Musse*
Diagnosing Huntington's Disease through gait dynamics *Juliana Paula Félix, Flávio Vieira, Ricardo Franco, Ronaldo Martins da Costa and Rogerio Lopes Salvini*
On the Potential for Facial Attractiveness as a Soft Biometric *Moneera Alnamnakani, Mark Nixon and Sasan Mahmoodi*
A Modified Viola-Jones Detector for Low-cost Localization of Car Plates *Victor H M Amorim, Bruno M Carvalho and Antônio C G Thomé*
RISEC: Rotational Invariant Segmentation of Elongated Cells in SEM images with Inhomogeneous Illumination *Ali Memariani , Bradley Endres, Eugénie Bassères, Kevin Garey, Ioannis Kakadiaris*
Performance Evaluation of Devices and Browsers in WebGL and WebVR Apps *Renato Toasa, Washington X. Quevedo, Mateo Alejandro Parreño Alvarez, Paul Francisco Baldeon Egas and Miguel Alfredo Gaibor Saltos*
IFOC: Intensity Fitting on Overlapping Cover for Image Segmentation *Xue Shi and Chunming Li*

KEYNOTE TALK

Monday, October 7, 2019 at 9am
(Sand Harbor II)

Dense 3D face correspondence for deep 3D face recognition and medical applications

Ajmal Mian
University of Western Australia
Australia

Abstract: In this talk, I will present our research on dense 3D face correspondence which is a core problem in facial analysis for many applications such as biometric identification, symptomatology for the diagnosis of Autism and Obstructive Sleep Apnoea and planning for facial reconstructive surgery. From a morphometric point of view, we are interested in performing dense correspondence based purely on shape without using texture. This makes the problem challenging but the correspondences and subsequent analyses more precise. The idea is to start from a sparse set of automatically detected corresponding landmarks and propagate along the geodesics connecting nearby points. By anchoring on the most reliable correspondences for propagation, accurate dense correspondences are iteratively established between hundreds of faces without using a prior model. Thus, we are able to construct population specific deformable face models for symptomatology and patient specific morphs to facial norms for reconstructive surgery. Moreover, by establishing dense correspondences between different facial identities and expressions, we synthesize millions of 3D faces with varying identities, expressions and poses to learn a deep Convolutional Neural Network (FR3DNet) for large scale 3D face recognition. FR3DNet achieves state-of-the-art results, outperforming existing methods in open-world and close-world face recognition, on a dataset four times the largest dataset reported in the existing literature.

Speaker Bio-Sketch: Ajmal Mian is a Professor of Computer Science at The University of Western Australia. He has received two prestigious fellowships and several research grants from the Australian Research Council and the National Health and Medical Research Council of Australia. He was the West Australian Early Career Scientist of the Year 2012 and has received several awards including the Excellence in Research Supervision Award, EH Thompson Award, ASPIRE Professional Development Award, Vice-chancellors Mid-career Research Award, Outstanding Young Investigator Award, the Australasian Distinguished Doctoral Dissertation Award and various best paper awards. He is an Associate Editor of IEEE Transactions on Image Processing and the Pattern Recognition journal. He is a General Co-Chair of the DICTA 2019. He was a General Co-Chair of ACCV 2018, Program Co-Chair of DICTA 2012 and Area Chair of WACV 2019, WACV 2018, ICPR 2016 and ACCV 2014. Ajmal Mian has supervised 12 PhD theses to completion and has published over 170 scientific papers in prestigious journals and conferences including PAMI, TNNLS, TIP, PR, TGRS, TBME, CVPR, ICCV and ECCV. His research interests are in computer vision, machine learning, 3D shape analysis, facial recognition and video analysis.

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KEYNOTE TALK

Monday, October 7, 2019 at 1:30pm
(Sand Harbor II)

Approaches to Massive Scientific Data Visualization and Analysis

James Ahrens
Los Alamos National Laboratory
USA

Abstract: Science is advancing via the development of highly-precise scientific simulations that are run on the world's largest and fastest supercomputers. The goal of these simulations is to better understand complex physical processes at all scales from the quantum level to the workings of our universe. In this talk, I will describe a set of approaches to analyzing the massive scientific data generated by these simulations, by transforming it into visual knowledge to support scientific understanding. By looking at the massive data visualization and analysis problem abstractly and asking questions about 1.) What computing and human resources are available, 2.) What are the strengths and limitations of these resources, different solutions emerge. These approaches include data parallelism, data streaming, data reduction operators and reduced size data representations, and in-situ analysis. I will summarize these approaches and discuss how emerging trends, such as, machine learning, data science and hardware accelerated ray-tracing, will a play an important role in future work.

Speaker Bio-Sketch: Dr. James Ahrens is a senior scientist in the Applied Computer Science Group at Los Alamos National Laboratory. His primary research interests are visualization, computer graphics, data science and parallel systems. Ahrens is author of over 100 peer reviewed papers and the founder/design lead of ParaView, an open-source visualization tool designed to handle extremely large data. ParaView is broadly used for scientific visualization, downloaded approximately a quarter of a million times per year, and is in use at supercomputing and scientific centers worldwide. Dr. Ahrens has extensive management experience as a technical program manager. He has over twenty awards as a principal or co-investigator from the U.S. Department of Energy and the U.S. National Science Foundation. These awards have evolved in scope over the course of his career to multi-million dollar, interdisciplinary, data analysis/visualization projects involving multiple partners from academia, laboratories and industry. Ahrens is currently the U.S. Exascale Computing Project's Data and Visualization lead for a collection of storage, data management and visualization projects that will be a key part of a vibrant exascale supercomputing application and software ecosystem. Dr. Ahrens provides leadership to the international visualization and graphics community. In November 2018, he was elected Chair of the IEEE Computer Society Technical Committee on Visualization and Graphics (VGTC). The VGTC is the Visualization and Graphics Technical Committee, the governance body that oversees and sponsors all IEEE visualization and virtual reality conferences including VIS, VR, ISMAR, 3DUI, Pacific Vis, and EuroVis (as a co-sponsor). He helped start the successful Large Data Analysis and Visualization Symposium (LDAV) held at IEEE Visualization. Dr. Ahrens received his B.S. in Computer Science from the University of Massachusetts at Amherst in 1989 and a Ph.D. in Computer Science from the University of Washington in 1996.

KEYNOTE TALK

Tuesday, October 8, 2019 at 9am
(Sand Harbor II)

Fast, accurate and stable simulations for interactive VR training

Sheldon Andrews
École de Technologie Supérieure
Université du Quebec
Canada

Abstract: Physical simulations are an ubiquitous component in modern computer graphics applications, and over the past several decades a plenitude of specialized algorithms have been developed for solving the linear systems that govern their dynamical behavior. Methods in the field have trended toward iterative techniques that are well-suited to GPU parallelization, yet some applications require alternative approaches. In this talk, I will present our recent results for improving the tractability of stiff and highly coupled multibody simulations that are CPU bound. Our work focuses not only on techniques to improve the computational performance, but also preserving physical and numerical traits. I will motivate the work with some challenging examples and postulate about open problems that lie ahead for the community.

Speaker Bio-Sketch: Sheldon Andrews is a professor of Software and IT Engineering at the École de technologie supérieure (Université du Quebec) in Montreal, Canada. He received his Ph.D. in Computer Science in 2015 from McGill University with Paul Kry. More recently, he was a postdoctoral researcher at Disney Research in Edinburgh (2014-2015) and then CMLabs Simulations in Montreal (2016). His research interests include real-time multibody dynamics, computational contact mechanics, physics-based 3D characters, motion capture, and measurement-based modeling for virtual environments.

BANQUET KEYNOTE TALK

Tuesday, October 8, 2019 at 8:00pm
(Sand Harbor I)

The state of modern computer vision

David Forsyth
University of Illinois at Urbana-Champaign
USA

Abstract

Computer vision has gone through major changes over the last seven years. The vision community can solve classification and regression problems with astonishing accuracy and relative ease, as long as enough data is available. Many very important practical problems, like object detection, can be wrangled into either a Classification or a regression problem. Furthermore, we have a spectacular grasp of the relations between 3D worlds and 2D images. I will review the main problems we can currently solve, describe very roughly how we solve them, and sketch out the domain of important unsolved problems.

Speaker Bio-Sketch: David Forsyth is currently Fulton-Watson-Copp chair in computer science at U. Illinois at Urbana-Champaign. He has published many papers on computer vision, computer graphics and machine learning. He has served as program co-chair and general co-chair for IEEE Computer Vision and Pattern Recognition on many occasions, and am a regular member of the program committee of all major international conferences on computer vision. He has served six years on the SIGGRAPH program committee, and he is a regular reviewer for that conference. He has received best paper awards at the International Conference on Computer Vision and at the European Conference on Computer Vision. He received an IEEE technical achievement award for 2005 for my research. He became an IEEE Fellow in 2009, and an ACM Fellow in 2014. His textbook, "Computer Vision: A Modern Approach" (joint with J. Ponce and published by Prentice Hall) is now widely adopted as a course text (adoptions include MIT, U. Wisconsin-Madison, UIUC, Georgia Tech and U.C. Berkeley). A further textbook, “Probability and Statistics for Computer Science”, has just appeared in print; yet another (“Applied Machine Learning”) is about to go into production. He has served two terms as Editor in Chief, IEEE TPAMI. He serves on a number of scientific advisory boards, and he has a practice as an expert witness.

KEYNOTE TALK

Wednesday, October 9, 2019 at 9am
(Sand Harbor II)

Bone Microstructural Imaging in Osteoporosis – Recent Developments and Translational Studies

Punam Saha
University of Iowa, USA

Abstract: Osteoporosis is a common age-related disease characterized by reduced bone density and increased fracture-risk. Nearly 40 percent of women and 13 percent of men suffer one or more fragility fractures in their lifetime, and the fracture prevalence will further rise with continued increase in life-expectancy. Osteoporotic hip fractures reduce life expectancy by 20 percent and add an annual healthcare cost of nearly 19 billion dollars in the United States only. Early and accurate diagnosis of osteoporosis and assessment of fracture-risk is fundamental to handle the disease, and bone imaging plays an important role to accomplish this goal. Dual-energy X-ray absorptiometry (DXA) measured bone mineral density (BMD) is clinically used to characterize osteoporosis. It is known that BMD explains 60-70% of the variability in bone strength and fracture-risk, and the remaining variability comes from collective effects of other factors such as cortical and trabecular bone distribution, and their micro-structural basis. Accurate and robust measurement of effective cortical and trabecular bone microstructural features, associated with bone strength and fracture-risk, is of paramount clinical significance. State-of-the-art imaging modalities for bone microstructural assessment include magnetic resonance imaging (MRI), high-resolution peripheral quantitative computed tomography (HR-pQCT), flat-panel cone beam CT (CBCT), and whole-body multi-row detector CT (MDCT). Different research groups have applied various methods for characterization of bone microstructure related to cortical porosity and thickness, trabecular volume, network area, spacing, number, star volume measure, structure model index, connectivity number etc. Our research group has developed unique methods for *in vivo* clinical CT-based assessment of cortical porosity and trabecular plate-rod and longitudinal-transverse micro-architecture. This talk presents the principles and basis of these methods, experimental results evaluating their fidelity, generalizability, and impact on translational and clinical research studies.

Speaker Bio-Sketch: Punam Kumar Saha received his Ph.D. degree in 1997 from the Indian Statistical Institute, where he served as a faculty member during 1993-97. In 1997, he joined the University of Pennsylvania as a postdoctoral fellow, where he served as a Research Assistant Professor during 2001-06, and moved to the University of Iowa in 2006, where is currently serving as a tenured professor of Electrical and Computer Engineering and Radiology. His research interests include image processing and pattern recognition, quantitative medical imaging, musculoskeletal and pulmonary imaging, image restoration and segmentation, digital topology, geometry, shape and scale. He has published over 100 papers in international journals and over 300 papers/abstracts in international conferences, holds numerous patents related to medical imaging applications, has served as an associate editor of Pattern Recognition and Computerized Medical Imaging and Graphics journals, and has served in many international conferences at various levels. Currently, he is an Associate Editor of the IEEE Transactions on Biomedical Engineering and the Pattern Recognition Letters journals. He received a Young Scientist award from the Indian Science Congress Association in 1996, has received several grant awards from the National Institute of Health, USA, and is a Fellow of the International Association for Pattern Recognition (IAPR) and American Institute for Medical and Biological Engineering (AIMBE).

KEYNOTE TALK

Wednesday, October 9, 2019 at 1:30pm
(Sand Harbor II)

Perception and Affordance Research Inspired Design of Virtual Self-Representation in Near-Field Virtual Reality Interactions

Sabarish Babu
Clemson University, USA

Abstract: In this keynote, I will be highlighting a body of work that was conducted over a decade in the investigation of spatial perception and fine motor actions in near field or personal space virtual reality simulations, and its implications to the design of interaction metaphors and self-avatars. In our initial research, we studied near field distance estimation in real and virtual environments via visually guided reaching and speech based responses. We found that distances are systematically misperceived in immersive virtual environments and the real world in the near field. We then investigated how visuo-motor recalibration or adaptation can overcome depth misperceptions in near field virtual reality, via calibration to congruent and divergent visual and haptic feedback. In multiple experiments, we found evidence that congruent and divergent visuo-haptic feedback not only differentially affected distance estimation, but also affected the properties of fine motor actions such as velocity, accuracy and path length of the end effector's movements in open and closed loop experiences in VR. Building upon these findings, we investigated the effect of anthropomorphic and anthropometric fidelity of self-avatars, which are self-representations of the user in VR, on spatial perception and affordances in near field interactions. In this recent thrust, we found evidence of the presence of a malleable embodied body schema that is adaptable based on alterations to the self-avatar, and subsequently scaling our perceptions of distance and the participants' reach envelope in VR interactions. More recently, we have been investigating the effects of the presence or absence of self-avatars in contemporary VR experiences on the affordance of passability, and comparing the results to that of real world viewing situations. Our initial results seem to suggest that the difference in viewing has a larger impact on perceived affordances in the medium field, than the presence or absence of body scaled virtual embodiment. Finally, I will end my talk by highlighting our ongoing research on the effects of congruent and divergent visuo-haptic feedback on size perception and near field affordances in VR. The results of our work have profound implications to the design of VR interactions in fine motor training such as surgical simulation, mechanical skills trainers, as well as tangible devices and interaction metaphors.

Speaker Bio-Sketch: Sabarish "Sab" Babu is an Associate Professor in the Division of Human Centered Computing in the School of Computing at Clemson University in the USA. He received his BS (2000), MS (2002) and PhD (2007) degrees from the University of North Carolina at Charlotte, and completed a post-doctoral fellowship in the Department of Computer Science at the University of Iowa prior to joining Clemson University in 2010. His research interests are in the areas of virtual environments, virtual humans, applied perception, educational virtual reality, and 3D human computer interaction. He has authored or co-authored over 75 peer-reviewed publications in premiere venues in the research field. He was the General Chair of the IEEE International Conference on Virtual Reality (IEEE VR) 2016. He also served as a Program Co-Chair for IEEE VR 2017. He and his students have received Best Paper Awards in the IEEE International Conference on Virtual Reality, IEEE International Conference on 3D User Interaction, ACM Symposium on Applied Perception, and the IEEE International Conference on Healthcare Informatics. His research has been sponsored by the US National Science Foundation, US Department of Labor, St. Francis and Medline Medical Foundations.

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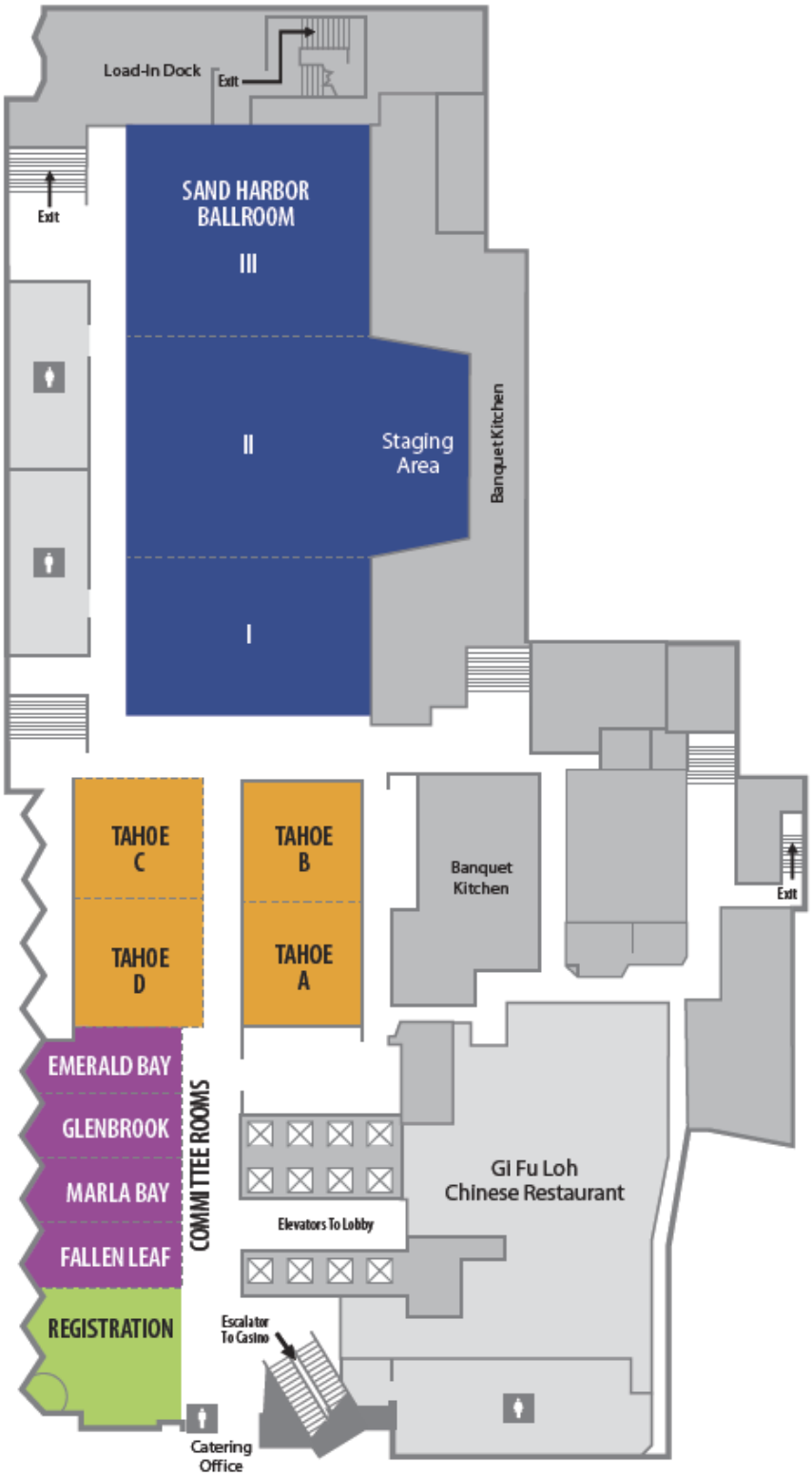

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