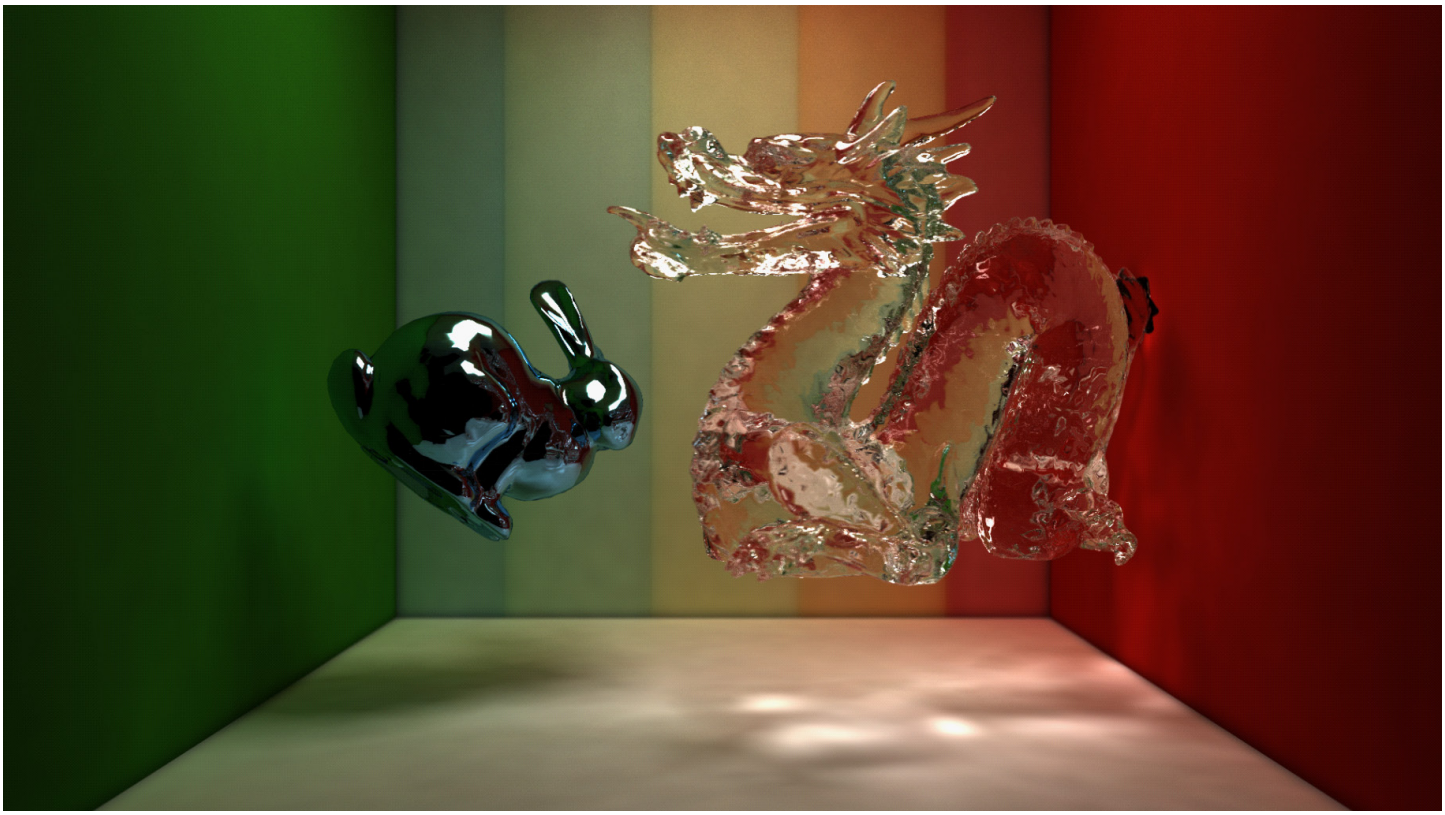


Patrick Cozzi presented at SIGGRAPH 2014; this image is from the GPU-Accelerated Photon Mapper project by Ishaan Singh, Yingting Xiao, & Xiaoyan Zhu

Letter From Dr. Badler

Greetings from the SIG Center for Computer Graphics at Penn! We've taken the opportunity of mailing it in December along with our annual Holiday Card. We hope you enjoy them both!

We have a few updates to the management and organization of the SIG Center. First of all, I am very pleased to announce that the Directorship of the Center for Human Modeling and Simulation has been passed to Ladislav Kavan. Ladislav is actively publishing in physics-based and interactive character deformation modeling and animation, so this new role guarantees continued relevance and currency for HMS. We've included here a sample of his work published in the 2014 SIGGRAPH Conference proceedings.

The SIG Center for Computer Graphics is now officially one of the NVIDIA CUDA Teaching Centers. Thanks go to Patrick Cozzi and Brittany Binler for preparing the materials for this recognition. Even though Patrick only teaches CIS565 GPU Programming once a year, we appreciate his enthusiasm for the topic and the course, and the great projects the student produce. This year CIS565 student works by Ishaan Singh, Lucy Xiao, Zia Zhu and Hao Wu were accepted in the SIGGRAPH Student Work Exhibit. A couple of sample images appear in this issue. We're proud of all of them!

I have taken on a new role as the founder and Director of the Digital Visualization Center (ViDi). In brief, the ViDi Center's mission is to address significant and interesting questions in the Humanities that may involve modeling and visualization of human artistic, structural, and cultural artifacts. We had a Kick-Off Symposium in March 2014 that included three outstanding speakers: Stephen Seitz from the University of Washington, Holly Rushmeier from Yale University and Ming Lin from the University of North Carolina at Chapel Hill. Expect to hear more about ViDi Center projects in the coming year. Additional information can be found on our website: http://vidi.upenn.edu.

Along with these organizational modifications, SIG, HMS and ViDi have a new Associate Director, Brittany Binler. You can read about her in the bio inside.

Our Computer Graphics community has been busy with publications, awards, and interesting career opportunities. I hope you enjoy reading about these achievements here.

We know that many of our alumni are doing exciting work in a variety of media and entertainment areas. Please feel free to write to me with a brief synopsis of what you do. We would like to expand our alumni notes in future Newsletters. And don't forget that we have a Facebook page that you are welcome to join: "CG@Penn".

Wishing everyone a great and happy Holiday season from all of us at Penn!

Norm Badler

Student Honors and Awards

Emre Tanirgan (left) with Disney Imagineering teammates. Photo by Copyright to Disney and Gary Krueger

DMD junior **Emre Tanirgan** and his team of four were finalists in the Walt Disney Imagineering's 23rd Imaginations competition. Founded in 1992, the Imaginations contest was to highlight the collaboration and skills required to create the interactive entertainment experiences that Imagineering is known for. The competition, which is open to American university students studying a variety of disciplines, drew 231 submissions last November. In January, Emre's team placed in the top six finalist positions. They were awarded...California. Sure enough, this is where Erne spent his summer. In January, Keşif placed in the top six finalist positions and was awarded a five-day, all-expense-paid trip to Imagineering Headquarters in Glendale, Calif. The contest is also used to attract and evaluate potential Imagineering employees, and sure enough, this is where Emre will be spending his summer.

This year's Imaginations contest prompt was, "design an experience that temporarily or permanently transforms [a large and densely populated] city for the enjoyment of its citizens and visitors." Tanirgan, originally from Istanbul, inspired the team to create Keşif, pronounced "keh-shif" which means "discovery" in Turkish. The project's focus was the Bosporus Bridge in Istanbul, which unites Europe and Asia over the Bosporus River. Over 10 million tourists cross the suspension bridge annually, and it has come to represent the fusion of two cultures. Using a local folk legend as their foundation, the project gives those crossing the bridge a glimpse into Turkish culture.

To transform Istanbul while reflecting its people, the Keşif experience integrates kinetic sculptures, physical tokens and a mobile app. Visitors to the strait would see moving images beneath the bridge and could also interact with images on top of the water. Afterwards, visitors could receive a coin (a token from tale) to remember their trip and could replicate their experience at home through the app.

The two versions of the kinetic sculptures, one suspended underneath the bridge and many floating on top of the water, would create moving pictures by raising and lowering luminous orbs, which act like pixels in a 3D display. The bridge system would consist of a platform holding spools from which the orbs would hang by steel cables. The result would be moving 3D artwork that appears magically suspended over the river.

Tanirgan notes that while all of his classwork has been valuable for the Imagineering challenge, his engineering entrepreneurship classes as well as his courses in 3-D computer modeling, software engineering, game design and an education course in Managing People were particularly relevant.

Morgan Snyder, a DMD sophomore, is part of a team of five undergraduates from Penn who competed in the Hult Prize.

Named as one of the top five ideas changing the world by President Bill Clinton and TIME Magazine, the annual competition for the the Hult Prize aims to identify and launch the most compelling social business ideas--start-up enterprises that tackle grave issues faced by billions of people. Winners receive USD 1 million in seed capital, as well as mentorship and advice from the international business community. Called "The Nobel Prize for students" by Mohammad Yunus, a Nobel Laureate, the annual competition for the Hult Prize aims to identify and launch the most compelling social business ideas: startup enterprises that tackle grave issues faced by billions of people.

Adam Mally received the "Penn Prize for Excellence in Teaching by Graduate Students."

Jeremy Newlin (right) accepts his DMD Becket Award from Dean Glandt.

The Penn team, "Sweet Bites," aims to solve a global issue concerning non-communicable diseases in challenged urban areas, mainly the burden of oral disease and its complications. Theirs is a simple solution: xylitol-enhanced chewing gum. By employing local women to distribute the gum packaged with medical information, they hope to enable female entrepreneurship, close the information gap around healthcare access, and improve the lives of millions suffering from preventable dental health problems.

Sweet Bites team won the regional competition for the Hult Prize in Boston against 45 other teams. Morgan's team piloted their business proposal during summer 2014 in India and Columbia. The team can be contacted at SweetBitesCo@gmail.com.

Congratulations to **Adam Mally** for receiving the "Penn Prize for Excellence in Teaching by Graduate Students." As Graduate Dean Kostas Daniilidis noted, "This is a true distinction voted on by

undergrads only, and Engineering is rarely represented." The Penn Prize for Excellence in Teaching by Graduate Students recognizes the profound impact that graduate students can have on undergraduate education at Penn. Nominations come directly from undergraduates and ten prizes are awarded annually.

More congratulations are in order! DMD Senior **Dave Sharples** has received an Honorable Mention in the 2014 CIS Senior Project Competition! We now have a tradition of having a DMD student place in the CIS winner's circle two years running (Michael Rivera did so last year). Congrats Dave and thanks for being prepared to show your work a week early!!

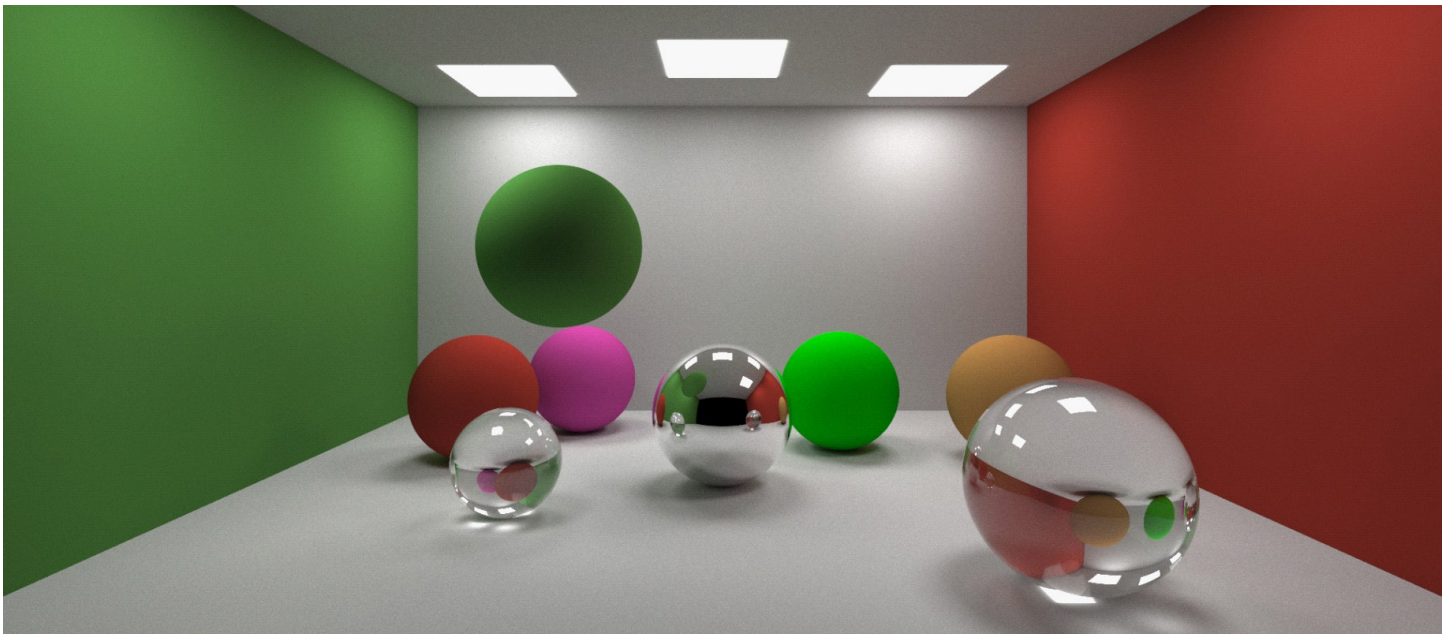
Jeremy Newlin was the 2014 recipient of the Dawn and Welton Becket DMD Achievement Award, which is presented to the DMD senior who exemplifies the ideals of the DMD program through outstanding academic and personal achievement, citizenship, and mentoring. Congratulations, Jeremy!

Aline Normoyle Wins Best Paper at MIG

"Trade-offs between Responsiveness and Naturalness for Player Characters" by Aline Normoyle, PhD Candidate, and Sophie Jörg, Assistant Professor at Clemson University, won Best Paper at Motion In Games 2014.

In many video games, players control a character from a third person perspective. Are video game players willing to trade-off responsiveness in the controls for better animation quality? Naturalness and responsiveness are conflicting goals for any game requiring precise timing and in this paper the authors describe several experiments which investigate the interplay between responsiveness and character animation on video game players. For example, they find that the animation affected players' enjoyment and satisfaction, even when it didn't affect their game performance or their perceived ability to control the character.

A screenshot from Aline Normoyle's experimental platrom


Patrick Cozzi presented a demo at SIGGRAPH 2014; this image is from the GPU-Accelerated Path Tracer project by Hao Wu.

2013 Publications

“Skinning: Real-time Shape Deformation” Alec Jacobson, Zhigang Deng, Ladislav Kavan, J. P. Lewis. SIGGRAPH Course, 2014.

“Consistently Orienting Facets in Polygon Meshes by Minimizing the Dirichlet Energy of Generalized Winding Numbers” Kenshi Takayama, Alec Jacobson, Ladislav Kavan, Olga Sorkine-Hornung. arXiv, 2014.

“Projective Dynamics: Fusing Constraint Projections for Fast Simulation” Sofien Bouaziz, Sebastian Martin, Tiantian Liu, Ladislav Kavan, Mark Pauly. ACM Transaction on Graphics 33(4) [Proceedings of SIGGRAPH], 2014.

“Ink-and-Ray: Bas-Relief Meshes for Adding Global Illumination Effects to Hand-Drawn Characters” Daniel Sýkora, Ladislav Kavan, Martin Cadík, Ondrej Jamriška, Alec Jacobson, Brian Whited, Maryann Simmons, Olga Sorkine-Hornung. ACM Transactions on Graphics 33(2) [Presented at SIGGRAPH], 2014.

“Fast Grid-Based Nonlinear Elasticity for 2D Deformations”. Rajsekhar Setaluri, Yu Wang, Nathan Mitchell, Ladislav Kavan, Eftychios Sifakis. Symposium on Computer Animation, 2014.

“Sound Localization and Multi-Modal Steering for Autonomous Virtual Agents”. Yu Wang, Mubbasir Kapadia, Pengfei Huang, Ladislav Kavan, Norman Badler. Symposium on Interactive 3D Graphics and Games, 2014.

“Look me in the eyes: A survey of eye and gaze animation for virtual agents and artificial systems”. K. Ruhland, S. Andrist, J. Badler, C. Peters, N. Badler, M. Gleicher, B. Mutlu and R. McDonnel. Eurographics STAR (State-of-the-Art Report), 2014.

“Simulating heterogeneous crowds with interactive behaviors” N. Pelechano, M. Kapadia, J. Allbeck, Y. Chrysanthou, S. Guy and N. Badler. Eurographics Tutorial, 2014.

“GPU-based Dynamic Search on Adaptive Resolution Grids”. Francisco Garcia, Mubbasir Kapadia, and Norman I. Badler. ICRA 2014.

“ADAPT: The Agent Development and Prototyping Testbed”. Alexander Shoulson, Nathan Marshak, Mubbasir Kapadia, Norman I. Badler. To appear, IEEE Trans. on Visualization and Computer Graphics, 2014.

“Path Planning for Coherent and Persistent Groups”. Tianyu Huang, Mubbasir Kapadia, Norman I. Badler, and Marcelo Kallmann. ICRA 2014.

“Path Planning for Coherent and Persistent Groups”. Tianyu Huang, Mubbasir Kapadia, Norman I. Badler, and Marcelo Kallmann. ICRA 2014.

2014 Publications

“Fast Simulation of Mass-Spring Systems”. T. Liu, A. Bargteil, J. O’Brien, L.Kavan. SIGGRAPH Asia 2013
“Anatomy Transfer”. D. Ali-Hamadi, T. Liu, B. Gilles, L. Kavan, F. Faure, O. Palombi, M. P. Cani. SIGGRAPH Asia 2013.

“Toward Event-Centric Interactive Narrative”. Alexander Shoulson, Mubbasir Kapadia and Norman I. Badler. Intelligent Narrative Technologies 6, 2013

“SPREAD: Sound Propagation and Perception for Autonomous Agents in Dynamic Environments”. Pengfei Huang, Mubbasir Kapadia, Norman I. Badler. ACM SIGGRAPH/Eurographics Symposium of Computer Animation (SCA) 2013

“Multi-Domain Real-time Planning in Dynamic Environments”. Mubbasir Kapadia, Alejandro Porres, Francisco Garcia, Vivek Reddy, Nuria Pelechano, Norman I. Badler. ACM SIGGRAPH/Eurographics Symposium of Computer Animation (SCA) 2013

“Dynamic Search on the GPU”. Mubbasir Kapadia, Francisco Garcia, Cory Boatright, Norman I. Badler. IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS 2013

“The Effect of Posture and Dynamics on the Perception of Emotion”. Aline Normoyle, Fannie Liu, Mubbasir Kapadia, Norman I. Badler, Sophie Jorg. Symposium on Applied Perception, 201

“Introducing the Programmable Vertex Pulling Rendering Pipeline”. Christophe Riccio, Sean Lilley. GPU Pro 4: Advanced Rendering Techniques. Editor(s): Wolfgang Engel, Confetti Special Effects.

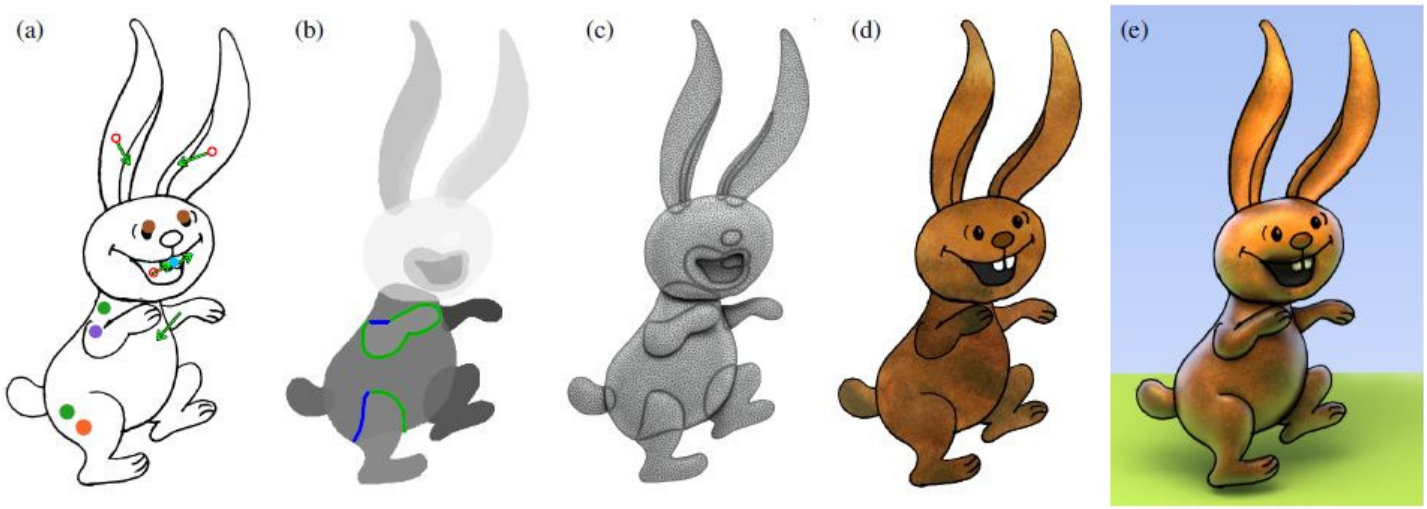
"Authoring Multi-Actor Behaviors in Crowds with Diverse Personalities". Mubbasir Kapadia, Alexander Shoulson, Funda Durupinar, Norman I. Badler. Modeling, Simulation and Visual Analysis of Large Crowds, Springer-Verlag, 2013.

"Navigation and Steering for Autonomous Virtual Humans". Mubbasir Kapadia and Norman I. Badler. WIREs Cognitive Science, Wiley, 2013.

"ADAPT: The Agent Development and Prototyping Testbed". Alexander Shoulson, Nathan Marshak, Mubbasir Kapadia, Norman I. Badler. ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games, March 2013. Submitted to IEEE Transactions on Visualization and Computer Graphics (TVCG)

"Efficient Motion Retrieval in Large Motion Databases". Mubbasir Kapadia, I-kao Chiang, Tiju Thomas, Norman I. Badler, Joseph T. Kider Jr. ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games, March 2013.

Ladislav Kavan Presents at SIGGRAPH 2014



Assistant Professor Ladislav Kavan presented "Bas-Relief Meshes for Adding Global Illumination Effects to Hand-Drawn Characters" by Daniel Sýkora, Ladislav Kavan, Martin Čadík, Ondřej Jamriška, Alec Jacobson, Brian Whited, Maryann Simmons, and Olga Sorkine-Hornung at SIGGRAPH 2014.

The authors present a new approach for generating global illumination renderings of hand-drawn characters using only a small set of simple annotations. Their system exploits the concept of bas-relief sculptures, making it possible to generate 3D proxies suitable for rendering without requiring side-views or extensive user input. They formulate an optimization process that automatically constructs approximate geometry sufficient to evoke the impression of a consistent 3D shape. The resulting renders provide the richer stylization capabilities of 3D global illumination while still retaining the 2D hand-drawn look-and-feel. They demonstrate their approach on a varied set of hand-drawn images and animations, showing that even in comparison to ground-truth renderings of full 3D objects, their bas-relief approximation is able to produce convincing global illumination effects, including self-shadowing, glossy reflections, and diffuse color bleeding.

Introducing Britt Binler

We are extremely pleased to announce that Britt Binler has accepted the position of Associate Director of the SIG Center for Computer Graphics. Previously, Britt worked in the Computer and Information Science Department as an Administrative Assistant. As Associate Director, Britt manages and maintains the diverse technology of the SIG Center and serves as the Graduate Coordinator of the CGGT program.

Britt is pursuing a Masters degree in Computer and Information Technology and serves as founder and president of oSTEM at Penn, a chapter of Out in Science, Technology, Engineering & Mathematics (oSTEM), the national student society dedicated to increasing participation of people who identify with lesbian, gay, bisexual, transgender, queer, or ally (LGBTQA) communities in disciplines related to science, technology, engineering, or mathematics (STEM).

Jeremy Newlin and Xiaoyan (Zia) Zhu created this image with Maya (modeling), Renderman (shading, lighting, and rendering), and Photoshop (texturing and post processing).