Karan Sher Singh

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Bio and Career Highlights

Karan Singh is an expert in Interactive Computer Graphics and a Professor in Computer Science at the University of Toronto. He holds a BTech. (1991) from IIT Madras and MS (1992), PhD (1995) from the Ohio State University. His research interests lie in interactive graphics, spanning art and visual perception, geometric and anatomic modeling, character animation, and sketch-based techniques and interfaces for AR/VR. He has been a technical lead on two commercial projects that have won technical Oscars (Maya, Paraform). He has co-founded multiple companies including Arcestra (now FindSpace), JanusVR and JALI, and supervised the design and research of critically acclaimed research systems ILoveSketch, MeshMixer (acquired by Autodesk in 2011), Neobarok and FlatFab. Karan co-directs a globally reputed graphics and HCI lab, DGP, has over 100 peer-reviewed publications, has supervised over 40 MS/PhD/postdoctoral students and is currently supervising 4 PhD students. He was the R&D Director for the 2004 Oscar winning animated short film *Ryan* and had a solo exhibition of electronic art titled Labyrinths.

Degrees

- Ph.D., *Computer and Information Science*. Ohio State University. 12/92-10/95
  Thesis: Realistic Human figure Synthesis and Animation for VR applications.
- M.S., *Computer and Information Science.* Ohio State University. 9/91-11/92
- B.Tech., *Computer Science and Engineering*. 8/87-7/91
  Indian Institute of Technology, Madras, India.

Employment

- July 2012- present: *Professor*, Computer Science, University of Toronto, Canada.
- Jan.2002- Jun.2012: *Associate Professor*, Computer Science, University of Toronto, Canada.
- July 2017-present: *Co-Founder*, JALI Inc. www.jaliresearch.com
- Dec. 2014-present: *Co-Founder*, Janus VR Inc. www.janusvr.com
- July 2014-2016: *Co-Founder*, FlatFab Inc. www.flatfab.com
- July 2014-present: *Co-Founder*, Conceptualiz Inc. www.conceptualiz.com
- Jan.2006- present: *Co-Founder*, Arcestra, Canada. www.arcestra.com
- Jan.2002- 2009: C*hief Scientist*, Geometry Systems Inc.(reverse engineering software).
- Jun.1999- Jun.2001: *Technical Lead*, Paraform Inc., Santa Jose, CA.
- Dec.1995- Jan.1999: *Graphics Researcher,* Alias Inc., Toronto, Canada.

- Jan.1994- Dec.1994: *Invited researcher*, Communication Systems Research Labs, Advanced Telecommunications Research (ATR), Kyoto, Japan.
- Mar. 1994- Sept 1994: *Bartender*, Taberuna Matano, Nara, Japan.

Visiting Professorships

- Winter 2020, Victoria University, WetaFX, New Zealand.
- Winter 2013, NUS Singapore.
- Summer 2011, INRIA Rhone-Alpes.
- Summer 2009, INRIA Sophiantipolis.
- Aug. 2008 – March 2009, Computer Science, Indian Inst. of Tech. (IIT) Delhi.
- Summer 2008, Microsoft Research, Beijing.
- Winter 2007, Computer Science, University of Pennsylvania.
- Summer 2005, Computer Science, University of Texas, Austin.
- Feb.1999- May 1999: Computer Science, University of Otago, New Zealand.
- Summer 1989-1993: *Student, Counselor, Instructor*, The Ross Program (Number Theory & Combinatorics), http://www.math.ohio-state.edu/ross/

Honours

- **University of Toronto, President's Impact Award, 2018.** http://www.research.utoronto.ca/pia/2018_recipients/
- Canadian Human Computer Communications Society, *Lifetime Achievement Award*, May 2019.
- **University of Toronto Inventor of the year Award 2015.** http://www.research.utoronto.ca/from-3d-printing-for-kids-to-spine-surgery-tools-u-of-ts-celebrates-its-top-innovators/
- **IIT, distinguished Alumnus Award 2015.**
- **MITACS 2008-2009 Mentorship Award of Excellence.**
  MITACS (now Mprime), the only Network of Centres of Excellence for the mathematical sciences, brings together academia, industry and the public sector to develop cutting edge mathematical tools vital to our knowledge-based economy.
  I have led a flagship MITACS project **Mathematical Surface Representations for Conceptual Design** since 2003, currently funding 6 investigators and 8 graduate students, with over 25 graduate student alumni and producing over 100 refereed publications. The MITACS mentorship award is annually conferred to a network investigator to reflect leadership and mentoring based on nominations from current and former students.
- **Indo-Canada Chamber of Commerce** (Technology Award), 2008.
  The Indo-Canada Chamber of Commerce (ICCC), founded in 1977, is a premier, not-for-profit, member and sponsor funded business organization with 1000+ members from the Canadian business and professional communities. The organization recognizes the achievements of Indo-Canadians in various disciplines at an annual event.
- **International Distinguished Scholar** (University of Pennsylvania), 2007.
  The Distinguished International Scholars Program aims to enhance global engagement on campus and deepen Penn's ties to universities and scholars around the world. I spent a part of Winter 2007 at visiting UPenn as one of one four awardees that year.
- **Centennial Foundation** (Excellence Award, Toronto), 2006.
  The Centennial foundation annual award recognizes achievements worldwide in relation to the Sikh community in North America.

- **Ryan.** (Software R+D Director)
  - **Oscar (Best Animated Short) 2005.**
  - Cannes 2004, Kodak Discovery Award, Young Critic's Prize, Canal+ Best Short Film.
  - SIGGRAPH 2004, Los Angeles, CA, Electronic Theater, Jury Prize.
  - Annecey International Film Festival 2004, Jury Award.
  - Prix Arts Electronica 2004, Golden Nica.
  - Ottawa animation festival, Grand Prize.
  - Genie (Best Canadian Animation) 2005.

  Ryan was an NFB produced, animated short film that won virtually every animation award in the years 2004-2005. Only the more significant awards are listed above. I was the software research and development director for the film that had a number of technological advances some of which were chronicled in papers [CS04] and [CS06].
- **Paraform 1.0, 2000.** (**Technical achievement Academy Award 2001**).

  I was the technical lead for conceptual modeling and manufacturing tools on a pioneer reverse engineering software system, that has over the years been used on a number of commercial film projects.
- **Maya 1.0, 1998. (Technical Oscar 2003,** more exclusive than a technical achievement award, only 38 such awards since 1930**)**.

  I designed and developed the object deformation and character and facial animation module on *Maya*, a system that is still the de facto commercial standard in modeling and animation. The papers [SF98], [SK00] chronicled some of this work and developed a new class of surface-oriented deformation techniques.
- **Bingo.** (Technical Director)
  - SIGGRAPH 1998, Orlando, FL, Electronic Theater, Grand Finale Animation.
  - Genie 1998, Best Canadian Animated Short Film.

  I was responsible for the creation of tools and some of the rigging process of the principal characters of the film. Further, in the absence of cloth simulation tools, wires [SF98] were used to model and animate clothing.

Technology Transfer

- JALI founded from research [E+16]
- Flatfab founded from research [MUS14]
- Arcestra founded as Sketch2 based on suggestive sketching research [T+04].
- Shapeshop3D, a tool for organic free-form modeling freely downloadable since 2007 [SS08].
- Meshmixer, a tool for rapid mesh composition, freely downloadable since 2009 [SSi10][SSii10][T+11], acquired by Autodesk Inc. in 2011.

Professional Activities

- ACM MIG Motion in Games Papers committee 2021.
- SMI, Expressive, Pacific Graphics Papers committee 2020.
- SMI, Expressive, SAP Papers committee 2019.
- SMI, Expressive, SAP Papers committee 2018.
- SIGGRAPH Papers committee 2017.
- Expressive Papers committee 2017.
- UIST Papers committee 2016.
- SIGGRAPH Papers committee 2016.
- UIST Papers committee, 2015.

- Expressive papers committee 2015.
- Program Chair: ACM SAP (Symposium on Applied Perception) 2014.
- SIGGRAPH Art Papers Advisory Board, 2014.
- SIGGRAPH, SIGGRAPH Asia Technical Papers committee, 2012, 2013, 2014.
- Program Committee 2014: GI (Graphics Interface).
- Program Committee 2013: SMI (Shape Modeling International), SGP (Symposium of Geometry Processing), SCA (Symposium of Computer Animation)
- Program Committee 2012: Eurographics, SMI (Shape Modeling International), SGP (Symposium of Geometry Processing), SCA (Symposium of Computer Animation)
- Program Chair: Eurographics Sketch-based Interfaces and modelling SBIM 2012, Annecy.
- SIGGRAPH Art Papers Jury, 2011.
- Conference Chair: Eurographics Sketch-based Interfaces and modelling, June 2008 (SBIM 2008), co-located with the Annecy Film Festival www.annecy.org.
- Course co-organizer and speaker:
  Interactive shape modelling, (Eurographics 2005, SIGGRAPH 2006).
- Co-organizer and speaker, summer school: *Interactive shape modelling* in Darmstadt, July 2005.
- Conference co-Chair: ACM SIGGRAPH (Association of Computing Machinery, Special Interest Group on Graphics) /Eurographics Symposium of Computer Animation, SCA 2003.
- Program Chair: Fields Instititute workshop on mathematics of Computer Animation, Nov. 2002.
- Frequent Program Committee Member for various conferences (since 2003):
  Eurographics, SIGGRAPH, SCA (Symposium of Computer Animation), SGP (Symposium on Geometry Processing), NPAR (Non-photorealistic Animation and Rendering), SBIM (Sketch based interfaces and modeling), Graphics Interface, IEEE VRST (Virtual Reality Software Technology).
- Managed the Dynamic Graphics Project (DGP) lab, University of Toronto, http://www.dgp.toronto.edu. (2007-2010).

Research Interests

My research in *interactive graphics* is broadly categorized across:

a. Shape perception, understanding and fabrication
b. Geometry Processing
c. Sketch and sculpt interfaces
d. Artistic Projection and Rendering
e. Character and facial modeling and animation
f. Human Anatomy
g. Augmented/Virtual Reality

Research Awards

- **Modeling, Animation and Fabrication of 3D Human Faces**. NSERC CRD with Autodesk Inc. 2020-2022 (105K Autodesk + 150K NSERC).
- **Product Readiness of a System for the Speech Driven Animation of 3D Faces.** *Connaught Fund, Innovation Award, 2019-2020,* 50K$.
- **Toward Three-Dimensional Cinematography via Advanced Manufacturing (**with Alec Jacobson and Pia Kleber), New Frontiers in Research Fund (125K*2 = 250,000$) 2019-2021.
- **President's Impact Award** (50K$)**.**

- **Enabling and leveraging whole-chassis sensing in VR, AR, and Handhelds (**with Daniel Wigdor), OCE, (26,250$), 2018- 2019**.**
- **Enabling and leveraging whole-chassis sensing in VR, AR, and Handhelds (**with Daniel Wigdor), NSERC CRD, (171,664$), 2018- 2020.
- **Design2Model: Sketching 3D designs**, 2016, 125,000$, NSERC (National Science and Engineering Research Council of Canada), I2I (Ideas to Innovation). (Co-investigator : Alla Sheffer).
- **Transcended Reality: Modeling, Fabrication, Interaction, Navigation and Perception in Immersive (AR/VR) Environments.** NSERC Discovery Grant 2016-2021, 38,000$ per year.
- Autodesk Research (Industrial Grant) 25,000$, 2015.
- National Sciences and Engineering Research Council Collaborative Research & Development ($265,000) **OS Enhancement for Zero-Latency UI Response**. Provincial matching for Tactual Labs sponsored research project ($150,000 in 2014), Co-Investigator (PI Daniel Wigdor).
- Ontario Centres of Excellence: Voucher for Innovation and Productivity ($210,000), **OS Enhancement for Zero-Latency UI Response**. Provincial matching for Tactual Labs sponsored research project, 2014, Co-Investigator (PI Daniel Wigdor).
- NSERC collaborative R+D grant. **PHuman: parametric, multiscale modeling and simulation of human anatomy**. 2012-2014, 160,000$ per year, Co-Investigator (PI Sidney Fels).
- DDD (Data Driven Design) 2011. **3D sketch canvases** 15K$. Collaborative grant with Prof. Laura Millard, Ontario College of Art and Design, OCADU.
- NSERC Discovery Accelerator Supplement 2011-2014, 40,000$ per year.
- **Sketch based modeling and perception.** NSERC Discovery Grant 2011-2015, 33,000$ per year.
- GRAND NCE (2010-present). Network Investigator and Project Leader SKETCH. 55,000$ per year.
- Autodesk Research (Industrial Grant) 20,000$, 2010.
- **Interactive interfaces for the visualization and exploration of anatomic structures.** 2007-2011, 100,000$, Early Research Award, Ontario Research Foundation.
- Autodesk Research (Industrial Grant) 30,000$, 2007.
- **Character Animation.** NSERC Discovery Grant 2007-2011, 30,000$ per year.
- **3D Sketch Graphics Software Development Project**, 2006, 125,000$, NSERC (National Science and Engineering Research Council of Canada), I2I (Ideas to Innovation). PHASE II (Co-investigator : Ravin Balakrishnan).
- **3D Sketch Graphics Software Development Project**, 2005, 125,000$, NSERC (National Science and Engineering Research Council of Canada), I2I (Ideas to Innovation). PHASE I (Co-investigator : Ravin Balakrishnan).
- **3D Sketching with a suggestion database**, 2005, 25,000$, CITO, Technical readiness (Co-investigator : Ravin Balakrishnan).
- **Intuitive interfaces for Modeling and Animation of Graphical Environments** 2005, 21,200 Euros + 8,880 Euros (France-Canada research Foundation). (Co-Investigator Lionel Reveret, INRIA Grenoble, France) (*Applied for*: Direction des Relation Européennes et Internationales).
- **3D Sketching Software**, 2005, 50,000$, NSERC (National Science and Engineering Research Council of Canada), IPM. (Co-investigator : Ravin Balakrishnan).
- **Mathematical Surface Representations for Conceptual Design**, 2003-2012, $120,000 per year for two years, **MITACS** (Mathematics of Information Technology and Complex Systems). (Co-investigators: Michiel van de Panne, Eugene Fiume, Richard Zhang, Ravin Balakrishnan, Alla Sheffer).
- **Laboratory for human computer interaction and graphics**, 2003, $994,066, CFI (Canadian Foundation for Innovation) New Ops (Co-investigator: Ravin Balakrishnan)
- **Laboratory for large scale high resolution interaction graphics**, 2002, $96,792, (National Science and Engineering Research Council of Canada) NSERC #: EQPEQ 252430. (Co-investigators: Ravin Balakrishnan, Eugene Fiume, Kyros Kutulakos).

- **Intelligent character setup and animation**, 2002-2006, 25000$ per year for four years, NSERC (National Science and Engineering Research Council of Canada) Discovery Grant #: 250321.
- **Next generation user interfaces for data visualization**, 2004-2007, $82,900, $89,400, $91,500, NSERC (National Science and Engineering Research Council of Canada). (Co-investigator: Ravin Balakrishnan).
- **Startup Grant**, 2002, 90,000$, BUL (Bell University Labs). (Sole PI).
- **Matching Grant**, 2002, 10,000$, Connaught Foundation. (Sole PI).

Patents

1. **Systems and methods for using hover information to predict touch locations and reduce or eliminate touchdown latency** C Forlines, RJJ Costa, D Wigdor, K Singh, H Xia **US Patent 10,592,050, 2020.**
2. **Systems and methods for using hover information to predict touch locations and reduce or eliminate touchdown latency** C Forlines, RJJ Costa, D Wigdor, K Singh, H Xia **US Patent 10,592,049, 2020.**
3. **Method And System For Color Representation Generation** M. Shugrina, A. Kar, S. Fidler, K. Singh. (US pat. filed 2018).
4. **Method and system for linking a first virtual reality (VR) immersive space with a second VR immersive space** James McCrae, Karan Singh. (US pat. 10,593,105, 2020).
5. **Method and system for translating a legacy web page into a three-dimensional virtual reality (VR) immersive space** James McCrae, Karan Singh. (US pat. 15/801,918 filed 2017).
6. **Combining 2d and 3d sketching for designing detailed 3d objects in Augmented Reality** (US pat. 62/572,399 filed 2017).
7. **System and Method for Animated Lip-Synchronization**
   Pif Edwards, Chris Landreth, Karan Singh, Eugene Fiume (US pat. filed 2017).
8. **Method and System for providing an interactive Virtual Reality environment**
   James McCrae, Karan Singh. (US pat. 62/420146 filed 2016).
9. **System and Method for Interactive 3D Modelling of Surgical Implants**
   Richard Hurley, Rinat Abdrashitov, Karan Singh, Ravin Balakrishnan, James McCrae
   (US Patent filed 2015).
10. **System and Method for Generating Planar Section 3D Shape Representations**
    James McCrae, Karan Singh.
    (US Patent filed 2014).
11. **Methods and systems for estimating three-dimensional information from two-dimensional concept drawings**
    Adrien Bousseau, Will Chang, Alla Sheffer, Karan Singh, Baoxuan Xu, James McCrae.
    (US Patent filed 2014).
12. **Methods and systems for characterizing concept drawings and estimating three-dimensional information therefrom**
    Adrien Bousseau, Cloud Shao, Alla Sheffer, Karan Singh.
    (US Patent 9405994, 2016).
13. **Systems and methods for using hover information to predict touch locations and reduce or eliminate touchdown latency**
    C Forlines, RJJ Costa, D Wigdor, K Singh, H Xia **(**US Patent App. 14/859,185, 2015).
14. **Interactive labyrinth curve generation and applications** (US pat. no. 7928983).
15. **System method and computer program for 3D sketching with dynamic partial image recognition and comparable image retrieval** (U.S. patent no. 8300062).
16. **A system for creating and modifying curves and surfaces** (U.S. pat. no. 7289121).
17. **Method and apparatus for geometric model deformation using wires** (U.S. patent no. 6,204,860).

18. **Motion synthesis equipment using 3D models**. Tokuganhei 7-42120 (Jap. Patent# 1995 - 42120).
19. **3D image synthesis equipment for enabling wrinkle formation**. Tokuganhei 7-105012 (Jap. Patent# 1995 - 105012).

Scholarly and Professional Work

Animations & Exhibitions

- Bingo *(Technical Director)* 1998.
- Ryan *(Software R+D Director)* 2004.
- Amazing *(Director)* 2005 (Eurographics Animation Festival).
- The Spine (*software tools and NPR rendering*) 2009.
- Labyrinths (19-21 nov. 2010, AF Galerie Romain Roland, Delhi).
- A figure runs though it (Group exhibition, Blue Moon Café, Toronto, July 2011).
- The Big Art Show (Group exhibition, Twist Gallery, Toronto, Oct. 2012).
- Labyrinths (Senior College UofT, May 2019).

Publications

Career Publication Count	
Chapters in Books	2
Papers in refereed journals	44
Papers in premier refereed conferences	59
Other refereed/invited contributions	14
Refereed conference abstracts/posters	11
Other publications	4

Papers, videos and supplementary material also available at http://www.dgp.toronto.edu/~karan/pubs.htm

Refereed journal publications (In reverse chronological order)

if (impact factor), *ar* (acceptance rate)

ACM Trans. on Graphics TOG (SIGGRAPH/SIGGRAPH Asia) (*if*=3.6, *ar*=20%)
ACM Trans. on Computer Human Interaction TOCHI (SIGCHI) (*if*=1.2)
Attention, Perception, & Psychophysics (*if=2.17)*
Psychonomic Bulletin and Review (*if=2.61*)
IEEE Computer Graphics & Applications (CG&A) (*if=1.7*)
Computer Graphics Forum CGF (Eurographics, Symp. of Geometry Processing) (*if*=1.7 *ar*=20%, 27%)
Computer Aided Design (*if*=1.6)
Computer Methods and Programs in Biomedicine (*if*=1.4)
Computers and Graphics (*if=0.8*)
The Visual Computer (*if=0.8*)
Journal of Graphics Tools (*if=0.6*)
Theoretical Computer Science (*if*=0.9)
SIAM Journal of Discrete Mathematics (*if*=0.7, listed in top-ten math journals)

- [X+20] *RigNet: Neural Rigging for Articulated Characters.* Z Xu, Y Zhou, E Kalogerakis, C Landreth, K Singh. *ACM Transactions on Graphics 2020 (SIGGRAPH)* (14 pages).
- [S+20] *Nonlinear Color Triads for Approximation, Learning, and Direct Manipulation of Color Distributions.* M. Shugrina, A. Kar, S. Fidler, K. Singh. *ACM Transactions on Graphics 2020 (SIGGRAPH)* (14 pages).
- [AJS19] *A system for efficient 3D printed stop-motion face animation,* R. Abdrashitov, A. Jacobson, K. Singh. *ACM Transactions on Graphics 2019 (SIGGRAPH)* (12 pages).
- [X+18] *Model-Guided 3D Sketching*, P Xu, H Fu, Y Zheng, K Singh, H Huang, CL Tai, *IEEE Transactions on Visualization and Computer Graphics 2018.* (13 pages).
- [Z+18] *VisemeNet: Audio-Driven Animator-Centric Speech Animation.* Y. Zhou, C. Landreth, E. Kalogerakis, K. Singh. *ACM Transactions on Graphics 2018 (SIGGRAPH 2018*).
- [A+17] *SketchSoup: Exploratory Ideation using Design Sketches.* R. Arora, I. Darolia, V. P. Namboodiri, K. Singh and A. Bousseau, *Computer Graphics Forum, CGF 2016* (11 pages).
- [E+16] *JALI: An Animator-Centric Viseme Model for Expressive Lip-Synchronization.* P. Edwards, C. Landreth, E. Fiume, **K. Singh**. *ACM Transactions on Graphics 2016* (SIGGRAPH 2016) (11 pages).
- [X+16] *Using Isophotes and Shadows to Interactively Model Normal and Height Fields.* Q Xu, S Liu, Y Gingold, **K Singh.** Computers & Graphics 2016 (13 pages).
- [WSK16] *Foreshortening produces errors in the perception of angles pictured as on the ground* M Wnuczko, **K Singh**, JM Kennedy *Attention, Perception, & Psychophysics 78 (1), 309-316, 2016* (8 pages).
- [dPS15] *SecondSkin: Sketch-based Construction of Layered 3D Models.* C. de Paoli, **K. Singh**. *ACM Transactions on Graphics 2015* (SIGGRAPH 2015) (10 pages). http://www.dgp.toronto.edu/~depaolic/projects/secondSkin/
- [B+15] *Modeling Character Canvases from Cartoon Drawing.* M. Bessmeltsev, W. Chang, A. Sheffer, **K. Singh**. *ACM Transactions on Graphics 2015* (SIGGRAPH 2015) (14 pages). http://www.cs.ubc.ca/labs/imager/tr/2015/Canvases/
- [C+15] *ColorBless: Augmenting Visual Information for Colorblind People with Binocular Luster Effect.* S. Chua, H. Zhang, M. Hammad, S. Zhao, S. Goyal, **K. Singh**. *ACM Transactions on Computer-Human Interaction (TOCHI), 21, 6 (January 2015), Article 32, (presented at CHI'15)* (20 pages)
- [X+14] *True2Form: 3D Curve Networks from 2D Sketches via Selective Regularization.* B. Xu, W. Chang, A. Sheffer, A. Bousseau, J. McCrae, **K. Singh**. *ACM Transactions on Graphics 2014 (presented at* SIGGRAPH 2014). (13 pages). http://www.cs.ubc.ca/~brianxu/publications/true2form/
- [BAS14] *Interactive Shape Modeling using a Skeleton-Mesh Co-Representation.* A. Baerentzen, R. Abdrashitov, **K. Singh**. *ACM Transactions on Graphics 2014 (presented at* SIGGRAPH 2014). (10 pages). http://www2.compute.dtu.dk/~janba/pam/
- [SS14] *Flow complex based shape reconstruction from 3D curves.* B. Sadri, **K. Singh**. *ACM Transactions on Graphics 2014 (presented at* SIGGRAPH 2014). (15 pages).
- [MMS13] *Surface Perception of Planar Abstractions*, J. McCrae, N. Mitra, **K. Singh** Symposium on Applied Perception, 2013 *(in ACM Transactions on Applied Perception).* (20 pages). http://www.dgp.toronto.edu/~mccrae/projects/perception/
- [W+13] *Mirror image arm used in monocular, binocular, and blindfolded pointing,* M. Wnuczko, J. Kennedy, M. Niemeier, **K. Singh.** *Psychonomic Bulletin & Review, February 2013, Volume 20, Issue 1, pp 95-100*. (journal impact factor 2.61).

- [B+12] *Design-Driven Quadrangulation of Closed 3D Curves,* M. Bessmeltsev, C. Wang, A. Sheffer, **K. Singh.** *ACM Transactions on Graphics (Proc. SIGGRAPH ASIA 2012), Volume 31, Issue 5, December 2012.*(11 pages). http://www.cs.ubc.ca/nest/imager/tr/2012/Quadrangulation/
- [S+12] *CrossShade: Shading Concept Sketches Using Cross-Section Curves.* C. Shao, A. Bousseau, A. Sheffer, **K. Singh**. *ACM Transactions on Graphics* (ACM SIGGRAPH 2012 (11 pages). http://www.crossshade.com/
- [**MSM11**] *Slices: A Shape-proxy Based on Planar Sections.* J. McCrae, **K. Singh**, N. Mitra. ACM Transactions on Graphics, SIGGRAPH Asia, 2011 (11 pages). http://www.dgp.toronto.edu/~mccrae/projects/slices/
- [**T+11**] *GeoBrush: Interactive Mesh Geometry Cloning.* K. Takayama, R. Schmidt, **K. Singh**, T. Igarashi, T. Boubekeur, O. Sorkine. Computer Graphics Forum, 30(2) (Eurographics 2011), pp. 613-622. (10 pages). http://igl.ethz.ch/projects/geobrush/
- [**KHS10**] *Learning 3D Mesh Segmentation and Labeling.* E. Kalogerakis, A. Hertzmann, **K. Singh**. ACM Transactions on Graphics, Vol. 29, No. 3, (SIGGRAPH 2010). (12 pages). http://people.cs.umass.edu/~kalo/papers/LabelMeshes/index.html
- [R+10] *Fiber bundle element method of determining physiological cross-sectional area from three-dimensional computer muscle models created from digitized fiber bundle data.* Ravichandiran, K., Ravichandiran, M., Oliver, M., **Singh, K.**, McKee, N., and Agur, A.M.R. (2010). Computer Methods and Programs in Biomechanics and Biomedical Engineering 13 (6): 741-748. (9 pages).
- [**K+09i**] *Extracting lines of curvature from noisy point clouds.* E. Kalogerakis, P. Simari, D. Nowrouzezahrai, **K. Singh**. Computer-Aided Design, Volume 41, Number 4 (April 2009), pp. 282-292 (10 pages). http://people.cs.umass.edu/~kalo/papers/curvature/index.html
- [**S+09i**] *Analytic drawing of 3D scaffolds.* R. Schmidt, A. Khan, **K. Singh**, G. Kurtenbach. ACM Transactions on Graphics (SIGGRAPH Asia 2009). (10 pages). http://www.dgp.toronto.edu/~rms/pubs/DrawingSGA09.html
- [**S+09ii**] *Multi-objective shape segmentation and labeling.* P. Simari, E. Kalogerakis, D. Nowrouzezahrai, **K. Singh**. Computer Graphics Forum (EG SGP Symposium Of Geometry Processing 2009). (8 pages)
- [**K+09ii**] *Data-driven curvature for real-time line drawing.* E. Kalogerakis, P. Simari, D. Nowrouzezahrai, J. McCrae, A. Hertzmann, **K. Singh**. ACM SIGGRAPH Transactions on Graphics Volume 28, Issue 1, January 2009. (14 pages) http://people.cs.umass.edu/~kalo/papers/ddcurvature/index.html
- [R+09i] *Fiber bundle element method of determining physiological cross-sectional area from three-dimensional computer muscle models created from digitized fiber bundle data.* Ravichandiran, K., Ravichandiran, M., Oliver, M., **Singh, K**., McKee, N., and Agur, A. Computer Methods and Programs in Biomechanics and Biomedical Engineering 13 (6): 741-748, 2009.
- [R+09ii] *Determining physiological cross-sectional area of extensor carpi radialis longus and brevis as a whole and by regions using 3D computer muscle models created from digitized fiber bundle data.* Ravichandiran, K., Ravichandiran, M., Oliver, M., **Singh, K**., McKee, N., and Agur, A. (2009). Computer Methods and Programs in Biomedicine 95, 203-212.
- [MS09] *Sketching piecewise clothoid curves*, J. McCrae , **K. Singh**. Computers and Graphics, v.33 n.4, p.452-461, August, 2009.
- [**SSB08**] *Sketching and Composing Widgets for 3D Manipulation***.** R. Schmidt, **K. Singh**, R. Balakrishnan. Computer Graphics Forum, Proceedings of Eurographics 2008. (10 pages).
- [**SS08**] *Sketch-Based Procedural Surface Modeling and Compositing with Surface Trees.* R. Schmidt, **K. Singh**. Computer Graphics Forum, Proceedings of Eurographics 2008. (10 pages).
- [**K+07**] *Robust statistical estimation of curvature on discretized surfaces***.** E. Kalogerakis, P. Simari, D. Nowrouzezahrai, **K. Singh**. Computer Graphics Forum (EG Symposium on Geometry Processing (SGP '07), pp. 13-22. (10 pages).
- [W+07] *Computational representation of the aponeuroses as NURBS surfaces in 3D musculoskeletal models.* F. Wu, V. Ng-Thow-Hing, **K. Singh**, A. Agur, N. McKee. Computer Methods and Programs in Biomedicine 88(2): 112-122 (2007) (10 pages).

- [**SKS06**] *Folding Meshes: Hierarchical mesh segmentation based on planar symmetry.* P. Simari, E. Kalogerakis, **K. Singh**. Computer Graphics Forum (EG Symposium on Geometry Processing (SGP '06) (8 pages).
- [**CS06**] *Cords: Geometric Curve Primitives for Modeling Contact.* P. Coleman, **K. Singh**. IEEE Computer Graphics and Applications 26:3. May/June, 2006 Pages 72-79.(8 pages)
- [GS 05] *Implementing the IBar camera widget.* C. Grimm, **K. Singh**. Journal of Graphics Tools, 10(3): 51-64, 2005, (14 pages).
- [LNS05] *Predictive Feedback for Interactive Control of Physics-based Characters.* J. Laszlo, M. Neff, **K. Singh**. Computer Graphics Forum (Eurographics 2005), (8 pages).
- [SP01] *Joining Polyhedral Objects using Implicitly Defined Surfaces*, **K. Singh** & R. Parent. The Visual Computer 17 (2001) 7, pp. 415-428. (14 pages)
- [**SF98**] *Wires: A Geometric Deformation Technique*. **K. Singh** & E. Fiume. ACM SIGGRAPH, Computer Graphics, pp. 405-414 (July 1998). (8 pages)
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- [**S+93**] *Optimal path cover problem on block graphs and bipartite permutation graphs*, R. Srikant, R. Sundaram, **K. Singh** & C. Rangan. Theoretical Computer Science, 115:2, pp 351-357, (1993). (8 pages).

Premier refereed conference publications

ACM UIST Symposium on User Interface Software and Tech. (*ar*=20%)
ACM SIGCHI CHI Conference on Human Factors in Computing Systems. (*ar*=25%)
Advanced Visual Interfaces (*ar*=30%)
Graphics Interface (*ar*=30%)
ACM NPAR Non-photorealistic animation and rendering (*ar*=35%)
ACM SIGGRAPH/EG SCA Symposium on Computer Animation (*ar*=35%)
ACM SIGGRAPH Symposium on Interactive 3D graphics and Games (*ar*=35%)
ACM SIGGRAPH/EG SBIM Sketch based interfaces and modeling (*ar*=50%)
IEEE ICRA International conf. of robotics and automation (*ar*=55%)

- [BFS19] *Signifier-Based Immersive and Interactive 3D Modeling*. A Bærentzen, JR Frisvad, K Singh, 25th ACM Symposium on Virtual Reality Software and Technology, *(ACM VRST, 2019)*.
- [A+19] *MagicalHands: Mid-Air Hand Gestures for Animating in VR*. R Arora, RH Kazi, DM Kaufman, W Li, K Singh. (*ACM UIST 2019)* (10 pages).
- [X+19] Predicting Animation Skeletons for 3D Articulated Models via Volumetric Nets. Z Xu, Y Zhou, E Kalogerakis, K Singh. *2019 International Conference on 3D Vision (3DV)*. (10 pages).
- [A+19ii] *Volumetric Michell trusses for parametric design & fabrication* R Arora, A Jacobson, TR Langlois, Y Huang, C Mueller, W Matusik, W. Matusik, A. Shamir, K. Singh, D. Levin. Proceedings of the ACM Symposium on Computational Fabrication, (*ACM SCF 2019*) (13 pages).
- [S+19ii] *Creative Flow+ Dataset.* M. Shugrina, S. Fidler, K. Singh. Computer Vision and Pattern Recognition (IEEE CVPR) 2019.
- [S+19] *Color Builder: a Direct Manipulation Interface for Versatile Color Theme Authoring.* M. Shugrina, W. Zhang, F. Chevalier, S. Fidler, K. Singh. In Proceedings of the CHI Conference on Human Factors in Computing Systems (ACM CHI '19).
- [L+19] *HoloDoc: Enabling Mixed Reality Workspaces that Harness Physical and Digital Content.* Z. Li, M. Annett, K. Hinckley, K. Singh and D. Wigdor. In Proceedings of the CHI Conference on Human Factors in

Computing Systems (ACM CHI '19).

- [A+18] *SymbiosisSketch: Combining 2D & 3D Sketching for Designing Detailed 3D Objects in Situ.* R. Arora, R. Habib, T. Grossman, K. Singh, and G. Fitzmaurice. Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems 2018 (12 pages).
- [WS17] *Bend-a-rule: a fabrication-based workflow for 3D planar contour acquisition*. M. Wei, **K. Singh**. *Proceedings of ACM Syposium on Computational Fabrication SCF 2017,* (8 pages).
- [S+17] *Participatory Shelter Design for Displaced Populace: Reflections from a User Study*. S. Sabie, S. Easterbrook, C. Munteanu, **K. Singh**, O. St-Cyr, F. Hashim. HCI across Borders Symposium 2017. (7 pages)
- [A+17ii] *Experimental Evaluation of Sketching on Surfaces in VR.* R. Arora, R. Habib, F. Anderson, T. Grossman, **K. Singh**, and G. Fitzmaurice. Proceedings of the ACM SIGCHI Comference on Human Factors in Computing Systems 2017 (12 pages).
- [H+16ii] *Multi-Device Storyboards for Cinematic Narratives in VR*. R. Henrikson, B. Araujo, F. Chevalier, **K. Singh**, R. Balakrishnan (ACM UIST 2016) (11 pages).
- [LS16] *Gestural Motion Editing using Mobile Devices.* N. Lockwood, **K. Singh**. (ACM Motion in Games 2016) (6 pages).

- [H+16] *Storeoboard: Sketching Stereoscopic Storyboards.* R. Henderson, B. Araujo, F. Chevalier, **K.Singh**, R. Balakrishnan. *Proceedings of the SIGCHI conference on Human Factors in computing systems* (**CHI '16**). (12 pages).

- [A+16] *Snake Charmer: Physically Enabling Virtual Objects.* B Araujo, R Jota, V Perumal, JX Yao, **K Singh**, D Wigdor. Proceedings of the TEI'16: Tenth International Conference on Tangible Embedded, and Embodied Interaction. (9 pages).
- [XGS 15] *Inverse Toon Shading: Interactive Normal Field Modeling with Isophotes.* Q. Xu, Y. Gingold, **K. Singh**. SBIM, Expressive 2015 **Best Paper Award**. https://cs.gmu.edu/~ygingold/inversetoon/
- [X+14ii] *Zero-latency tapping: using hover information to predict touch locations and eliminate touchdown latency*. H. Xia, R. Jota, B. McCanny, Z. Yu, C. Forlines, K. Singh, and D. Wigdor. *Proceedings of the 2014 symposium on User Interface Software and Technology* (ACM UIST). (9 pages).
- [MUS14] *FlatFitFab: Interactive Modeling with Planar Sections*. J. McCrae, N. Umetani, **K. Singh** *Proceedings of the 2014 symposium on User Interface Software and Technology* (ACM UIST). (10 pages). http://flatfitfab.com/
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- [F+14] *LACES: Live Authoring Through Compositing and Editing of Video Stream.* D. Freeman, S. Santosa, F. Chevalier, R. Balakrishnan and **K. Singh** *Proceedings of the SIGCHI conference on Human Factors in computing systems* (**CHI '14**). April 2014.
- [S+13] *Direct Space-Time Trajectory Control for Visual Media Editing.* S. Santosa, F. Chevalier, R. Balakrishnan and **K. Singh**. in *Proceedings of the SIGCHI conference on Human Factors in computing systems* (**CHI '13**). 10 pages. 2013. **Best Paper Honorable Mention.**
- [S+13ii] *Sculpting multi-dimensional nested structures*. L. Stanculescu, R. Chaine, M.P. Cani, **K. Singh**. 10 pages (to appear) *Shape Modeling International 2013.*

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- [R+12] *Inverse Kinodynamics: Editing and Constraining Kinematic Approximations of Dynamic Motion.* C. Rahgoshay, A. Rabbani, **K. Singh**, P. Kry. *Graphics Interface 2012*, (**Best Paper Award).**
- [DS12] *Concepture: A Framework for Recognizing Gestures with Repetitive Patterns.* N. Donmez, **K. Singh**. Eurographics *Sketch Based Interfaces and Modeling, SBIM 2012.* (**Best Paper Award).**
- [ZWS12] *Snout: One Handed use of Capacitive Touch Devices*, A. Zarek, D. Wigdor, **K. Singh** 2012 – to Appear. Snout: One Handed use of Capacitive Touch Devices. International Working Conference on Advanced Visual Interfaces. *AVI 2012.*
- [**TSB11**] *Elasticurves: Exploiting Stroke Dynamics and Inertia for the Real-time Neatening of Sketched 2D Curves.* Y. Thiel**, K. Singh**, R. Balakrishnan**.** ACM UIST 2011. (10 pages).
- [LS11] *Biomechanically-Inspired Motion Path Editing.* N. Lockwood, **K. Singh**. ACM SIGGRAPH SCA '11. (10 pages).
- [MS11] *Neatening sketched strokes using piecewise French Curves.* J. McCrae, **K. Singh**. ACM/EG SBIM Sketch-Based Interfaces and Modeling, 2011. (8 pages).
- [M+10] *Exploring the Design Space of Multiscale 3D Orientation.* J. McCrae, M. Glueck, T. Grossman, A. Khan, **K. Singh**. Advanced Visual Interfaces 2010. (8 pages).
- [MS09] *Sketching path layouts.* J. McCrae, **K. Singh**. Graphics Interface 2009. (8 pages).
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- [GSS 09] *CubeCam: A Screen-Space Camera Manipulation Tool.* C. Grimm, N. Sudarsanam, and K. Singh, ACM NPAR/Computational Aesthetics 2009**.** (8 pages).
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- [**MS08**] *Sketching piecewise clothoid splines.* J. McCrae, **K. Singh**. Eurographics, Sketch based interfaces and modeling SBIM 2008 (**Best Paper Award**). (8 pages)
- [SGS08] *Non-linear perspective widgets for creating multiple-view images.* N. Sudarsanam, C. Grimm, **K. Singh**. (ACM NPAR 2008). (8 pages).
- [**D+08**] *Video browsing by direct manipulation.* P. Dragicevic, G. Ramos, J. Bibliowicz, D. Nowrouzezahrai, R. Balakrishnan, **K. Singh**, ACM SIGCHI CHI 2008 (10 pages).
- [**AS07**] *Kinodynamic skinning using volume-preserving deformations.* A. Angelidis, **K. Singh**. (ACM SIGGRAPH SCA Symposium of computer animation 2007, (12 pages). **Best Paper Award**. (also presented at a SIGGRAPH session).
- [S+07] *Sketching, scaffolding and inking:a visual history for interactive 3d modeling.* R. Schmidt, T. Isenberg, P. Jepp, **K. Singh**, B. Wyvill. (ACM NPAR 2007). (10 pages).
- [A+06] *A Controllable, Fast and Stable Basis for Vortex Based Smoke Simulation.* A. Angelidis, D. Nowrezarahai, F. Neyret, **K. Singh**. ACM SIGGRAPH/Eurographics *SCA* 2006. (8 pages).
- [**PS06**] *Organic labyrinths and Mazes*. H. Pedersen, **K. Singh**. *ACM* Nonphotorealistic Rendering and Animation *NPAR 2006.* (8 pages).
- [**PCS05**] *Anatomic rigging of characters from the outside-in.* M. Pratscher, P. Coleman, **K. Singh**. (ACM SIGGRAPH/ EG SCA 2005). (8 pages).
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- [SS05] *Extraction and remeshing of ellipsoidal representations from mesh data.* P. Simari, **K. Singh**. (Graphics Interface 2005) (8 pages).
- [**YLS04**] *Layered Dynamic Control for Interactive Character Swimming*. P. Yang, J. Laszlo, **K. Singh**. ACM SIGGRAPH /EG SCA 2004 pp 39-47. (8 pages).
- [**SGS04**] K. Singh, C. Grimm, N. Sudarsanam. *The IBar- A perspective based screen space widget* (ACM UIST (User Interface Software Technology), 2004, pp 95-98. (4 pages).
- [**CS04**] *RYAN: Render Your Animation Non-Linearly projected.* P. Coleman, **K. Singh**. ACM NPAR 2004 pp 129-138. (8 pages).
- [**T+04**] *A Suggestive Interface for Image Guided 3D Sketching.* S. Tsang, R. Balakrishnan, **K. Singh**, A. Ranjan. *(*ACM CHI Conference on Human Factors in Computing Systems. *ACM CHI Letters, 6(1), 2004)* p. 591-598. (8 pages).
- [**ES03**] *Handrix: Animating the human hand*, G. El Koura, **K. Singh**. ACM SIGGRAPH / Eurographics Symposium of Computer Animation (SCA 2003), pp 110-119. (8 pages).
- [**GBS03**] *An interface for creating and manipulating curves using a high degree-of-freedom input device.* T. Grossman, R. Balakrishnan, **K. Singh**. *(*ACM CHI Conference on Human Factors in Computing Systems. *ACM CHI Letters, 6(1), 2003),* pp 185-192. (8 pages).
- [**S02**] *A Fresh Perspective*, **K. Singh**. Graphics Interface, (May 2002), pp 17-24.
- [**SK00**] *Skinning Characters using Surface Oriented Free-Form Deformations*, **K. Singh** & E. Kokkevis. Graphics Interface, pp. 35-42, 2000). (8 pages).
- [**S99**] *Interactive Curve Design using Digital French Curves.* **K. Singh**. 1999 ACM Symposium on Interactive 3D Graphics, pp. 23-30 (April 1999). (8 pages).
- [B+99] *Exploring Interactive Curve and Surface Manipulation Using a Bend and Twist Sensitive Input Strip*, R. Balakrishnan, G. Fitzmaurice, G. Kurtenbach & **K. Singh**. , 1999 ACM Symposium on Interactive 3D Graphics, pp. 111-118 (April 1999). (8 pages).
- [SF93] *Map making by cooperating mobile robots*, **K. Singh** & K. Fujimura. IEEE International Conference on Robotics and Automation, Vol.2, pp 254-259, (1993).

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- [SS19] *MC^2: Mining Creativity through Consensus.* K. Singh, R. Sundaram, *DARPA Applications and Barriers to Consensus Protocols (ABC) Workshop*, February, 2019 (4 pages).
- [WSK15] *Foreshortening causes errors: Convergence fails to support constancy*. M. Wnuzcko, **K. Singh**, J. Kennedy, *International Conference on Perceptual Organization June 23 – 26, 2015*.
- [BS14] *Advising Students in Techincal Projects: Recognizing Problem Scenarios,* A. Baerentzen, **K. Singh**. *Proceedings of the 10th International CDIO Conference, Universitat Politècnica de Catalunya, Barcelona, Spain, June 16-19, 2014.*
- [K+11] Dots, line, contour & surface edge trigger centre-surround pickup mechanism. J. Kennedy, M. Wnuczko, M. Santos, P. Coppin & **K. Singh**. International Conference of perception and action ICPA 2011.
- [B+11] High-Precision Surface Reconstruction of Human Bones from Point-Sampled Data. J. Bibliowicz, A. Khan, A. Agur, **K. Singh**. International Summit on Human Simulation (ISHS)2011.
- [N+07] D. Nowrouzezahrai, P. Simari, E. Kalogerakis, **K. Singh**, E. Fiume. *Compact and Efficient Generation of Radiance Transfer for Dynamically Articulated Characters*, Proceedings of the ACM Graphite 2007**.** (8 pages).
- [**SBS06**] J. Sheng, R. Balakrishnan, **K. Singh**. *SCULPROX: An Interface for Virtual 3D Sculpting via Physical Proxy*. ACM Graphite 2006. (8 pages)
- [B+05] L. Barrett, P. Coleman, C. Grimm, **K. Singh**. *Sketching 3D scene projections*. (8 pages)(ACM Graphite 2005).

- [SB04] **K. Singh**, R. Balakrishnan. *Visualizing 3D Scenes using Non-Linear Projections and Data Mining of Previous Camera Movements* (AFRIGRAPH International conference on Computer graphics, virtual reality, visualisation and interaction in Africa 2004) pp 41-48.
- [**SPK04**] **K. Singh**, H. Pedersen, V. Krishnamurthy. *Feature based retargeting of parameterised geometry (IEEE Geometric Modeling & Processing 2004)* pp 163-172.
- [**SOP95**] **K. Singh**, J. Ohya & R. Parent. *Human figure synthesis and animation for virtual space teleconferencing*, IEEE Virtual Reality Annual International Symposium, pp. 118-126, 1995.
- [M+95] L. Moubaraki, **K. Singh**, J. Ohya, F. Kishino, *Wrinkle Animation of Cloth and Faces in Virtual Space Teleconferencing*, Distributed Multimedia Systems and Applications, Stanford California, USA, (1995) (8 pages).
- [SP95] **K. Singh** & R. Parent. *Implicit function based deformations of polyhedral objects*, Eurographics workshop on Implicit Surfaces, Grenoble, pp. 113-128, 1995.

Refereed Abstracts/Sketches/Posters/Talks

SIGGRAPH sketches and talks (*ar*=25%)

- [E+20] *JALI - driven expressive facial animation and multilingual speech in Cyberpunk 2077*. P. Edwards, E. Fiume, C. Landreth, M. Malinowski, M. Popławski, K.Singh. (*ACM SIGGRAPH 2020 Talks)* (2 pages).
- [W+12] *Avatar pointing: mirror-imaged arm used in visual and blindfolded pointing.* M. Wnuczko, J. Kennedy, M. Niemeier, K. Singh. *Southern Ontario Neuroscience Association 2012*.
- [SSi10] meshmixer: an interface for rapid mesh composition (2010). R. Schmidt, **K. Singh**. ACM SIGGRAPH 2010 - Talks Program
- N. Lockwood, P. Coleman, P. Simari, **K. Singh**. *DirectCam: A Gestural System for Animatic Creation* (ACM SIGGRAPH Sketches/posters 2007).
- P. Coleman, **K. Singh**. *Cords: Interactive Modeling of 3D Curves with Physics-Like Properti*es (ACM SIGGRAPH Sketches 2004).
- Leon Barett, P. Coleman, C. Grimm, **K. Singh**. *Sketching 3D scene projections* (ACM SIGGRAPH Posters 2004).
- C. Lessig, D. Nourezazarahai**, K. Singh**. GPU-accelerated ray casting of node-based implicits (SIGGRAPH Poster 2006).
- Ravichandiran, M., Ravichandiran, **K., Singh**, K., Liebgott, B., McKee, N., Ng-Thow Hing, V., Agur, A. (2007). *"Three-dimensional muscle model of mandibular elevation and depression based on digitized data from cadaveric specimens".* American Society of Biomechanics Meeting, Palo Alto, California, USA, August 2007. Abstract/Poster.
- Ravichandiran, **K., Singh**, K., McKee, N. and Agur, A. (2007). *"Physiological cross sectional area of extensor carpi radialis longus and brevis: an in situ computer modelling study".* Clinical Anatomy 20, . American Association of Clinical Anatomists Meeting, Henderson, NV, USA, June 16-20, 2007. Abstract/Poster.
- NH McKee, W Tsang, AM Agur, **K Singh**: *Steps towards anatomically accurate modelling of human hand movement.* Candaian Society of Plastic Surgeons, Nanaimo, BC. Canadian Journal of Plastic Surgery 2005: 13: pp 90-91.
- W. Tsang, N. McKee, A. Agur, **K. Singh**: *Exploring the utility of the concept of rheostat activators of the forearm and hand muscles for modeling hand movements.* Plastic Surgery Research Council, 50th annual meeting, Toronto, Ontario, May 20, 2005. (NSERC)
- G. Elkoura, K. Singh, N. McKee, A. Agur. "*Reverse Engineering and data mining hand movements playing a guitar*" (American Assoc. for hand surgery, 2004, Orthopedics vol. 26, abstract p1279).

Books and Chapters

- The Fourier Transform, K. Singh & R. Sundaram. ISBN-10: 1092304169.
- Voices and Images: 15 years of the Visual Arts Gallery. Penguin Books 2015 *A reflection on perspective in art, science and digital media*, **K. Singh,** 111-121.
- N. McKee, A. Agur, W. Tsang, **K. Singh**: *Possible uses of computer modeling of the functioning human hand.* In: Plastic Surgery Clinics of North America Volume on "Hand challenges". Elsevier Inc, 2005. PA.

Other Publications

The immersive internet (https://medium.com/@karansher/the-immersive-internet-2010ecf918ad).

AR⇔VR⇔XR *(https://medium.com/@karansher/vr-ar-xr-931031feafc8)*

Contributions to idea&s magazine University of Toronto.
http://www.ideasmag.artsci.utoronto.ca/index.html

- Conflict Crossword idea&s Spring 2008.
- Digital Organic Labyrinths and Mazes idea&s Autumn 2007.
- Technological breakthroughs in scale idea&s Autumn 2005.

A reflection on perspective in art, science and digital media, **K. Singh**. Swiss Arts Council and India Habitat Center Art Journal, Volume 9, 2009 pp 16-21 (5 pages).

Invited Lectures and Colloquia

Keynotes, Colloquia and distinguished lectures = 33, *Other invited lectures* = 50.

Keynotes and Distinguished Lectures

Centennial college keynote, LSI Rochester keynote, DCSIL event, SIGGRAPH SAVR session, Oaxaca sketch and sculpt simulation, VRTO colloquium. TEDx U of T.

- *Keynote:* Creative Arts, July 3 19, Yogjakarta, Indonesia, …*On Creative Visual Design.*
- *Keynote*: ACM MIG 2019 Motion Interaction and Games, 29 Oct. 2019. *Expressive Facial Animation.*
- *Colloquium:* University of Northumbria, Newcastle, 30 Oct. 2019, …*On Creative Visual Communication.*
- *Keynote:* International XR workshop, 20 Feb. 2020, Victoria University NZ. *Creativity in XR.*
- *Colloquium:* University of Victoria, Wellington, NZ, Apr. 10, 2019, …*On Creative Visual Communication.*
- *Keynote*: SIBGRAPI Brazilian Symposium on Computer Graphics and Image Processing Oct 31, 2018, …*On Creative Visual Communication.*
- *Keynote*: VRTO Virtual and Augmented Reality Conference June, 2018, *Transcending Reality*.
- *Featured Session Speaker and Moderator*: SIGGRAPH Asia 2017, *https://sa2017.siggraph.org/attendees/featured-sessions?view=event&eid=209*
  Towards Stronger Human Connections in AR/VR.
- *Featured Session on AR/VR Speaker*: SIGGRAPH 2017 & SIGGRAPH Asia 2017, *The Immersive Internet.*
- *Keynote*: SPLASH 2017, Software for Augmented and Virtual Reality Oct. 24, 2017.

- *Keynote*: VRTO Virtual and Augmented Reality Conference June 16, 2017, *The Immserive Internet*.
- *Keynote*: Centennial College Rises June 6, 2017, *Creativity, Perception and Interaction.*
- *Distinguished Lecture*: Animafest Zagreb, June 13, 2015. http://www.animafest.hr/en/2015/side_event/read/lecture_chris_landreth_karan_singh_making_faces : *Making Faces*.
- *Coloquium:* Meet the Media Guru, Future ways of living, Milan, June 11, 2015. http://www.meetthemediaguru.org/karan-singh/ : *The future of internet interaction.*
- *Coloquium:* College de France June 8, 2015. http://www.college-de-france.fr/site/marie-paule-cani/symposium-2015-06-08-11h45.htm : *Perception, Drawing and Interactive Modeling.*
- *Keynote*: SmartGraphics, August 28, 2014, Taipei. http://www.smartgraphics.org/sg14/ : Perception, Drawing and Interactive Modeling.
- PanIIT Conference, Toronto, June 2014: Innovation in Technology - A peep into the future.
- SOCS Colloquium McGill University Oct 2012: Art and Perception driven Interactive Modeling.
- Keynote: *Sketching: perception, interaction and modeling*. Eurographics Symposium of Geometry Processing SGP July 2010, Lyon.
- *Sketch and sculpt: perception, interaction and modeling*. Computer Science keynote Lecture *APICS Mathematics, Statistics and Computer Science Conference,* St. Mary's University, Oct. 2010.
- Keynote: *Sketching: perception, interaction and modeling*: Colloquium, March 18, 2010, School of Technology & Design, NYC College of Technology.
- Keynote: *Straight ahead vs. pose to pose animation* China International cartoon and animation festival (Hangzhou, May 2007).
- *Labyrinths & Mazes*. Ross Mathmatics Program, Ohio State University, 50th anniversary distinguished lecture (July 2007).
- *Anatomy and animation*, Tufts University, Colloquium, April 2006.
- *Anatomy: Art or Science*. Ontario Science Center, public lecture series in connection with Bodyworlds exhibit Dec. 2005.
- *Ryan: artist driven interactive graphics* (Colloquia, Distinguished lecture series).
    - Beijing Film Academy, April 2004
    - Gobelins Animation School Paris June 2004
    - McGill University Sept. 2004
    - Washington Univ. at St. Louis Nov. 2004
    - UBC, Electronic Arts Vancouver Dec. 2004
    - MITACS annual meeting May 2005
    - Northeastern University Jan. 2006

Other lectures and talks

- Weta Inc. Apr. 11, 2019, *Expressive Facial Animation.*
- NSERC Create DAV workshop Nov. 19, 2018, …*On Creative Visual Design.*
- BIRS workshop on Geometry & Computation for Interactive Simulation, *Sketching and Sculpting Simulations*, Sept. 2017.
- SFU, *…on art, animation and VR*, Nov. 2017.
- Light and Sound Interactive LSI Rochester, *The immersive internet*. Sept. 13 2017.
- Dreamworks Animation, *…on art, animation and VR*. Aug. 2016,
- Sony Entertainment, *…on art, animation and VR*. Oct. 2016.
- UT Dallas. *Perception, Drawing and Interactive Modeling,* Jan. 15. 2016.
- INRIA Grenoble. *Cinematography in mobile, stereo, AR/VR and evolving formats.* Oct. 26, 2015.
- Expressive, Istanbul June 20, 2015, Inverse Toon Shading (paper presentation).
- Pixar Animation Studio, March 2015: Perception, Drawing and Interactive Modeling.

- IIT Delhi, Feb 2015: Perception, Drawing and Interactive Modeling.
- Tata Consultancy Services, Bangalore, Jan 2015: Virtual and augmented reality: reincarnated.
- Intl. Conf. on Transformations in Engg Education ICTEE, Bangalore, Jan 2015: Entrepreneurship in education: a case study in Canada (lecture).
- Tata Consultancy Services, Delhi, Dec 2014: Computational aspects of Fabrication.
- INRIA Nancy, Dec 2014: Perception, Drawing and Interactive Modeling.
- INRIA Rhone-Alpes, Nov 2014, Grenoble: True2Form-3D modeling from concept sketches.
- SmartWeek, Oct 2014, Toronto: Flat Fabrication (lecture).
- Dagstuhl, Computational Aspects of Fabrication, Sept 2014: Flat Fabrication.
- Tata Consultancy Services COIN Launch, Toronto, June 2014: Strengthening Canada's Innovation Culture (panel).
- INRIA Lille Novemeber 2013: Art and Perception driven Interactive Modeling.
- Tech. Univ. of Lisbon July 2013: Art and Perception driven Interactive Modeling.
- INRIA Grenoble July 2013: Pose-centric Animation.
- Disney Research, Burbank, CA, August 2013: Pose-centric Animation.
- INRIA Grenoble May 2012: Art and Perception driven Interactive Modeling.
- Nanyang University of Singapore May 2013: Art and Perception driven Interactive Modeling.
- SoCS Colloquium National University of Singapore Jan 2013: Sketch interaction.
- INRIA Sophiantipolis June 2012: Stroke and multi-touch interfaces.
- Interactive Sketch & Sculpt systems: August 2010, Dreamworks, Adobe.
- Interactive 3D modeling. Disney research, Oct. 2010.
- Sketching and sculpt: perception, interaction and modeling . GRAND Lecture, UBC, UVictoria Oct. 2010
- Sketch and sculpt: 2 day tutorial, RWTH Aachen, Dec. 2010
- *Sketching: perception, interaction and modeling.* (TCS Delhi Apr 09, INRIA Grenoble Sept 09).
- *Sketch-based modeling interfaces.* (Microsoft Research, Beijing, May 2008).
- *Anatomy and animation* (IIT Madras, Jan. 2009, IIT Delhi, Nov. 2008).
- *Artist driven interactive graphics*.
    - UT Austin March 2004
    - Microsoft Research Asia April 2004
    - INRIA Grenoble May 2004
    - Rutgers Dec. 2004
    - Microsoft Research Seattle Jan. 2005
    - University of Calgary Feb. 2005
- *3D computational models of the human hand* Great Lakes Hand Society Oct. 2005.
- *Labyrinths and Mazes (INRIA Grenoble)* May 2005.
- *Interactive control of 3d curves (*Univ. of Connecticut) Oct. 2005
- *Mathematical surface representations for conceptual design,* MITACS (Mathematics of Information Technology and Complex Systems) IT theme meeting, Banff 2003.
- *Cameras and psychorealism.* Electronic Arts Vancouver 2002, CMU (Carnegie Melon University) 2003, IIT (Indian Institute of Technology) Bombay 2003.
- *Conceptual Automotive Design*, Porsche Design Center, Weissach, Germany, 2000.
- *A twisted view of expressive character animation*, Univ. of Otago, New Zealand, 1999.
- *Layered Facial Animation*, Texas Instruments Research, Dallas TX, 1998.

Courses Taught

Undergraduate courses = 26 (at U of T)**,** =34 (total)

Graduate courses (cross-listed courses counted as UG) = 13 (at U of T).

University of Toronto

Undergraduate

- CSC 199 The Natural world and computer graphics (Fall 2013)
- CSC 148 Introduction to Computer Science. (Fall 2006, Winter 2011)
- CSC 373 Algorithm Design, Analysis and Complexity (Fall 2019).
- CSC 418/2504 Computer Graphics. (Winter 2002, Fall 2002-2005, Winter 2007, Fall 2007, Winter 2011, Winter 2012, Fall 2015 *2, Fall 2016, Fall 2017, Winter 2018, Fall 2018).
- CSC 491 (Fall 2004, Fall 2005, Fall 2007, Fall 2011) Capstone Design Course: Interactive Graphics.
- CSC 490 (Winter 2010) Capstone Design Course: Optical Illusions.
- CSC 490 (Winter 2014) Capstone Design Course: Creative Interfaces for mobile devices.
- CSC 490 (Fall 2018) Capstone Design Course: Augmented and Virtual Reality.

Graduate

- CSC 2529 (Winter 2003-2005, Winter 2007) Character Animation.
- CSC 2505 (Fall 2005) Geometric Modeling.
- CSC 2521 (Winter 2010, Fall 2011) Sketch interaction, perception and modeling.
- CSC 2521 (Winter 2011) Interactive 3D modeling for design and fabrication.
- CSC 2521 (Fall 2013) Interactive Geometry.
- CSC 2521 (Winter 2011) Interactive Modeling.
- CSC 2524 (Fall 2017, Fall 2018, Fall 2019) Topics in Interactive Computing AR/VR.

Ohio State University

- CIS 221 Introduction to programming and algorithms in Modula-2. (3 quarters each in 1991,92, 95).

University of Otago, New Zealand

- COSC 342 Computer Graphics.

University of Pennsylvania

- CS 461/561 Character Animation. (Winter 2007)

Students

Career Student Numbers		
	In Progress	Completed
Masters	1	30
Phd	4	7
Postdoctoral Fellows	0	7

Graduate Students Supervision (current)

Student	Degree	Thesis title	Start date	End date	Email
Rahul Arora	PhD	VR modeling and perception	Fall 2015		arorar@cs.toronto.edu

Rinat Abdrashitov	PhD	Interactive procedural modeling	Winter 2015	Winter 2019	rindopuz23@gmail.com
Joonho Kim	PhD	Facial Animation	Fall 2019	Fall 2022	joonho@dgp.toronto.edu
Maria Shugrina	PhD	Machine learning for artistic rendering	Winter 2017		shumash@gmail.com

Students Graduated

PDF = 7 (2 co-supervised) **PhD** = 7 (1 co-supervised) **M**Sc = 30 (7 co-supervised).

Student	Degree	Thesis Title	Start date	Graduation date	Employment	Email
Nancy Iskander	MSc	3D models from sketches of human faces using CNNs, Procedural and Contour Mapping	Fall 2015	Winter 2018	Ubisoft	
Kevin Gibson	MSc	Analysing Functional objects	Fall 2014	Winter 2016		rkevingibson@gmail.com
Noah Lockwood	PhD	Interactive locomotion control	Fall 2006	Fall 2015	Industrial Light and Magic	lockwood@dgp.toronto.edu
Bruno de Araujo	PDF	AR/VR techniques	Winter 2014	Fall 2015	Tactual Labs	bdearaujo@gmail.com
Yupeng Zhang	MSc	Mimicry of form and function	Fall 2014	Winter 2016		yupeng@dgp.toronto.edu
Stacey Oue	MScP	3D sketch modeling	Winter 2015	Winter 2016		stacey.oue@gmail.com
Marta Wnuzcko	PDF	Perception and Persepctive	Winter 2014	Winter 2015		m.wnuczko@mail.utoronto.ca
Rinat Abdrashitov	MSc	Polar-Annular Mesh based sculpting	Fall 2012	Fall 2014	PhD	rindopuz23@gmail.com
Chris de Paoli	MSc	SecondSkin: Sketch-based 3D modeling of layered structures	Fall 2012	Fall 2014	PhD	chrisdepaoli@gmail.com
Qiuying Xu	MSc	Iso-luminant painterly rendering	Fall 2012	Fall 2014		qiuying@dgp.toronto.edu
Mario Barrientos	MScP	3D model scanning	Winter 2014	Winter 2015		
Seacy Zhen	MSc	Computer modeling of snow	Fall 2012	Winter 2014		seacy@dgp.toronto.edu
James	PhD	Planar section	Fall	Winter	Janus VR	mccrae@dgp.toronto.edu

McCrae		representations of 3D shape	2008	2014		
Fanny Chevalier	PDF	Interacting with Video	Fall 2011	Fall 2013	INRIA Lille	fanny@dgp.toronto.edu
Ashish Kaila	MSc	MasterStroke A collaborative flipbook animation system	Fall 2011	Fall 2013	Amazon	ashishkaila@hotmail.com
Bardia Sadri	PDF	Flow Complex based shape reconstruction.	Fall 2010	Fall 2012	Side FX	sadri@dgp.toronto.edu
Cloud Shao	MSc	CrossShade: Shading Concept Sketches Using X-Section Curves.	Fall 2011	Winter 2013	Electronic Arts	cshao@dgp.toronto.edu
Stephanie Santosa	MSc	Direct Space-Time Trajectory Control for Visual Media Editing	Fall 2011	Winter 2013		ssantosa@dgp.toronto.edu
Matthew Williams	MSc	Multi-Touch Approach to Text Input on Mobile Devices	Fall 2011	Winter 2013	Google	jay@dgp.toronto.edu
Patrick Coleman	PhD	Expressive Motion Editing Using Motion Extrema	Fall 2006	Fall 2011	Pixar	patrick@dgp.toronto.edu
Yannick Thiel	MSc	Elasticurves: exploiting stroke dyanmics and inertia for the real-time neatening of sketches.	Fall 2009	Winter 2011	Sava Transmedia	ythiel@dgp.toronto.edu
Vangelis Kalogerakis	PhD	Machine Learning algorithms for geometry processing by example.	Fall 2006	Fall 2010	PDF Stanford University	kalo@dgp.toronto.edu
Ryan Schmidt	PhD	Part-based representation and editing of 3D surface models.	Fall 2006	Fall 2010	NSERC PDF UC Berkeley, Autodesk.	rms@dgp.toronto.edu
Alexandrina Orzan	PDF	Production Drawing	Fall 2009	Fall 2010	INRIA Sophiantipolis	orzan@dgp.toronto.edu
Igor Mordatch	MSc	Robust Physics-Based Locomotion Using Low-Dimensional Planning	Fall 2009	Winter 2010	PhD student U of Washington	mordatch@dgp.toronto.edu
Seok-	PDF	ILoveSketch	Fall	Fall	Asst. Prof.	shbae@dgp.toronto.edu

Hyung Bae			2007	2009	KAIST	
Patricio Simari	PhD	Algorithms in 3D Shape Segmentation	Fall 2004	Fall 2009	PDF, Johns Hopkins, Autodesk Inc.	psimari@dgp.toronto.edu
Brodie Champion	MSc	Watercolour rendering	Fall 2007	Fall 2009		brodie@dgp.toronto.edu
James McCrae	MSc	Sketch based Path Layout Design	Fall 2007	Winter 2008	Autodesk intern	mccrae@dgp.toronto.edu
Alexis Angelidis	PDF	Vortex based simulation methods	Fall 2005	Fall 2006	Pixar	silex@dgp.toronto.edu
Evangelos Kalogerakis	MSc	A robust statistical approach for curvature estimation in discretized surfaces.	Fall 2004	Winter 2006	PDF Stanford University	kalo@dgp.toronto.edu
Steve Tsang	MSc	A sketch based 2D anim. system using dyn. motion hier.	Fall 2004	Fall 2006	ATI	stsang@dgp.toronto.edu
Noah Lockwood	MSc	High DOF input and large displays for accessible animation.	Fall 2004	Fall 2006	current student	lockwood@dgp.toronto.edu
Naiqi Weng	MSc	Interactive character control on a volumetric display	Fall 2003	Winter 2005	Autodesk	nweng@dgp.toronto.edu
Winnnie Tsang	MSc.	An Anatomically Accurate Inverse Dynamics Solution For Unconstrained Hand Motion.	Fall 2003	Winter 2005	Silicon Knights	wtsang@dgp.toronto.edu
Jia Sheng	MSc	An Interface for Virtual 3D Sculpting via Physical Proxy.	Fall 2003	Fall 2005	Microsoft Research Asia	jsheng@dgp.toronto.edu
Patrick Coleman	MSc	Interactive control of nonlinear projection for complex animated scenes.	Fall 2003	Fall 2004	Pixar	patrick@dgp.toronto.edu
George El Koura	MSc	Handrix: Animating the human hand.	Winter 2002	Winter 2004	SideFx, Pixar	gelkoura@dgp.toronto.edu
Xia Liu	MSc	Editing digital models using physical materials.	Winter 2002	Winter 2004	AUG Signals	xia@dgp.toronto.edu

Sageev Oore	PDF	Sub-muscular data collection and processing	Winter 2002	Summer 2002	Asst. Prof. St. Marys, Halifax.	sageev@cs.stmarys.ca
Paul Yang	MSc	Layered Dynamic Control for Interactive Character Swimming	Fall 2003	Fall 2005	Electronic Arts Inc.	paulyang@dgp.toronto.edu
Paul Thuriot	MFA	Character setup for production pipelines.	2000	2001, Academy of Art Univ, San Francisco	Tippett Studios	pthuriot@tippett.com

Graduate Student Thesis Committees

Masters thesis second reader = 17

Student	Supervisor	Graduated
David Hill	Alejo Hausner	2002
Howard Zhang	Demetri Terzopoulos	2002
Tovi Grossman	Ravin Balakrishnan	2004
Wael Abouelsadaat	Ravin Balakrishnan	2004
Kevin Forbes	Eugene Fiume	2005
Alex Kolliopolis	Aaron Hertzmann	2005
Anand Agarwala	Ravin Balakrishnan	2006
Tristan Campbell	Ravin Balakrishnan	2006
Derek Nourezazarahai	Eugene Fiume	2006
Hanieh Bastani	Eugene Fiume	2007
Ian Vollick	Aaron Hertzmann	2007
Azam Khan	Ravin Balakrishnan	2008
Peter O'Donovan	Aaron Hertzmann	2009
Simon Breslav	Aaron Hertzmann	2010
Jian Zhao	Ravin Balakrishnan	2011
Edy Garfinkiel	Aaron Hertzmann	2013
Janis Libeks	Aaron Hertzmann	2013
Rorik Henrikson	Ravin Balakrishnan	2014
Anurudha Hetiarachi	Daniel Wigdor	2015

PhD committees = 27

Student	Supervisor	Started	Graduated
Richard Zhang	Eugene Fiume	Jan 2002	June 2002
Wael Abouelsadaat	Ravin Balakrishnan	August 2003	Did not finish

Anastasia Bezerianos	Ravin Balakrishnan	September 2003	August 2008
Tovi Grossman	Ravin Balakrishnan	September 2003	December 2007
Maciej Kalsiak	Michiel van de Panne	Jan 2002	September 2008
Michael McGuffin	Ravin Balakrishnan	September 2003	May 2007
Shahzad Malik	Alan Jepson	September 2004	July 2008
Gonzalo Ramos	Ravin Balakrishnan	September 2004	July 2007
Alessandro Rosatelli	Anne Agur (Dept. of Anatomy).	September 2005	September 2009
Xiang Cao	Ravin Balakrishnan	May 2004	October 2008
Abhishek Ranjan	Ravin Balakrishnan	September 2004	December 2008
Joe Laszlo	Eugene Fiume	Jan 2002	Did not finish
Martin de Lasa	Aaron Hertzmann	September 2005	September 2010
Jack Wang	Aaron Hertzmann	September 2005	2010
Qinxin Yu	Demetri Terzopoulos	September 2004	July 2007
Alexander Koliopolis	Aaron Hertzmann	September 2005	Did not finish
Daniel Vogel	Ravin Balakrishnan	September 2005	December 2010
Derek Nourezarzaaharai	Eugene Fiume	September 2005	December 2010
Xiaojun Bi	Ravin Balakrishnan	September 2005	August 2011
Jian Zhao	Ravin Balakrishnan	September 2010	September 2015
Peter O'Donovan	Aaron Hertzmann	September 2010	July 2015
Tyler deWitt	Eugene Fiume	July 2011	Did not finish
Hanieh Bastani	Eugene Fiume	September 2007	Did not finish
Dustin Freeman	Ravin Balakrishnan	September 2011	July 2015
Pif Edwards	Cosup with Eugene Fiume	July 2012	current
Rorik Henrikson	Ravin Balakrishnan	September 2010	March 2017
Haijun Xia	Daniel Wigdor	September 2016	current
Aakar Gupta	Ravin Balakrishnan	September 2013	July 2017

External examiner

Student	Graduated	University
Debanga Neog	April 2018	UBC
Kasper Steenstrup	August 2016	TU Copenhagen
Quentin Galvane	November 2015	INRIA Grenoble
Morten Nobel-Jørgensen	August 2015	TU Copenhagen, Denmark.
Honghua Li	March 2015	Simon Fraser Univ.
Mark Luffel	Not grad yet	Georgia Tech.
Bruno de Araujo	August 2013	Tech. U of Lisbon
Cedric Zanni	September 2014	INRIA Grenoble
Lucian Stanculescu	July 2014	U of Lyon
Gunay Orbay	May 2013	CMU
Paul Kry	May 2004	UBC
Pauline Jepp	March 2006	U of Calgary
Rong Liu	March 2010	Simon Fraser Univ.
Ran Gal	September 2011	Tel-Aviv Univ.