

# A conversation with CHCCS 2019 achievement award winner Karan Singh

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## ABSTRACT

A 2019 CHCCS Achievement Award from the Canadian Human-Computer Communications Society is presented to Dr. Karan Singh. This award recognizes the significant and varied contributions he has made in interactive computer graphics, spanning geometric modeling, art and visual perception, facial and character animation, and sketch-based techniques and interfaces.

CHCCS invites a publication by the award winner or an award-winner interview to be included in the proceedings, and this year we continue with the latter, which allows for a varied discussion regarding research, insights, and the contributions of the award winner. What follows is an edited transcript of a conversation between Karan Singh and Michiel van de Panne that took place on March 26, 2019, via Skype.

## THE INTERVIEW

**CHCCS:** Congratulations with the CHCCS Achievement Award!

**Karan:** Thank you – it’s good to see the company that I’ll be keeping!

**CHCCS:** You’ve had a fascinating path through industry and academia; Can you comment on how that came about?

**Karan:** It wasn’t really planned. I did my Bachelor’s in India at IIT, with a general CS degree. There was no graphics, but I knew that I wanted to do something visual and so graphics became the natural place that I wanted to get to after my Bachelors. At that time I didn’t know if I wanted to go beyond a Masters. Nobody in my family or circle of friends had a similar career path.

**CHCCS:** Do you have any particular memories of the first thing you did related to CG?

**Karan:** We had to do an undergraduate thesis, and so we armtwisted a compilers guy to allow us to do graphics. My UG thesis ended up being *ALAN*, a 2D Animation LANguage with an interactive editor, which I justified by writing a compiler to vector graphics for the language. Built without much understanding of graphics I think it reinvented many wheels. After my Masters, I went straight into a PhD and a few people were concerned that I was “still in school”. So after the Ph.D. I figured I should leave university-like institutions for a while. I applied to a number of industry jobs and had lots to choose from. I ended up picking the cool and challenging opportunity to build the character and facial animation tools for *Maya (Alias|Wavefront)* from scratch. After spending 6 years away from research and academia, I began to miss it again, and wanted to work on longer term, more ambitious, and crazy ideas. I think that in me, there is a bit of both industry and academia; in that I want my work to have life and creative use beyond the undoubted satisfaction of pushing the field forward.

**CHCCS:** You’ve also made contributions across a wide span of topics, including modeling, animation, fabrication, interaction, and more. Is there a particular thread that connects much of this work? What’s made you such a polyglot?

**Karan:** The common thread is really what drew myself and many others to graphics in the first place, a beautiful blend of art and science. I get excited by anything creative; it doesn’t matter in which bucket of graphics or human computer interaction it belongs. A good part of graphics is about, or has been about, recreating reality, e.g., people, materials, etc. That is very important, but for me it is also about transcending that and going beyond the physical world, and that includes how it is represented, how it moves and how it looks. And for many of us, a lot of our work is really the work of amazing students that we are fortunate to work with, and they pull you in directions that you may not have gone into otherwise. When recruiting students, I usually first ask students what they want to work on, independent of my interests. Lastly, there is influence from industry and other collaborators, that pushes you to broaden your zone of interest.

**CHCCS:** The notion of “3D modeling for everyone” has been a longstanding challenge. How would you describe the progress that has been made towards this goal? Are the pieces in place to make a significant jump forward on this?

**Karan:** We have made some huge jumps in 3D modeling. But it might not seem like it’s solved because in the end we’re building tools, and not ideas; those still need to come from creative people. Some people equate better tools to better creativity, but better tools just make people more efficient at communicating their creative ideas. In some sense “2D modeling for everyone” is a solved problem with pencil-and-paper and digital tools like *Illustrator* and *Photoshop*. But some people create amazing things and others can’t do very much with it. 3D modeling is starting to get close to that. The one big differentiator in 2D vs 3D is the camera. A 2D camera is an incredibly simple and robust way for anyone create or at least capture 2D imagery. 3D scanners have been around for a long time, but there still is not a 3D scanner that has that robust and complete, push-button efficiency.

**CHCCS:** What do you believe to be among your most significant contribution over the years, or can you perhaps highlight some of your favorite results that you feel are really going in the right direction?

**Karan:** On the modeling/animation side: the work on wires and wraps have been used a lot; these surface skinning techniques like wires and wraps, helped establish current methods where the manipulation handles are abstractions of the geometry itself. It took quite some effort to first conceive from customer requests, and then convince management that it was ready to sneak into an overdue product. On the animation side: more recent work on facial animation has been very gratifying: the original *JALI* system and the later *Visemenet* ML variant. It has resulted in a very promising startup, and it is refreshing to see the whole procedural animation space, which was a bit of a dead area, come back to life. My modeling and fabrication work has been truly interdisciplinary, published equally in HCI and graphics conferences. For this, *ILoveSketch* and *Mesh-mixer* come to mind. The latter was difficult to publish but was

very influential on industry side. The more recent perceptual work on true2form and cross-shade have been papers that I'm very proud of as well. There are some papers that I originally thought of as more specialized ideas, but that have had sizable impact, in particular sketching clothoid forms, which has a very elegant formulation and algorithm. Our work on fabrication using slices has seen its ideas adopted in *FlatFab*. Finally, a real labour of love was *A fresh perspective*, published here at Graphics Interface, which heavily influenced the look of the film *Ryan*, but needed to be reformulated to fit a conventional animation workflow; which was also published with the acronym *RYAN*.

**CHCCS:** What insights can you share with us about tech transfer between industry and universities?

**Karan:** There is how it works "on paper", and then how it works in reality. There are two points that I have learned the hard way: (1) industry works fairly quickly when they want to commercialize something. Often you may be talking for two years. And then when the need is there, they will want to move very quickly, so be prepared if you are interested; (2) as academics we are often overly critical of our own work or scared of revealing its limitations. I think it's important that we try not to do that. Don't be overly humble and remember that many of the limitations can be solved or eliminated with constraints or user involvement. Commercialization grants that require research are less strongly tied to very tight deliverables tend to be more successful for longer-term impact, since neither research results nor the coming and going of students happens perfectly as planned, in time.

**CHCCS:** How do you keep up with the ever-growing volume of research that we as researchers need to track?

**Karan:** Reviewers rejecting your papers certainly help with that. More seriously, in the past this was helped by going to a lot of conferences and browsing conference proceedings. Nowadays, I find that now my understanding of the field tends to go in waves. If there is an area that I'm passionate about at present, I go at it with the help of students and seek out the prior art. This often comes at the expense of another area that you are not currently active in. In general I do rely on my students a fair bit to keep me up to date.

**CHCCS:** Are there particularly ways in which you think that Computer Graphics, as a research area, should adapt as the nature of the open problems changes over time, and the impact of machine learning (ML) ?

**Karan:** We've all started to adopt some aspects of ML. It used to be a novel idea to try and combine the two fields, but now saying that you're using ML for graphics is like saying you're doing computer programming for graphics. Using ML in problems where there is not so much data is interesting to me. This requires bootstrapping both the learning and the creation of data that can help training. Our ML followup on the procedural facial animation is a good example of this. We have seen waves related to vision, fabrication, and ML all be welcomed by the graphics community. In general, graphics has been a very adaptive discipline, as it should be. This is equally true on the HCI side, with human-robot interaction, ubiquitous computing, multisensory inputs, and VR/AR/xR. These all offer new platforms and exciting tools.

**CHCCS:** Are there any other topics you'd like to discuss, or insights that you would like to share?

**Karan:** Something that has worked well for me over the years has been to try and create things myself, both as a user and also being as hands-on in terms of implementations as you can. I use my own interests and hobbies to inform my work, mine my experience for problems, and then be my own user and critic for the solutions; just as you (Michiel) have brought your sporting prowess to problems of

balance and motion; or people looking for easier ways to do things has resulted in new inventions in human computer interaction. I'm very glad that my academic career happened in Canada. We have a very talented, supportive and unique community that I've been very happy to be part of.

**CHCCS:** Thank you for the conversation, and congratulations again with the Achievement Award!

**Karan:** Thanks so much.