Computers & Graphics 105 (2022) A9–A11

Contents lists available at ScienceDirect

Computers & Graphics

journal homepage: www.elsevier.com/locate/cag

Announcement

A Conversation with SMI 2021 Young Researcher Award winner Melina Skouras

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ARTICLE INFO

Article history:
Available online 31 May 2022

ABSTRACT

The 2021 Shape Modeling International Young Researcher Award is presented to Dr. Melina Skouras for her significant contributions to shape modeling. For this award, the candidates must have received the their Ph.D. degrees within seven years of the award being presented.

This year, 2021 is the year, which marks the passing of our founder, Professor Kunii, and the introduction of the new SMI awards. The SMI steering committee decided that the awardee's publication should take an interview format. This permits a casual discussion of the research areas, insights, and contributions of the award winner. What follows is an edited transcript of a conversation between Melina and Brian Wyvill (University of Victoria, Professor and Canada Research Chair, retired), a long term SMI steering committee member and research contributor in shape modeling.

The interview that took place on the 9th November, 2021, via Zoom.

Introduction

The Shape Modeling International Young Researcher Award. was established in 2021 to recognize young researchers' significant contributions to shape modeling. To be considered, the Candidates must have received their Ph.D. degrees at most seven years ago. The recipients of the award are selected by the SMI Awards Committee, based on proposals from the research community in Shape Modeling. We have formed an Awards Committee that is chaired by Brian Wyvill. The members were Ergun Akleman, Loic Barthe, ad Michela Spagnuolo in alphabetical order. This publication provides an interview with Dr. Melina Skouras 1, who is the first recipient of the Young Researcher Award.

The interview

Brian: Hello Melina. Congratulations on being recognized as the 2021 SMI Young Researcher Award winner. You are the first of what we hope to be a long series of awardees at future conferences.

My first question is, what attracted you to computer graphics?

Melina: Basically I followed the flow of my interests. I think that computer graphics is very diverse, and accepting of related topics that I really like. For example geometry and optimization, and physics. It also deals with visual content, which makes the area very attractive, at least this is what attracted me initially. Even if in the end, I don't really work on animation, movies, or images, but on real objects.

Fig. 1. Melina Skouras.

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https://doi.org/10.1016/j.cag.2022.05.012
0097-8493/

Brian: As you say, it's the people who have made the field so encompassing to include other interesting related areas like fabrication. Modeling with actual things you can touch is great. So when did you do your PhD and who was your supervisor?

Melina: I did my PhD from 2010 to 2014. With Markus Gross. It was at ETH, in collaboration with Disney Research Zurich. Markus was my supervisor, but I was surrounded by a lot of other great people when I was there. I closely worked with Bernd Bickel and Bernhard Thomaszewski. ETH had just bought a new multi-material 3D printer. I believe it was owned by the Department of Mechanical Engineering. Markus was really excited about this machine that not so many labs could afford. He really wanted to push the idea of playing with materials. This is something that Bernd had started when he was doing his PhD, and I continued the work on similar things.

Brian: What's the story behind your rubber balloons project?

Melina: Initially, I was not supposed to work on this but on the simulation of facial tissues for medical applications. I had implemented a shell simulator supporting different material properties. At some point, I just used pressure forces to deform my shell and to test the simulator because it was really easy to do from an implementation point of view. Someone saw what I was doing, and asked: "That looks like a balloon. Maybe you could change the shape by playing with the materials?" That sounded interesting. So we tried to do that. In the beginning we played with the thickness of the balloon to modulate its stiffness, locally. The idea was to inflate a super simple shape, such as a sphere, with varying thickness, and to get something fancier once inflated, but this didn't really work. So we decided to change the rest shape itself to optimize the inflated shape of the balloon [1].

Brian: And where did you submit that work?

Melina: To Eurographics 2012 [1].

Brian: Was it well received?

Melina: Reviews were not bad, but we also had some surprising comments. At the time computational fabrication was not a well established sub-topic of computer graphics. We had to justify why we were submitting to this venue. We had comments such as why don't we just send this to Popular Mechanics?

Brian: Yes, not terribly academic?

Melina: We didn't know how to take this. I had a look at the current issue and the main title was "how to change your tires in winter"...

Brian: Computational fabrication has become part of computer graphics. Nowadays, there are some specialized conferences on 3D printing and so forth. You started something there. So how did that progress? Who were your main influences who collaborated with you? And where did you take that after that project?

Melina: Yes, the field moved a lot. I worked with Markus of course, who was one of the main actors in this area, but also with Wojciech Matusik who also worked for Disney Zurich, at some point, and who was also attracted by this kind of things, and Steve Marschner too, who also visited Disney while I was doing my PhD. I also worked with Eitan Grinspun, who is amazing, perhaps not doing so much fabrication at the time, but it was really great working with him.

Brian: Did you pursue that line of research later? Was it actually your PhD topic?

Melina: Yes, even if I was not initially meant to work on that, my PhD topic quickly centered around the design and fabrication of deformable objects. This is still the core of my research. It was a new sub-field and there were, and still are, so many things to be done in this area.

Brian: So did you found a little bit of pushback when that field started because it wasn't part of computer graphics really before. You got some pushback from Eurographics, you were saying? So later, when you were trying to submit your work to conferences and journals, did that suddenly change? Or was there still pushback from the graphics field on manufacturing and fabrication?

Melina: The push back was not that hard at Eurographics, but we still had to write a paragraph where we explained why this was part of this conference, just to please this reviewer. As people started working on this topic, reviewers also got used to seeing papers on fabrication, so there were fewer questions raised about whether this should belong to computer graphics. Another thing is that, and this is a good thing in computer graphics, it's a community that is very open minded to new ideas. If the application is interesting, if the algorithms are interesting, people are happy to actually accept the work. I'm not sure it's really true in other communities, or maybe it's more difficult to change direction, and create something really new.

Brian: I agree. That's certainly my experience. There's sometimes some initial pushback, and then people are quite accepting. What is your current position?

Melina: I am a research scientist at INRIA. So full time researcher.

Brian: And you don't have any teaching?

Melina: I don't need to teach, but I do teach a bit, because I like to teach and I like to be in contact with students. If I didn't teach at all, I would never see them. I could still have Ph.D. students, but I think it's easier to have direct contact.

Brian: Do you have Ph.D. students at the moment?

Melina: Yes, I do. They inspire me. It's nice to see fresh blood working on topics I like, and hear new questions and comments. They're very smart, so it's very nice to work with them.

Brian: Your balloons paper was back in 2012, and you have had quite a lot of publications since then. I wondered what were the projects that really stand out that you're most enthusiastic about?

Melina: I really liked that first project. Another, which got a lot of attraction was the one on the design of actuated characters actuated by strings or sticks, where we optimized for materials distribution and actuation forces [2].

Brian: In SIGGRAPH in 2013?

Melina: Yes. Also, there was another project on balloons, made of flat inextensible panels this time, which also got attention from people from other communities and industrials, who were already working with actual inflatables. Because, I think, the application is very concrete. That was presented at SIGGRAPH 2014 [3].

Brian: You've had a lot of success with SIGGRAPH, which is great, and I see that you've worked with people from other disciplines, physicists, and so forth. Do you want to make some comments on your collaborations outside of our community?

Melina: It's still in progress, but yes, I do work with people in architecture and physics. Now that computational fabrication's part of computer graphics, we can bridge to the communities who are also working in the area, on similar topics, but doing the work differently, because they come from different communities.

Putting everybody together and help them to communicate, is something that is really interesting and inspiring. There already are some initiatives, for example, with the Symposium on Computational Fabrication and some dedicated workshops in this area. I think we need to do more of this. I've visited some labs where I met people from other communities working on similar topics as I, without my knowing it. We need to start working with these people outside graphics. We can learn a lot from each other.

Brian: One of the places that I have met you frequently is at the Bellairs workshops in Barbados, which certainly is a melting pot of people from different disciplines, alas, suspended during the COVID crisis. Did you get a lot out of those Bellairs workshops, working with people from other areas?

Melina: There were also people from my discipline, but I definitely started projects with people that I've met at Bellairs. We've got a paper recently with Etienne Vouga on how to simulate wrinkled geometries, using a reduced model. It's a TOG paper, which will be presented at SIGGRAPH this year [4]. Actually we started discussing about this idea at one of these Bellairs workshops.

Brian: That's great. The list of papers that has come directly or indirectly out of Bellairs is actually quite astonishing. It's always been a great inspiration for me. I really didn't know anything about the work on fabrication that was forging ahead until Paul Cry got together his workshop with your group, and so forth. It's been quite something. And this working on the really the boundaries of computer graphics. So where do you see that going?

Melina: It's not so much at the boundary anymore, but I think the field will continue growing, I think the more people from other communities will look into what we do in computer graphics and computational fabrication, the more they will want to work with us. They realize that, thanks to numerics, we can do things that they cannot do. There already are some collaborations between researchers from computer graphics and physics, for example, between Mark Pauly and Benoit Roman or Pedro Reis, people like that. Not all people are open minded, but others are, fortunately! For example, what I do is very close to mechanics, but I'm not a mechanicist. The mechanics researchers think in a different way. We take some liberties, e.g. with the theory, that they wouldn't dare to take, but which make us creative; allow us to do things that they cannot do, and allow us to tackle problems that would be too difficult to solve with the traditional methods. Now some of them see our results, and think that there might be something that's useful in their own work.

Brian: It's great when you get good feedback from people, in another discipline, it's very satisfying. You mentioned that you'd worked with other disciplines. You mentioned physicists, and architects, what kind of work were you doing with the architects?

Melina: There were some applications with inflatables. We had a paper with Emily Whiting, for example, in 2019, on panel based formworks [5]. This is related to architecture, on how to cast concrete or plaster using soft molds. What I find interesting with architectural applications, is the scale. At large scale, the challenges are different. Loads start to become significant, specific fabrication constraints need to be taken into account. This is different when you just work with small scale models.

Brian: Lots of other disciplines are involved in manufacturing and fabrication. I just wondered if you look for other disciplines who might benefit from your work and vice versa?

Melina: There are tons of application in design, or in the clothing industry. Designing patterns for a custom inflatable shares similarities with the design of patterns for a garment. So maybe these technique could be adapted for crafting real garments. It's a natural extension.

Brian: Sounds absolutely great. Is there anything else you'd like to add? You are early in your career; what are your dreams and aspirations?

Melina: What are my dreams? I definitely want to continue pushing this line of research. To take on more challenges in this direction. There is so much to be done. I think seeing one's work being used for real applications is really nice. Computational fabrication is something that has to do with real artifacts and leads to many concrete applications, but it's a bit different to work on a research project and have something that can be used to produce objects that satisfy industrial standards. There are lots of practical problems to be solved.

Brian: How are you driven by technology? Are the limitations on fabrication in the hardware at the moment as to what can be fabricated? Is this a big influence on the direction your research takes?

Melina: This is one thing the hardware, the other thing relates to uncertainties and imprecisions, and predictability of our models, which are often idealized. In the real world, there are small deviations from the shapes that we compute, stiffnesses of the material that we use might exhibit variations, sewing or welding lines might have a finite thickness, etc. There might be things that we haven't necessarily modeled that might have a significant influence on the shapes, and that should actually be taken into account.

Brian: Right. When fabrication becomes something which is not as quite as futuristic as it is now, I can see it will open up possibilities for you.

It's been great talk to you, and congratulations again on this award.

Melina: Thanks a lot for giving me the award. I think that's a big recognition for me, but also for all the people working on this topic, and following this line of research.

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