Klara Nahrstedt was interviewed by Michael Riegler for ACM SIGMM Records.

Klara Nahrstedt *is a Ralph and Catherine Fisher Professor in Computer Science Department, and Director of Coordinated Science Laboratory at the University of Illinois at Urbana-Champaign. Her research interests are directed towards multimedia systems, teleimmersive systems, trusted cyber-physical systems, Quality of Service (QoS) management in wired and wireless networks, and distributed, and pervasive mobile systems. She is the recipient of the University Scholar Award, the Humboldt Research Award, IEEE Computer Society Technical Achievement Award and ACM SIGMM Technical Achievement Award, IEEE Fellow and ACM Fellow. She is the member of the German Academy of Sciences (Leopoldina Society). She was the editor-in-chief of ACM/Springer Multimedia Systems Journal, she was the general co-chair of ACM Multimedia, the general chair of ACM NOSSDAV, the general chair of IEEE Pervasive Computing and Communications (Percom), chair of ACM Special Interest Group in Multimedia (2007-2013), associate editor of ACM Transactions on Multimedia and she is the associate editor of IEEE Transactions on Multimedia.*
Klara Nahrstedt received her Diploma degree in mathematics and numerical analysis from Humboldt University, Berlin, in 1985. She was a research scientist in the Institute for Informatik in Berlin until 1989. In 1995 she received her PhD from the University of Pennsylvania in the Department of Computer and Information Science.

Michael Alexander Riegler *is a PhD student at Simula Research Laboratory. He received his master degree from the Klagenfurt University with distinction. His master thesis was about large scale content based image retrieval. He wrote it at the Technical University of Delft under the supervision of Martha Larson. He is a part of the EONS project and the DigSys pre-project at the Media Performance Group. His research interests are endoscopic video analysis and understanding, image processing, image retrieval, parallel processing, gamification and serious games, crowdsourcing, social computing and user intentions. Furthermore he is involved in several initiatives like the MediaEval Benchmarking initiative for Multimedia Evaluation.*

Michael Riegler (MR): Describe your journey into computing from your youth up to the present. What foundational lessons did you learn from this journey? Why were you initially attracted to multimedia?

Klara Nahrstedt (KN): From my youth I have been attracted and interested in mathematics, physics and other sciences. However, since most of my family were electrical and computer engineers, I was surrounded by engineering gadgets and devices, and one of them was a very early computer, able to answer various quiz questions about the world. I liked this new device with its many potentials. Therefore, my interests and my family's influence guided me towards an educational journey between science and engineering. I did my undergraduate studies in Mathematics and my Diploma work in Numerical Analysis, at the Humboldt University zu Berlin in East Germany. And after the Berlin Wall came down in 1989, my educational journey led me to the Computer and Information Science Department at the University of Pennsylvania in Philadelphia

where I did my PhD degree and studied multimedia systems and networking.

My interest in multimedia came during my time at the Institute for Informatik, where I worked as a research programmer. This was the time after my Diploma Degree and after my System Administrator job at the Computer Center of the Ministry of Agriculture in East Berlin. This was the time when Europe, in contrast to USA, invested heavily in the new ISO-defined X.25-based digital networking technology, and with it in the new X.400 email system and its applications. One of the very interesting discussions at the time was to transport via email not only text messages, but also digital audio and images as messages. I wanted to be part of the discussion, since I believed that a picture (image) is worth 1000 words and auditory interfaces would be easier for users to enter messages than text messages. I wanted to help develop solutions that would enable transport of these multi-modal media, and my long journey into multimedia systems and networks started. After I joined University of Pennsylvania, as part of my PhD work, I was exposed to the research in the GRASP laboratory where researchers studied computer vision algorithms and cameras, mounted on robots. As a researcher interested in networking and multimedia, it was very natural for me to explore the integrated multimedia networking problems for tele-robotic applications and enable video and control information to be transported from remote robots to operators and to visualize what the remote robot was doing. Since my PhD the journey into deep understanding of multimedia systems and networks continues as new knowledge, technologies, applications, and users emerge.
The foundational lessons that I learned from this journey are: (1) acquire very strong fundamental knowledge in science and humanities very early independent what future opportunities, jobs, interests, and circumstances guide you towards; (2) work hard and believe in yourself; and (3) keep continuously learning.

MR: Tell us more about your vision and objectives behind your current roles? What do you hope to accomplish and how will you bring this about?

KN: During my professional life, I had three different roles: researcher, educator and provider of professional services in different functions.
- As a researcher, my vision and objective are to provide theoretical and practical cyber-solutions that enable people to communicate seamlessly and trustworthy with each other and with their physical environments.
- As an educator, my vision and objective were and are to educate as best I can the next generation of undergraduate and graduate students who are very well prepared to tackle the numerous new challenges in the fast changing human-cyber-physical environments.
- In the space of professional services, I served in various roles as the member of numerous program committees, and organizing member and/or chair, co-chair, editor of IEEE and ACM professional venues, as the chair of ACM Special Interest Group on Multimedia (SIGMM), and as the member of various departmental and college committees, and now as the Director of the Interdisciplinary Research Unit, the Coordinated Science Laboratory (CSL) in the College of Engineering at the University of Illinois at Urbana-Champaign. In each of the administrative and service roles, my vision and objective are to provide high quality service to the

community if it is a high quality technical program at a conference or journal, fair and balanced allocation of resources that would advance the mission of SIGMM, or a broad support of interdisciplinary work in CSL.

I hope to achieve the vision and objectives of my research, educational and professional service activities via hard work, continuous learning, willingness to listen to others, and a very strong collaboration with others, especially my students, colleagues and staff members that I interact with.

MR: Can you profile your current research, its challenges, opportunities, and implications?

KN: My current research moves in three different directions which have some commonalities, but also differences. The major commonality of my research is in aiming to solve the underlying joint performance and trust issues in resource management of multi-modal systems and networking that we find in the current human-cyber-physical systems. The three different directions of my research are: (a) 3D teleimmersive systems for tele-health, (b) trustworthy cyber-physical systems such as power-grid, oil and gas, and (c) trustworthy and timely cloud-based cyber-infrastructures for scientific instruments such as distributed microscopes.

In all of these challenges and directions, the challenges are in providing real-time acquisition, distribution, analysis and retrieval of multi-modal data in conjunction with providing security, reliability and safety.

The opportunities in the areas of human-cyber-physical systems in health, and critical infrastructures are enormous as people are aging, physical infrastructures are being fully stressed, and multimedia devices are challenging every societal cyber-infrastructure by generating Big Data in terms of their volume, velocity and variety.

We are living in truly exciting times as the digital systems are getting more and more complex. The implications are that we have a lot of work to do and solve many challenges as a multimedia system and networking community in collaboration with many other communities. It is very clear that a single computing community is not able to solve the many problems that are coming upon us in the space of multi-modal human-cyber-physical systems. Inter and cross-disciplinary research is the call of the day.

MR: How would you describe the role of women especially in the field of multimedia?

KN: "Difficult" comes to my mind. The number of women in multimedia computing is small and in multimedia systems and networks even smaller. I wish that the role and visibility of women in multimedia technology field would be greater when it comes to IEEE and ACM awards, conference leadership roles, editorial boards memberships, participations in SIGMM technical challenges, and other visible events and roles. Multimedia technology became such a ubiquitous base for numerous application fields including education,

training, entertainment, health care, social work which have very strong representations of women in general. Hence, I believe that women in multimedia should play even more of a crucial role in the future than today, especially in innovation, leadership, and interconnection of multimedia computing technologies with the above mentioned application fields.

MR: How would you describe your top innovative achievements in terms of the problems you were trying to solve, your solutions, and the impact it has today and into the future?

KN: My top innovative achievements range from bringing a much better understanding into the field of Quality of Service (QoS) Management and Quality of Service Routing for multimedia systems and networks, to developing novel real-time and trusted resource management architectures and protocols for complex multi-modal applications, systems and networks such as the 3D teleimmersion, energy-efficient mobile multimedia, and trustworthy smart grid, to name few. My QoS research impact can be seen in current wide area wired and wireless networks and systems. The impact of the research management algorithms, architectures and systems that I and my research group have developed can be seen throughout the Microsoft, Google, HP, and IBM solutions where my graduate and undergraduate students took on an employment and brought with them research results and knowledge that then made their ways into multimedia applications, systems and network products.

MR: Over your distinguished career, what are your top lessons you want to share with the audience?

KN: The top lessons that I would like to share are: be patient, honest, open-minded, and fair; don't give up; be humble but don't be shy to "toot your own horn" when appropriate; listen what others have to say; and be respectful to others since everybody has something to contribute to the community and society in his/her own way.

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