

Getting to know... Tamás Szirányi, IAPR Fellow



Prof. Tamás Szirányi received his Ph.D. and D. Sci. degrees in 1991 and 2001 from the Hungarian Academy of Sciences, Budapest. He was appointed to a full professor position in 2001 at the University of Pannonia, Veszprém, Hungary, and, in 2004, at the Péter Pázmány Catholic University, Budapest, Hungary. In 2014, he was appointed as a full professor at Budapest University of Technology and Economics. He leads the Distributed Events Analysis Research Laboratory at the

Institute for Computer Science and Control of the Hungarian Academy of Sciences. His research activities include machine perception, pattern recognition, texture and motion segmentation, Markov random fields and stochastic optimization, remote sensing, surveillance systems for panoramic and multiple camera systems, intelligent networked sensor systems, image quality, digital film restoration, image rendering and coding. Dr. Szirányi was the founder and past president (1997-2002) of the Hungarian Image Processing and Pattern Recognition Society (the Hungarian member society of the IAPR). He was an Associate Editor of the IEEE Transactions on Image Processing (2003-2009), and is currently an Associate Editor of Elsevier's Digital Signal Processing. He was honoured with the Master Professor Award in 2001 and the Széchenyi Professorship in 1999. He is a Fellow of the IAPR and of the Hungarian Academy of Engineering. He has more than 250 publications including 50 major scientific journals.

*Tamás Szirányi, IAPR Fellow
ICPR 2008, Tampa*

For contributions to stochastic models and learning methods for video event analysis, and to energy optimization-based image and video segmentation.

by [Tamás Szirányi](#), Institute for Computer Science and Control of the Hungarian Academy of Sciences and the Budapest University of Technology and Economics, Hungary

My involvement with image processing began in 1980 when I finished my MSc thesis about the mapping of thermal distribution on IC chips. Then, a method using linear programming and physical models helped us to estimate the image of thermal distribution

with high precision. So, my first impression of image processing was the necessity of using tricky math to get useful results. Thanks to my supervisor, Prof. V. Székely, this impression determined my attitude towards image processing: math and pragmatism.

Later, I had special interests in recognizing shapes from the domain of not direct visibility by statistical methods: I introduced subpixel pattern recognition (Pattern Recognition, 1994), texture recognition with focal sensors (CVIU, 1998), depth maps from single images (IEEE Tr. PAMI, 2007), and finding hidden changes in remote sensing images (IEEE GRSL, 2014).

I started my career in industry, namely in the R/D department of an electrical company. Until 1991,

I was a Research Fellow and Project Leader of Optoelectronics Development at the VIDEOTON Development Institute, Budapest. At that time, my work involved designing optical data storage, laser printers and document scanning devices, and other applications of laser systems. I led a research department of more than 20 people and organized several state-of-the-art projects.

During this period, in 1987, I visited Italian universities, including the Research Center "E. Piaggio" (Pisa, Prof. Paolo Dario), as a postdoc researcher. At that time, I had my first publication in Pattern Recognition Letters, about the recognition of very low resolution images, applied for robot touch detection.

Since new technologies needed

new experts, we started a doctorate program at the Technical University of Budapest, where about a dozen young researchers were trained with the partial supervision of the Videoton company. At that time, I was supervising PhD students, and we also had fruitful collaborations with university labs in optics and optoelectronics. We also had good cooperation, including licensing and development activities, with leading international companies like Philips and Thomson. Then, I was interested in hardware/firmware based image processing methods, dealing with the theoretical limits of OCR considering optical resolution and sampling rates. After the economic changes in Hungary around 1990, the Videoton company went out of business, and the whole institute scattered. I continued my career at the Institute for Computer Science and Control (SZTAKI) of the Hungarian Academy of Sciences.

In parallel, I continued teaching at universities, and was invited for professorship at different universities. In 1997, we founded the Faculty of Information Technology at the University of Veszprém (presently University of Pannonia), where I developed and taught several new subjects: image processing, pattern recognition, biometrics in personal identification. I also organized an image processing research laboratory and supervised a group of excellent PhD students. My first PhD student later became the chair holder professor.

This research laboratory had some successful R&D projects:

- DIMORF: software for the restoration of archive films. Our first result, the restoration of the first color Hungarian movie "Ludas Matyi", was featured

in cinemas, released on DVD, and is still occasionally being shown on TV.

- Image compression and surveillance systems with panoramic cameras: cooperative projects with Samsung Co., and Tateyama Co. (Japan) led to industrial applications and patents.

Later, I handed the leadership of the laboratory over to an earlier PhD graduate of mine, and I moved my professorship to the newly founded Faculty of Information Technology at the Péter Pázmány Catholic University, Budapest. This faculty had special areas connected to life sciences and new technologies in physics. I gave lectures, and I had a staff consisting of PhD students, partially cooperating with my new SZTAKI laboratory.

Also in 1997, I founded the Hungarian Image Processing and Pattern Recognition Society (KEPAF), the Hungarian IAPR member society, and I was its first president for five years. With the formation of KEPAF, a real working society was created from a group of interested image processing and pattern recognition researchers. The society continues to grow and holds a national conferences every second year.

Between 1990-2002, my research activities were focused on focal plane smart imaging sensors. I have designed sophisticated analogue and digital circuits and related software packages. I also supervised young researches in the institute (SZTAKI) and at the university labs.

My former PhD students have earned several international scholarships and outstanding job positions. Their scientific performance fulfilled the highest

international requirements. In 2006, I founded a new research laboratory in SZTAKI, with a starting staff consisting of my selected previous PhD students. Our goal was and is the interpretation and organization of information coming from distributed or embedded sensors. The sensors can be dynamic or static imaging devices, other multimedia sources or a network of different sensors. The challenge is in the evaluation, recognition and classification of events occurring at different locations or times. We place special emphasis on machine learning, data mining, human perception, geometrical optics, optimization methods and variational analysis. Our areas of interests include image and video analysis, biometrical identification, connections with sensor networks, virtual reality and computer graphics. Our first major project was the development of a surveillance event analysis system for the Hungarian police.

In 2014 I was invited to the Budapest University of Technology and Economics, Faculty of Transportation Engineering and Vehicle Engineering and was appointed full professorship.

I have contributions to image and video analysis in

- Retrieving geometrical information from videos without any a priori information about the image structure or possible shapes:
 - registration through co-motion statistics for matching image views, resulting in multimodal camera fusion or finding the vanishing point for planar reflected images or shadows,
 - focus maps through

Bayesian iterations by using a theoretically new orthogonality criterion;

- Segmentation, change and motion detection by using novel effective Bayesian methods;
- Restoration of archive films by self-learning adaptive recognition methods.

I also have contributions in sensor systems and engineering solutions:

- Developing intelligent focal plane sensor toolboxes, designing sophisticated analogue and digital circuits and related software packages – used by several R&D groups worldwide;
- Measuring the visual quality and human perception in human-computer interfaces.

We have several international cooperations, including French INRIA institutes, Italian, Turkish, Dutch and German universities

and research groups. We also have active cooperation with researchers in machine learning, cognitive sciences and mathematics. Our group and my colleagues have been honoured by several prizes in recent years, and we achieved a high scientific level (number and quality of publications) in solving engineering tasks.

By now we have collected so many ideas about sensor systems, surveillance, and aerial imaging, that I can see several new areas of innovation, the more important ones being:

- Modeling high complexity systems containing an indefinite number of (freely positioned) networked sensors.
- Obtaining additional information from sensor networks, characterizing their geometrical or statistical relations and forming more

effective collaborations.

I started my career in industry and then continued into academia. Just as during my years in industry, I continue to pursue scientific achievement. Currently I strive to produce scientific results with industrial applicability. Such duality continues to drive my research work: my aim is to bring together new theoretical issues in creating a new thinking of networked equipment.

It is my conviction that a system containing a large number of sensors can provide much more information and knowledge than the simple summation of single sensors. During my earlier career in both industry and academia my favorite activities were around and about intelligent sensor systems. Today, it is clear that the time of smart, self-organized sensor systems has arrived, and I keep pursuing answers and solutions on how to face the related challenges.

IAPR Then and Now...IAPR Newsletter, Vol. 6 Nos. 2 and 3, October 1983

Excerpt from the Minutes of the Ninth Meeting of the Executive Committee of the IAPR

Hotel Eremitage, Lyngby (DK)
July 14, 1983

Present were: Simon (President), Kohonen (Vice-President), Freeman (Treasurer), Devijver (Secretary), Levine (Chm. 7ICPR), Bajcsy (Newsletter editor), Danielsson (Chm. Membership committee), Rutovitz (Chm. Awards comm.).

Membership

- Danielsson reports that an application for membership was received from Hungary in October 1982, but the information provided at that time about the Hungarian national organization did not match the requirements of the IAPR Constitution. Additional information was received in July 1983 which presently allows the membership committee to propose that the Hungarian organization be accepted by the Governing Board as the

twentieth national member of the IAPR.

The Hungarian national organization is the Section of Artificial Intelligence and Pattern Recognition of the John Von Neumann Society for Computer Science with a membership of 25 (category A). The proposed Hungarian national representative is Dr. G. Kozman, Center Research Institute for Physics, POB 42, Budapest H.1525.

- The IAPR secretary is directed to organize a mail ballot on the Hungarian application at his earlier convenience.

Follow-Up To the Minutes of the ninth meeting of the Executive Committee of IAPR

- A mail ballot dated September 5, 1983 has gone out to all members of the IAPR Governing board concerning the application for membership in the IAPR from the "Section of Artificial Intelligence and Pattern Recognition of the John Von Neuman Society for Computer Science, Hungary"

IAPR Then and Now...IAPR Newsletter, Vol. 20 No. 1, January 1998

New GB member for Hungary The new Hungarian representative on the GB of IAPR is Dr. Tamás Szirányi, the newly elected President of the Hungarian Association for Image Analysis and Pattern Recognition (KEPAF). Dr. Szirányi

replaces Professor Dmitry Chetverikov who served on the GB since the early 80's. Dr. Szirányi is Senior Research Fellow at MTA SZTAKI, Budapest and Associate Professor at the University of Veszprem.