

Yuri A. Ivanov

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Objective: Research position in the area of Computer Vision, Machine Learning, and Human-Computer Interfaces.

Research Interests: Statistical models of visual and auditory perception, visual motion and speech processing, machine learning, reinforcement learning, computer vision, on-line algorithms.

Education:

PhD, MIT, Expected in August, 2001

MS in Media Arts and Sciences, MIT, 1998

MS, BA in EECS, State Academy of Air and Space, Leningrad (St. Petersburg), Russia, 1992

Professional Experience:

1996 - Present: Research Assistant, PhD Student MIT, Media Lab, Vision and Modeling, Synthetic Characters

- Studied computer vision and machine learning;
- Developed on-line learning algorithms for learning perceptual organization in the action-perception cycle for autonomous agents with audio and video interfaces. These algorithms extend to Partially Observable Markov Decision Processes and explore methods of reward-based statistical estimation. They achieve their fundamental advantage by balancing unsupervised and reward-based costs in order to achieve a faster convergence.
- Co-developed a system for speech and discourse analysis for the "Facilitator Room" project. The system for identification of the topic of a conversation in a group of people is based on a simple classification algorithm but is surprisingly robust.
- Conducted research in the area of Stochastic Context-Free Grammars (SCFG) and languages for action recognition and motion analysis. SCFGs are well suited for modeling complex dependencies in the input stream. The work focused on possibilities of their use in machine vision for identification of high-level structured activities, such as musical conducting, drawing, and surveillance, where the expert knowledge can be encoded in the statistical model by formulating a set of grammar rules.
- Built a complete video surveillance system based on the Stochastic Context-Free Grammar parser. The system included a MIT AI Lab's object tracker and used the SCFG as a model of activities and multi-object interactions in a parking lot. A novel parsing algorithm was developed in order to model simple multi-object tracking events, while ensuring their spatial and temporal consistency.
- Designed and implemented an algorithm for fast background segmentation in theatrical and interactive applications. The geometry-based approach is based on a fast and efficient method for segmentation of foreground objects violating the pre-computed stereo model of the background and delivers a real-time performance in situations with changing lighting conditions.
- Participated in the development of the KidsRoom project, a precursor to the KidsRoom2, which was exhibited at the Millennium Dome, London.

1995 - 1996: Senior Consultant

Albion Intl., Sprint Intl., Washington DC

Responsibilities included implementation of a script compiler for a large-scale network router management system; router management system design and developer training.

1994 - 1995: Research engineer

Magnet Interactive Studios, Washington DC

Conducted research in wavelet-based image compression and multi-resolution mesh optimization for 3D modeling; explored algorithms for distributed graphics rendering; designed and developed a cross-platform game and media engine.

1992 - 1994: Sr. Software Engineer

ECTA Corporation, Ambler, PA

Managed data acquisition and GUI teams of a financial services database project; designed the record caching mechanism and a memory management scheme; developed embedded data validation mechanisms.

1984 - 1992: Software Engineer, Intern

Russian Academy of Sciences, Leningrad

Participated in the research of algorithms for behavior modeling; developed a data visualization system for a custom sensor array; took part in developing a LOGO interpreter and LOGAME – an educational system for a high school course on programming languages; implemented OS shell and disk management tools for a new microcomputer family; interned with a team developing software for the Space Flight Control Center.

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Publications:

Journals:

1. Y. A. Ivanov, A. F. Bobick, *Recognition of Visual Activities and Interactions by Stochastic Parsing*, Transactions on Pattern Analysis and Machine Intelligence **22**(8), 852–872 (2000).
2. Y. Ivanov, A. Bobick, J. Liu, *Fast Lighting Independent Background Subtraction*, International Journal of Computer Vision **37**(2), 199–207 (2000).
3. A. F. Bobick, S. S. Intille, J. W. Davis, F. Baird, C. S. Pinhanez, L. W. Campbell, Y. A. Ivanov, A. Schutte and A. Wilson, *Perceptual User Interfaces: The KidsRoom*, Communications of the ACM **43**(3), 60–61 (2000).
4. A. F. Bobick, S. S. Intille, J. W. Davis, F. Baird, L. W. Campbell, Y. Ivanov, C. S. Pinhanez, A. Schutte and A. Wilson, *The KidsRoom: A perceptually-based interactive and immersive story environment*, PRESENCE: Teleoperators and Virtual Environments **8**(4), 367–391 (1999).

Conferences:

5. Y. Ivanov, *Cluster Analysis for Weakly Labeled Data*, Accepted to Recent Developments in Mixture Modeling, Mixtures 2001, Hamburg, Germany (2001).
6. Y. Ivanov, B. Blumberg, A. Pentland, *Expectation-Maximization for Weakly Labeled Data*, 18th International conference on Machine Learning 2001, Williamstown, MA (2001).
7. R. Burke, D. Isla, M. Downie, Y. Ivanov, B. Blumberg. *CreatureSmarts: The Art and Architecture of a Virtual Brain*,. Game Developers Conference 01, pp. 147–166, San Jose, CA (2001)
8. Y. Ivanov, B. Blumberg, A. Pentland, *EM For Perceptual Coding and Reinforcement learning Tasks*, 8th International Symposium on Intelligent Robotic Systems, Reading, UK (2000).
9. T. Jebara, Y. Ivanov, A. Rahimi, A. Pentland, *Tracking Conversational Context for Machine Mediation of Human Discourse*, Socially Intelligent Agents 2000 - The Human in the Loop, Fallmouth, MA (AAAI, 2000).
10. Y. Ivanov, A. Bobick, *Recognition of Multi-Agent Interaction in Video Surveillance*, ICCV 99, Corfu, Greece (1999).
11. Y. Ivanov, C. Stauffer, A. Bobick, W. E. L. Grimson, *Video Surveillance of Interactions*, CVPR 99, Workshop on Video Surveillance, Ft. Collins, CO (1999).
12. A. F. Bobick, Y. A. Ivanov, *Action Recognition using Probabilistic Parsing*, CVPR 98, Santa Barbara, CA (1998).
13. Y. A. Ivanov, A. F. Bobick, J. Liu, *Fast Lighting Independent Background Subtraction*, ICCV 99, Workshop on Video Surveillance, Bombay, India (1998).

References:

1. Prof. Bruce Blumberg, MIT Media Laboratory, bruce@media.mit.edu
2. Prof. Aaron Bobick, Georgia Institute of Technology, afb@cc.gatech.edu
3. Prof. Alex Pentland, MIT Media Laboratory, sandy@media.mit.edu