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IEEE Aerospace & Electronic Systems Society (AESS)
AES Chapter Lecture

An overview of imaging sensors, visual surveillance algorithms and a superresolution algorithm

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Date: March 6, 2007
Time: 11:30-12:30 am, EST
Location: 6 Sigma Conference Room, Raytheon

Registration is required before Feb. 28, 2007. Just send an email message to
zhen_ding@raytheon.com, Max number of people: the first registered 20.

Major topics:

- o Comparison of imaging sensors for surveillance applications
- o An overview of visual surveillance algorithms
- o A superresolution algorithm for improving target recognition in visual surveillance

We briefly introduce our superresolution algorithm and its relevance in visual surveillance. An imaging sensor samples the projection of an underlying 3D scene at the intersect points of a 2D grid. An imaging sensor samples spatially blurred intensities because of the finite dimension of its constituent sensors. The sampling grids of neighboring frames of a video sequence are, in general, non-identical due to camera and object motion. This means that the information from a number of adjacent frames can be combined to obtain a superresolved frame. Such a higher resolution frame will improve the effectiveness of recognition of targets which in turn will improve surveillance.

We have developed a novel superresolution algorithm based on a fast motion estimation technique. Two stages of this algorithm, namely, motion estimation and high-resolution reconstruction, rely on an area-based interpolation scheme that involves intersecting two pixel grids in arbitrary orientation, displacement, and scaling. We develop a fast approximate solution of the interpolation, whose exact solution is prohibitively expensive. In addition, gradient descent algorithm is used for fast convergence of the

motion estimation algorithm. Experimental results demonstrate the good performance of the proposed superresolution algorithm as well as its robustness against noise.

Presenters

Xiaolin Wu received his BSc degree from Wuhan University, China in 1982, and his PhD degree from the University of Calgary, Canada in 1988. He is currently a professor in the Department of Electrical and Computer Engineering, McMaster University, Ontario, Canada, and a research professor of computer science, Polytechnic University, Brooklyn, New York. His research interests include multimedia coding and communications, image processing, signal quantization and compression, joint source-channel coding, and medical imaging. He has published more than 150 research papers and holds two patents in these fields. His awards include the 2003 Nokia Research Fellowship, 2000 Monsteds Fellowship, and 1998 UWO Distinguished Research Professorship. He is a senior member of the IEEE.

Abhijit Sinha received his B.S. degree in physics from the University of Calcutta, India, in 1994. He received his M.S. degree in electrical communication engineering from the Indian Institute of Science, Bangalore, India, in 1998 and his Ph.D. degree in electrical and computer engineering from the University of Connecticut, USA, in 2002. He worked as a Postdoctoral Fellow at the University of Connecticut from 2002 to 2003. Currently, he is working as a research associate at McMaster University, Canada. His research interests include signal/image processing, target tracking, data fusion, and communications.

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Invited by Dr. Zhen (Jack) Ding, Dr. Jian Wang

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