

# Khurram Hassan Shafique

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## Research Interests

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Automated Visual Surveillance Systems, Aerial Video Exploitation, Visual Sensor Networks, Content Extraction from Images/Video, Graph Partitioning and Clustering, Combinatorial Algorithms, Pattern Recognition, and Machine Learning.

## Education

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2000 – 2004

### Ph.D. Computer Science

School of Electrical Engineering and Computer Science,  
University of Central Florida, Orlando, FL

Thesis Title: *Partitioning a Graph in Alliances and its Application to Data Clustering*

Advisor: Dr. Ronald Dutton

GPA: 3.97

1993 – 1998

### B.E. Computer Systems Engineering

NED University of Engineering and Technology, Karachi, Pakistan

## Honors and Awards

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**Honorable Mention for Best Paper Award** at ACM Multimedia Conference, Singapore, 2005.

**Hillman Fellowship Award** for excellence in research, School of Electrical Engineering and Computer Science, University of Central Florida, 2003.

**Merit Awards** for securing first position in undergraduate second year, third position in third year, and third position in final year, Computer Systems Engineering, NED University of Engineering and Technology, 1998.

## Employment History

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March 2006-Present

**Research Scientist**, ObjectVideo Inc, Reston, VA

March 2005-March 2006

**Post Doctoral Research Associate**, School of Computer Science, University of Central Florida, Orlando, FL

January 2000 – December 2004

**Graduate Research Assistant**, School of Computer Science, University of Central Florida, Orlando, FL

April 1998 – December 1999

**Lecturer**, NED University of Engineering and Technology, Karachi, Pakistan

### Refereed Journal Papers

1. "Probabilistic Modeling of Scene Dynamics for Applications in Visual Surveillance," with Saleemi I., and Shah M., IEEE Transactions on Pattern Analysis and Machine Intelligence, to appear.
2. "Partitioning a Graph in Alliance Free Sets," with Dutton R.D., Discrete Mathematics, to appear.
3. "Modeling Inter-Camera Space-Time and Appearance Relationships for Tracking across Non-Overlapping Views," with Javed O., Rasheed Z., and Shah M., Computer Vision and Image Understanding Journal (Elsevier), vol. 109, issue 2, February 2008.
4. "Automated Surveillance in Realistic Scenarios," with Javed O. and Shah M., IEEE Multimedia, vol. 14, issue 1, Jan-March 2007.
5. "A Tight Bound on the Cardinalities of Maximum Alliance-Free and Minimum Alliance-Cover Sets," with Dutton R.D., Journal of Combinatorial Mathematics and Combinatorial Computing, vol. 56, 2006.
6. "A Non-Iterative Greedy Algorithm for Multi-frame Point Correspondence," with Shah M., IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 27, no. 1, January 2005.
7. "A Virtual 3D Blackboard: 3D Finger Tracking using a Single Camera," with Wu A., da Vitoria Lobo N., and Shah M., Applied Optics, vol. 43 issue 2, 2004.
8. "Target-Tracking in Airborne Forward Looking Infrared Imagery," with Yilmaz A. and Shah M., Journal of Image and Vision Computing, vol. 21, no. 7, 2003.

### Refereed Conference and Workshop Papers

9. "An Efficient Data Driven Algorithm for Multi-Sensor Alignment," with Guo F., Aggarwal G., Cao X., Rasheed Z., and Haering N., Workshop on Multi-camera and Multi-Modal Sensor Fusion Algorithms and Applications, with ECCV, Marseille, France, October 2008.
10. "Automated Visual Analysis in Large Scale Sensor Networks," with Rasheed Z., Cao X., Liu H., Yu L., Lee M., Ramnath K., Choe T., Javed O., and Haering N., ACM/IEEE International Conference on Distributed Smart Cameras (ICDSC), California, September 2008.
11. "A Rank Constrained Continuous Formulation of Multi-frame Multi-Target Tracking Problem," with Lee M. and Haering N., IEEE International Conference on Computer Vision and Pattern Recognition (CVPR), Anchorage, Alaska, June 2008. (Acceptance Rate 32%)
12. "Self Calibrating Visual Sensor Networks," with Hakeem A., Javed O., and Haering N., IEEE Workshop on Applications of Computer Vision, Copper Mountain, Colorado, January 2008.
13. "Object Based Video Coding Framework for Static Camera Videos," with Hakeem A. and Shah M., ACM Multimedia Conference, Singapore, 2005. (Acceptance Rate 16%, **Nominated for Best Paper Award**)
14. "Appearance Modeling for Tracking Across Multiple Non-Overlapping Cameras," with Javed O. and Shah M., IEEE International Conference on Computer Vision and Pattern Recognition (CVPR), San Diego, 2005. (Acceptance Rate 6%)
15. "Estimation of the Radiometric Response Functions of a Color Camera from Differently Illuminated Images," with Shah M., IEEE International Conference on Image Processing (ICIP), Singapore, October 2004.
16. "On X free Covers," with Dutton R. D., to appear in Congressus Numerantium, 2004.
17. "A Non-Iterative Greedy Algorithm for Multi-frame Point Correspondence," with Shah M., The Ninth IEEE International Conference on Computer Vision (ICCV), Nice, France, October 2003. (Acceptance Rate 20%)
18. "Tracking Across Multiple Cameras with Disjoint Views," with Javed O., Rasheed Z., and Shah M., The Ninth IEEE International Conference on Computer Vision (ICCV), Nice, France, October 2003. (Acceptance Rate 20%)
19. "Maximum Alliance-Free and Minimum Alliance-Cover Sets," with Dutton R. D., Congressus Numerantium 162, pp. 139-146, 2003.
20. "A Hierarchical Approach to Robust Background Subtraction using Color and Gradient Information," with Javed O. and Shah M., IEEE Workshop on Motion and Video Computing, Orlando, Dec 2002.
21. "Estimation of Rigid and Non-Rigid Facial Motion using Anatomical Face Model," with Yilmaz A., and Shah M., International Conference on Pattern Recognition (ICPR), Quebec City, Canada, August 2002.
22. "On Satisfactory Partitioning of Graphs," with Dutton R. D., Congressus Numerantium 154, pp. 183-194, 2002.

23. "Target-Tracking in FLIR Imagery Using Mean-Shift and Global Motion Compensation," with Yilmaz A., Shah M., and da-Vitoria Lobo N., Workshop on Computer Vision Beyond Visible Spectrum with CVPR 2001, Kauai, Hawaii, Dec 2001.

#### **Book Chapters**

24. "Automated Geo-registration and Inter-Sensor Calibration in Large Sensor Networks," with Guo F., Aggarwal G., Rasheed Z., Cao X., and Haering N., in Smart Cameras, Springer (to appear), 2009.
25. "Smart Cameras for Visual Surveillance," with Javed O., in Smart Cameras, Springer (to appear), 2009.

#### **Symposium Papers, Talks, and Demonstrations**

26. "Autonomous Real-time Ground Ubiquitous Surveillance-Imaging System (ARGUS-IS)," with Leininger B., Edwards J., Antoniadis J., Chester D., Haas D., Liu E., Stevens M., Gershfield C., Braun M., Targove J.D., Wein S., Brewer P., and Madden D.G., SPIE Defense and Security Symposium, 2008.
27. "On Optimality and Complexity of Multi-frame Multi-target Tracking," Invited Talk at Janelia Farm Research Campus, Howard Hughes Medical Institute, July 2008.
28. "Automatic Visual Analysis for Transportation Security," with Haering N., IEEE Conference on Technologies for Homeland Security, 2007.
29. "Multiple Vehicle Tracking in Surveillance Videos," with Zhai Y., Berkowitz P., Miller A., Varket A., White B., and Shah M., CLEAR Evaluation Campaign and Workshop, 2006.
30. "Autonomous Target Following by Unmanned Aerial Vehicles," with Rafi F., Khan S., and Shah M., SPIE Defense and Security Symposium, 2006.
31. "Automated Surveillance in Realistic Scenarios," with Shah M., Invited Talk at Second Annual Florida Tech Transfer Conference, Orlando, 2005.
32. "Real Time Surveillance and Monitoring Using Multiple Cameras," Invited Talk at IBM TJ Watson Research Center, October 2004.
33. "Balancing Roots of a Tree," The Eighteenth Midwest Conference on Combinatorics, Cryptography and Computing, October, 2004
34. "Visual monitoring of Railroad Grade Crossing," with Sheikh Y. A., Zhai Y., and Shah M., SPIE Defense and Security Symposium, April 2004
35. "Real Time Surveillance in Multiple Non-Overlapping Cameras," with Javed O., Rasheed Z., Alatas O., Hakeem A., and Shah M., Demonstration at IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Madison, Wisconsin, June 2003.
36. "Maximum Alliance-Free and Minimum Alliance-Cover Sets," with Dutton R. D., Seventeenth International Symposium on Computer and Information Science, Orlando, Oct 2002.

## **Patents**

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37. "Tracking across Multiple Cameras with Disjoint Views," U.S. Patent Number 7450735.
38. "Method for Detecting Water Regions in Video," U.S. Patent Application 20080298636.
39. "Automatic Camera Calibration and Geo-registration using Objects that Provide Positional Information," U.S. Patent Application 20080240616.
40. "Video-based Sensing for Daylighting Controls," U.S. Patent Application 20080180553.
41. "Stationary Target Detection by Exploiting Changes in Background Model," Provisional U.S. Patent.

## **Professional Skills**

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### **Programming Languages**

C/C++, Visual C++, Visual C#, OpenMP, MPI, MATLAB, Intel 8088/86 Microprocessor Assembly, Intel 8x51 Micro-controller Assembly

### **Platforms**

Windows, Linux, and UNIX

## **Immigration Status**

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U.S.A. Permanent Resident (Green Card)

## **References**

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Available upon Request