Hazem El-Alfy

CONTACT
INFORMATION

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OBJECTIVE
Obtain a faculty or research position upon graduating with PhD.

RESEARCH
INTERESTS

Computer Vision: Processing surveillance video, anomaly detection, video editing, camera management.
Scientific Computing: Stochastic partial differential equations.
Computer Graphics.

EDUCATION

Ph.D., Computer Science (June 2009)
University of Maryland, College Park, USA.
Advisors: Prof. Larry Davis, Prof. David Jacobs.
Thesis: Techniques for Video Surveillance: Automatic Video Editing and Target Tracking.

M.Sc., Computer Science (May 2005)
University of Maryland, College Park, USA.
Advisors: Prof. Howard Elman, Prof. Ramani Duraiswami.
Scholarly paper: Computation of Scattering from N Spheres with Stochastic Boundary Conditions using Multipole Reexpansion.

M.Sc., Applied Mathematics (Aug 2001)
Engineering Mathematics Dept, Faculty of Engineering,
Alexandria University, Alexandria, Egypt.
Advisors: Prof. Abdel-Karim Aboul-Hassan, Dr. Mohamed Sayed.
Thesis: Computer Algebra and its Applications.

B.Sc., Computer Science (May 1997)
Computer Science and Automatic Control Dept, Faculty of Engineering,
Alexandria University, Alexandria, Egypt.
Graduation project: HTML Editor and Web Browser with Arabic Language Support.

EMPLOYMENT

Engineering Math Dept, Alexandria University, Alexandria, Egypt. (present)
Position: *Assistant Professor.* (pending approval, expected Dec 09)

Computer Science Dept, University of Maryland at College Park. (May 03 – Aug 09)
Position: *Graduate Research Assistant.*
Duties: Master's and doctoral research.

Computer Science Dept, Univ. of MD, College Park. (Aug 01 –May 03, Jan 08 – Aug 09)
Position: *Teaching Assistant.*
Duties: Conducting discussion sessions, holding office hours, proctoring exams and grading.
Courses taught: Low-level programming with C, Computer organization and architecture.

Engineering Math Dept, Alexandria University, Alexandria, Egypt. (Apr 99 – Aug 01)
Position: *Teaching/Research Assistant, Lab Assistant.*
Duties: Holding office hours, proctoring exams and grading. Conducting exercise sessions in college algebra, calculus, linear algebra, numerical analysis, probability, statistics and stochastic processes. Supervised Matlab and DERIVE lab sessions. Masters level research.

Computer Science Dept, Alexandria University, Alexandria, Egypt. (Sep 97 – Jan 98)
Position: *Part-time Teaching Assistant, Lab Assistant.*
Duties: Holding office hours, proctoring exams and grading. Supervising labs and exercise sessions in DOS/Windows operating system, MS-Basic and Visual Basic programming.

AWARDS AND
HONORS

- Dept of Computer Science, University of Maryland, College Park: Assistantship for the PhD Program in Computer Science.
- Engineering Mathematics Dept, Alexandria University, Egypt: Scholarship for Master's degree, 1999.
- Alexandria University, Egypt: Honor Certificate for academic distinction, 1993-1997

PUBLICATIONS

- Hazem El-Alfy, David Jacobs and Larry Davis, "Multi-Scale Video Cropping," in *Proceedings of the ACM International Conference on Multimedia (MM'07)*, pp. 97-106, Augsburg, Bavaria, Germany, September 23–28, 2007.
- Hazem El-Alfy, David Jacobs and Larry Davis, "Assigning Cameras to Subjects in Video Surveillance Systems," in *Proceedings of the IEEE Int. Conf. On Robotics and Automation, (ICRA '09)*, pp. 837-843, Kobe, Japan, May 12–17, 2009.

UNDER
PREPARATION

- Hazem El-Alfy, David Jacobs and Larry Davis, "Multi-Camera Management in Surveillance Applications," submitted, *Journal of Intelligent Service Robotics*.
- Hazem El-Alfy, David Jacobs and Larry Davis, "An Optimal Two-Player Pursuit-Evasion Game Strategy," *ICRA '10*.

NON-REFEREED
PUBLICATIONS

- Hazem El-Alfy, "Techniques for Video Surveillance: Automatic Video Editing and Target Tracking," Ph.D. Thesis, Department of Computer Science, University of Maryland, College Park, USA.
- Hazem El-Alfy, "Multiple Scattering from *N* Spheres with Uncertain Source Location Using Stochastic Multipoles," submitted as a scholarly paper, in partial fulfillment of the degree of Masters of Science, Department of Computer Science, University of Maryland, College Park, USA.
- Hazem El-Alfy, "Computer Algebra and its Applications," Masters of Science Thesis, Engineering Mathematics Department, Faculty of Engineering, Alexandria University, Alexandria, Egypt.

PROFESSIONAL
ACTIVITIES

- Reviewer, International Conference on Pattern Recognition, (ICPR).
- IEEE student member.

SELECTED
RESEARCH
PROJECTS

Multi-Scale Video Cropping

We consider the problem of "cropping" surveillance videos. This process chooses a trajectory that a small sub-window can take through the video, selecting the most important parts of the video for display on a smaller monitor. The result is a meaningful video with a lower resolution that can fit on smaller displays and save bandwidth. The globally optimal trajectory for a cropping window is found by using a shortest path algorithm. The method is applied on real surveillance videos.

Assigning Cameras to Subjects in Surveillance Systems

Given an environment with obstacles, and many people moving through it, we construct a separate video for each person, by stitching together video segments from multiple cameras over time. We employ a novel approach, using bipartite matching, to assign a camera to each person as a function of time, with camera switches when needed. When the number of people is large, we cluster as many people as possible into small groups, then assign cameras to groups using a minimum cost matching algorithm. The method is tested using numerous runs from different simulators.

Stochastic Multiple Scattering

We solve the problem of wave scattering by multiple spheres, subject to uncertain boundary conditions. Uncertainty is modeled through a Karhunen-Loève expansion of

the right hand side. Useful properties of spheres are exploited, by discretizing the problem in a basis of spherical harmonics, and speed-up is achieved through multipole reexpansion.

Implicitization Problem

Implicitization is the process of converting equations of curves and surfaces from parametric form into implicit form. We implement algorithms for currently available methods. In addition, we devise a new method for problems for which no direct method is available. The method relies on producing an approximation of the input problem. Several variants of this new method try to offer a compromise between its accuracy and versatility.

Virtual 3D tour inside a building

Implementation of a virtual tour inside the 4th floor of the Computer Science Department building using a real 3D model of the building. The model is rendered using lighting, shading and texturing. An obstacle detection algorithm is developed to allow the user to cross into rooms only through their doors.

OTHER SKILLS

Programming: Matlab, C/C++, OpenGL graphics library. Windows platform.
Languages: Arabic, English, French.

REFERENCES

Prof. Larry Davis
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Larry Herman
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