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OBJECTIVE

Seeking a challenging R&D career in 2D/3D Image Processing and Computer Vision for Biomedical Engineering (Availability: Jan '09)

SUMMARY

- PhD in Electrical Engineering (Currently in ABD; degree expected in Fall '08) with focus in 2D and 3D image processing, pattern recognition and classification (including Bayesian modeling of visual perceptions), parameter estimation, image fusion, image de-noising, image de-blurring, image segmentation, geometric modeling and calibration of sensors, and stochastic optimization
 - Experience with microscopic imaging systems
 - Experience in design and development of optical systems
 - Experience with instrumentation (design and development of robotic arm motions, computer camera interface, etc)
 - Research experience both in school and industry
 - Teaching and advising experience
 - Technical writing experience
 - Excellent communication skills
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EDUCATION

PhD in Electrical Engineering (ABD; degree expected in Fall '08)
The University of Tennessee at Knoxville, TN
Major: Image Processing and Computer Vision; Minors: Robotics, Probability and Statistics; GPA 3.88

MS in Computer Engineering (2001)
Wright State University, Dayton, OH
Major: Image Processing and Computer Vision; Minors: Software Engineering, Optics; GPA 3.70

BS in Computer Science and Engineering (1997)
Bangladesh University of Engineering and Technology, Dhaka, Bangladesh
Majors: Computer Software, Computer Hardware; Minors: Electrical Engineering, Mathematics; GPA 3.57

RESEARCH EXPERIENCE

- 2003–Present

The University of Tennessee at Knoxville, TN
Min H. Kao Department of Electrical Engineering and Computer Science
Imaging, Robotics, and Intelligent Systems (IRIS) Lab
Graduate Research Assistant

MRF (Markov Random Field) Stereo with Statistical Estimation of Parameters (PhD Dissertation) [2][5][6]:

PhD dissertation is focused on Markov Random Field (MRF) based stereo matching with statistical estimation of parameters. The proposed technique automatically estimates the parameters for an MRF based stereo matching algorithm. The contributions of the dissertation are gaining higher accuracy in matching and reducing time of convergence. MRF is applied in many applications in computer vision including image restoration, image reconstruction, motion detection, edge detection, region segmentation, texture and object matching, texture and object recognition, and pose estimation.

Automation on an XYT stage:

A GUI in Visual Basic was developed to control a motorized XYT stage. In the implementation, a PC communicated with three servo motors via an AT6400 indexer and three motor drivers. The goal was to rotate all three motors connected to the XYT stage synchronously to simulate the motion of a boat. Theoretical challenge was to estimate the motion parameters of the boat given the path of travel and maximum acceleration and deceleration.

Synchronized computer-camera interface for stereo vision [8][11]:

The goal was to reconstruct a scene in 3D from a calibrated stereo pair of the scene. A *thread* driven VC++ software to interface two cameras with computer USB ports was designed and developed. The objective was to capture binocular stereo images of a scene triggering shutters of the two stereo cameras simultaneously. The setup was used to capture stereo images of a scene which is not guaranteed to remain still such as a human face. Stereo images of human faces were successfully captured and reconstructed in 3D using this setup.

Scanning Electron Microscope (SEM) and Confocal Microscope imaging [7][9][10][15]:

SEM was used to capture micro- or nano-scale stereo images of object surfaces for 3D surface metrology. The challenge was to match noisy stereo images, which was overcome using annealing based energy minimizing algorithm. Confocal Microscope was used for the same purpose but in this case the object surface topology was obtained from confocal scans of the surface. Results thus obtained encouraged Y-12, Oak Ridge National Lab (ORNL) to provide funding for further research.

Survey on 3D face modeling for face recognition [1]:

As a part of 3D face recognition project a comprehensive survey was conducted on 3D face modeling. The survey included 3D scene modeling techniques: laser scanning, structured light projection, stereo vision, shape from motion, shape from space carving, morphing, and shape from shading. These are also general techniques for 3D scene modeling but in the survey, emphasis was given particularly on modeling of human faces as they are used for 3D assisted face recognition.

Image noise estimation using Macbeth chart:

Experiments were conducted to estimate random noise in images and also to observe dependency of noise level on intensity of images.

- 2002–2003

Digital Optics Technologies, Rolling Meadows, IL
Staff Engineer (R&D)

Sensor data fusion:

This was a demonstration project where images of the same scene, captured by two sensors active into two different ranges of wavelengths, were fused. One of the sensors was sensitive to organic elements such as trees, animals, etc and the other was sensitive to inorganic elements such as roads, buildings, etc.

Holographic optical correlation [3][4]:

A holographic optical correlator setup was developed for optical correlation of binary images. The goal of this project was parallel correlation of a user provided image with a batch of target images stored in a hologram. The project successfully correlated an image with 24 target images in parallel in its first phase and so was awarded funding for its second phase.

- 1999–2001

Wright State University, Dayton, OH
Department of Computer Science and Engineering
Intelligent Systems Lab
Graduate Research Assistant

3D reconstruction of human Faces [12]:

The goal of this project was to reconstruct 3D human faces in stereo video sequences. Active and passive stereo matching techniques were fused for stereo matching. In the active stereo part, matching was performed almost explicitly from laser scan of the face. The passive stereo involved matching with energy minimizing algorithm in the regions of the face where the active stereo (i.e. laser detection) failed.

MS Thesis:

Thesis title: 3D Reconstruction and Tracking of Human Face from a Stereo Image Sequence [12]

Advisor: Prof. Ardeshir Goshtasby

PUBLICATIONS

(Under Shafik Huq or Mohammad Huq)

- Book chapter:* [1] **S. Huq**, B. Abidi, S. Kong, and M. Abidi. Chapter 2: A Survey on 3D Modeling of Human Faces for Face Recognition. *3D Imaging for Safety and Security*, pp. 25–67. Publisher: Springer, Jul 2007; ISBN: 978-1-4020-6181-3
- Journals:* [2] (In Submission) **Shafik Huq**, Andreas Koschan, Besma Abidi, and Mongi Abidi. Parameter Estimated MRF Stereo with Occlusion Detection and Filling. *Int'l Journal of Computer Vision and Image Understanding*.
- [3] Mark Andrews, M. S. Shahriar, Renu Tripathi, **Mohammad Huq**, John T. Shen, “Shared Hardware Alternating Operation of a Superparallel Optical Holographic Correlator and a Superparallel Holographic RAM,” *Optical Engineering*, Vol. 43, No. 8, pp. 1856–1861, Aug 2004.
- [4] M. S. Shahriar, R. Tripathi, M. Kleinschmit, J. Donoghue, W. Weathers, **M. Huq**, and J. T. Shen. “Superparallel holographic correlator for ultrafast database searches,” *Optics Letters*, Vol. 28, No. 7, pp. 525–527, Apr 2003.
- Conferences:* [5] **Shafik Huq**, Andrea Koschan, Besma Abidi, and Mongi Abidi, “Efficient BP Stereo with Automatic Parameter Estimation,” to appear in the *Proc. of IEEE 15th Int'l Conf. on Image Processing (ICIP)*, Oct 2008.
- [6] **Shafik Huq**, Andreas Koschan, Besma Abidi, and Mongi Abidi, “MRF Stereo with Statistical Estimation of Parameters,” *Proc. of IEEE 4th Int'l Symposium on 3D Data Processing, Visualization, and Transmission (3DPVT)*, Atlanta, Jun 2008.
- [7] **Shafik Huq**, Besma Abidi, David Page, and Mongi Abidi, J. Frafjord, S. Deckanich, “Inspection of Fracture Surfaces using 3D from Stereo Images of Large Chamber SEM,” *Int'l Conf. on Microscopy and Microanalysis (ICMM)*, Florida, Aug 5–9, 2007.
- [8] **Shafik Huq**, Besma Abidi, and Mongi Abidi, “Stereo-based 3D Face Modeling using Annealing in Local Energy Minimization,” *IEEE 14th Int'l Conf. on Image Analysis and Processing (ICIAP)*, Modena, Italy, Sep 10–13, 2007.
- [9] **S. Huq**, B. Abidi, C. Kammerud, M. Abidi, J. Frafjord, S. Deckanich, “3D Measurements of Wear on Machining Tools Using a Confocal Microscope,” *Int'l Conf. on Microscopy and Microanalysis jointly with Int'l Metallographic Society (IMS)*, Vol. 34, No. 2, Aug 2006.
- [10] C. Kammerud, B. Abidi, **S. Huq**, and M. Abidi, “3D Nanovision for the Inspection of Micro-Electro-Mechanical Systems,” *IEEE Int'l Conf. on Electronics, Circuits, and Systems (ICECS)*, Gammarth, Tunisia, Dec 2005.

[11] B. Abidi, **S. Huq**, and M. Abidi, "Fusion of Visual, Thermal, and Range as a Solution to Illumination and Pose Restrictions in Face Recognition," *Proc. of IEEE Carnahan Conf. on Security Technology (ICST)*, Albuquerque, NM, pp. 325–330, Oct 2004.

[12] **Shafik Huq**, Besma Abidi, Ardeshir Goshtasby, and Mongi Abidi, "Stereo Matching with Energy Minimizing Snake Grid for 3D Face Modeling," *Proc. of SPIE Defense and Security Symposium*, Vol. 5405, pp. 530–536, Apr 2004.

Topical Meetings:

[13] **Shafik Huq**, Besma Abidi, David Page, Mongi Abidi, J. Frafjord, S. Deckanich, "3D Modeling from Large Chamber SEM Stereo Images for Micro-scale Surface Inspection and Characterization," *2nd Topical Int'l Meeting on Emergency Preparedness & Response and Robotic & Remote Systems*, NM, USA, Mar 2008.

[14] W. Hao, **S. Huq**, D. Page, B. Abidi, A. Koschan, and M. Abidi, "Nano-Scale 3D Metrology for Surface Characterization and Inspection of High-Precision Manufactured Components," *ANS/ENS International Meeting*, Washington, DC, Nov 11–15, 2007.

[15] **S. Huq**, B. Abidi, D. Page, M. Abidi, J. Frafjord, S. Deckanich. Nano-scale Imaging Research. *Poster in National Nuclear Security Administration (NNSA)*, Sep 2006.

TEACHING and ADVISING

- **Ahsanullah University of Science and Technology, Dhaka, Bangladesh**

Department of Computer Science and Engineering

Lecturer (1997–1999)

Teaching:

Taught freshmen and sophomores a number of undergraduate level courses. The courses were Simulation Modeling, Numerical Methods, 4-bit Microprocessor Design and Implementation, and Computer Programming Languages.

Laboratory development:

Determined the need for and procured equipments for laboratories used by students of Computer Science and Electrical Engineering departments

Seminar organization:

Organized seminars for invited talk presented by international scholars (2 scholars from the US and 1 from Japan)

Co-curricular activities:

Organized inter-department tournament on a game called Cricket; mentored programmer teams formed by advanced students for participation in international ACM programming contest

- **The University of Tennessee at Knoxville, TN**

Min H. Kao Dept. of Electrical Engineering and Computer Science

Graduate Research Assistant, 2003–Present

Advising:

Advised a PhD student of the Department of Mechanical Engineering, UTK in special topic course in computer vision for two semesters (Fall '07 and Spring '08). The course was offered by the Department of Electrical Engineering and Computer Science, UTK.

TECHNICAL WRITING and PAPER REVIEW

- **The University of Tennessee at Knoxville, TN**

Min H. Kao Dept. of Electrical Engineering and Computer Science

Graduate Research Assistant, 2003–Present

Assisted in writing proposals for Computer Vision based solicitations.

- **Digital Optics Technologies, Rolling Meadows, IL**
Staff Engineer (R&D), 2002–2003

Assisted in writing proposals for Computer Vision and Optics based solicitations.

- **Reviewer of JPRR** (Journal of Pattern Recognition Research)
<http://www.jprr.org/index.php/jprr>
- **Reviewer of 3DPVT** (International Symposium on 3D Data Processing, Visualization, and Transmission)
<http://www.3dpvt.org/>

HONORS and AWARDS

- Admission Test Merit List award from Bangladesh University of Engineering and Technology, Dhaka, Bangladesh (42nd among 3500 top students selected from the whole country based on GPA)
- 1st among 5000 regional College students
- 1st among 8000 regional High School students

COMPUTER SKILLS

Programming Languages/Packages/Libraries:

Visual C++ .NET, C/C++, Assembly, Visual Basic 6.0, Matlab, OpenGL, Java, HTML, VBScript, MS Office

GUI development skills:

Visual C++ .NET, Visual Basic 6.0, OpenGL, Java, Matlab

Networking protocol knowledge and software development skills:

TCP/IP (Physically implemented and run in laboratory communicating computers with 'I' and 'T' connectors), Datagram, OpNet (Optimum networking software), Distributed computing

Concurrent processing skills:

Multithreaded applications with locking and unlocking of shared resources

Operating Systems:

Windows, UNIX, LINUX

REFERENCES

1. Dr. Mongi A. Abidi
(<http://www.eecs.utk.edu/faculty/abidi/main>)
Professor, Min H. Kao Dept. of Electrical Engineering and Computer Science
The University of Tennessee at Knoxville
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2. Dr. Selim M. Shahriar
(http://www.ece.northwestern.edu/faculty/Shahriar_Selim.html)
Associate Professor, Dept. of Electrical and Computer Engineering
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3. Dr. Ardeshir Goshtasby
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