Srikumar Ramalingam

Research Associate, Vision Lab, Oxford Brookes Univ., UK [Adv: Prof. Philip H.S. Torr]
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Education

Ph.D in Computer Science, 2006
INRIA Rhone Alples, France [Adv. Dr. Peter Sturm]

Jointly[1]enrolled at Institut National Polytechnique de Grenoble (INPG), France &
University of California, Santa Cruz,USA [Adv. Prof. Suresh Lodha].

M.S in Computer Science (CGPG : 3.8 on 4.0), 2004
University of California, Santa Cruz, USA.

B.E in Computer Science (CGPA : 8.7 on 10), 2001
College of Engineering at Guindy, Anna University, Madras, India.

Objective

Research scientist or Postdoc position in a Research Lab or University.

Research Interests

Computer vision (3D reconstruction, energy minimization, graph cuts, omnidirectional cameras, camera calibration, scene understanding)

Research

Oxford Brookes University, Oxford UK
Research Associate Sep06-Present
Prof. Phil Torr.

- Bayesian Single View 3D Reconstruction
- Multilabel and Higher Order Clique problems in Graph Cuts

Microsoft Research, Cambridge UK
Research Intern Jun-06-Aug-06
Dr. Andrew Fitzgibbon & Dr. Antonio Criminisi.

- Bayesian Priors for single point camera calibration

Project MOVI, INRIA Rhone Alpes France
Ph.D Candidate/Research Internship Jun03-Sep03, Apr04-Sep04, July05-Jun-06
Dr. Peter Sturm.

- Theory, algorithms and experiments for generic camera calibration (Ph.D thesis)
- Generic structure-from-motion framework

[1]Ph.D Co-supervision agreement referred as *cotutelle de these* in French

- Generic self-calibration of central and radially symmetric cameras

University of California, Santa Cruz USA
Ph.D Candidate/Research Assistant Sep01-May03, Oct03-Mar04, Oct04-Jun05
Prof. Suresh Lodha.

- 3D reconstruction from multi-scale images (Masters thesis)
- Semi-automated 3D reconstruction of UCSC campus from multiple sensors
- Geo-spatial visualization

Skills

- OpenGL, VRML, Matlab, Maple, Java, C, C++, Unix, Solaris, LaTeX, Xilinx

Teaching

Oxford Brookes University, Oxford, UK UK
Co-Instructor

- Machine Vision, 2007, 2008

University of California, Santa Cruz USA
Teaching Assistant

- ENGR27: Engineering mathematics, Winter 2002
- CMPS160: Computer graphics, Spring 2003
- CMPS201: Analysis of algorithms, Winter 2005
- MATH11B: Calculus for applications, Spring 2005

Relevant course work

Computer graphics, Computer vision, Image processing, Artificial intelligence, Analysis of algorithms, Statistical signal processing, Probability and statistics, Multimedia systems, Engineering mathematics, Calculus, C/C++/Java/VC++/VB.

Awards and Grants

- Honorable Mention *APRIF Thesis Award 2007* given by French Association for Pattern Recognition.
- One of the two french finalists for *Cor Baayen Thesis Award 2007* given by European Consortium for Informatics and Mathematics (ERCIM).
- Marie Curie Scholarship for the years 2005 and 2006 by the European Union.
- Member of UC Santa Cruz ACM Programming Team (CyberSlugs-1): Represented UCSC in 2004 ACM Pacific Northwest Programming Contest competing with 50 other universities from USA and Canada.
- Student Travel Grant to attend ECCV 2004, Prague, May 11-14, 2004.
- Regents Fellowship in UC Santa Cruz for Fall 2001.
- National Merit Scholarship for scoring the highest marks in Mathematics in All India Secondary School Exam (AISSE) in 1995.

- Stood among 0.1% in Tamil Nadu State Engineering Entrance Examination (over 100,000 students) in India in 1997.

Patents

- Title: Online calibration of camera families in structure-poor scenes
  Under submission with Microsoft Research, Cambridge, UK (with Andrew Fitzgibbon and Antonio Criminisi)

[2]Computer Vision, Graphics and Image processing conferences

Srikumar Ramalingam, Pushmeet Kohli, Karteek Alahari, Philip H.S. Torr, Exact Inference in Multi-label Higher Order Clique CRFs, To appear in CVPR, Alaska, USA, 2008.

Srikumar Ramalingam, Peter Sturm, Minimal Solutions for Generic Imaging Models, To appear in CVPR, Alaska, USA, 2008.

Gregory Rogez, Jonathan Rihan, Srikumar Ramalingam, Carlos Oritte, Philip H.S. Torr, Randomized Trees for Human Pose Estimation, To appear in CVPR, Alaska, USA, 2008.

Andrew Fitzgibbon, Duncan Robertson, Antonio Criminisi, Srikumar Ramalingam, Andrew Blake, Learning Priors for Calibrating Families of Stereo Cameras, ICCV, Brazil, 2007.

Srikumar Ramalingam, Peter Sturm and Edmond Boyer, A factorization based self-calibration for radially symmetric cameras, 3DPVT, USA, 2006.

Srikumar Ramalingam, Peter Sturm and Suresh K. Lodha, Theory and calibration algorithms for axial cameras, ACCV, Hyderabad, India, 2006.

Srikumar Ramalingam, Peter Sturm and Suresh K. Lodha, Towards generic self-calibration of central cameras, OMNIVIS in ICCV, Beijing, China, 2005.

Peter Sturm, Srikumar Ramalingam and Suresh K. Lodha, On calibration, structure-from-motion and multi-view geometry for panoramic imaging models, ISPRS Panoramic Photogrammetry Workshop, Berlin, Germany, 2005.

Srikumar Ramalingam, Peter Sturm and Suresh K. Lodha, Towards complete generic camera calibration, CVPR, Vol.1, 1093-1098, San Diego, USA, 2005.

Srikumar Ramalingam, Suresh K. Lodha and Peter Sturm, A generic cross camera structure-from-motion analysis, OMNIVIS in ECCV, Prague, Czech Republic, 2004.

Peter Sturm and Srikumar Ramalingam, A generic concept for camera calibration, ECCV, Vol.2, 1-13, Prague, Czech Republic, 2004.

Srikumar Ramalingam and Suresh K. Lodha, Adaptive enhancement of 3D scenes using hierarchical registration of texture mapped models, 3DIM, 203-210, Alberta, Canada, 2003.

[2]All publications available at http://www.soe.ucsc.edu/∼srikumar/publications.html

Suresh Lodha, Amin P. Charaniya, Nikolai M. Faaland and Srikumar Ramalingam, Visualization of spatio-temporal GPS uncertainty within a GIS environment, SPIE, 216-227, Florida, USA, 2002.

Suresh K. Lodha, Nikolai M. Faaland, Grant Wong, Amin P. Charaniya, Srikumar Ramalingam and Arthur M. Keller, Consistent visualization and querying of GIS databases by a location-aware mobile agent, CGI, 248-253, Tokyo, Japan, 2002.

Srikumar Ramalingam and Malarvizhi Chinnusamy, Strong encryption using steganography and digital watermarking, PCS, 425-428, Seoul, Korea, 2001.

Srikumar Ramalingam, Mobile code security, In Proc. of SPIE Vol. 4534, 47-54, USA, 2001.

Journals, Tutorials, Edited Book

Srikumar Ramalingam, Suresh K. Lodha and Peter Sturm, A generic structure-from-motion framework, CVIU, 2006.

Srikumar Ramalingam and Suresh K. Lodha, 3D reconstruction from multi-scale images, CVIU [Under submission].

Srikumar Ramalingam, Peter Sturm and Suresh K. Lodha, Toward Complete Calibration of Generic Imaging Models, PAMI [Under submission].

Srikumar Ramalingam, Peter Sturm and Suresh K. Lodha, Generic Calibration in Practice: Axial Cameras and Degeneracy analysis, PAMI [Under submission].

Srikumar Ramalingam, Generic Models and Algorithms for Camera Calibration and Structure-from-Motion, Tutorial at ECCV-2006 (along with Peter Sturm and Rahul Swaminathan).

Peter Sturm, Srikumar Ramalingam and Suresh K. Lodha, On calibration, structure-from-motion and multi-view geometry for generic camera models, In Edited Book, Imaging beyond the pinhole camera, K. Daniilidis, R. Klette, and A. Leonardis (editors), Kluwer Academic Publishers, 2005.

Thesis and Reports

Srikumar Ramalingam, Generic Imaging models: Calibration and 3D reconstruction algorithms, Ph.D Thesis, jointly at INRIA Rhone Alpes in France & UC Santa Cruz in USA, November 2006. **Honorable mention AFRIF Thesis award given by french association for pattern recognition**. Thesis committee: Peter Sturm, Suresh K. Lodha, Andrew Fitzgibbon, Tomas Pajdla, Hai Tao, Augustin Lux and James Crowley.

Srikumar Ramalingam, 3D Reconstruction from multiresolution images, Masters thesis, Thesis Committee: Suresh K.Lodha, Roberto Manduchi, Marc Pollefeys (UNC Chappel Hill), Peter Sturm (INRIA France) and Hai Tao, Department of Computer Science, UC Santa Cruz, USA, 2004.

Srikumar Ramalingam, Second Foundation: Efficient simulation of quantum algorithms,

B.E Thesis, Along with Lenin Singaravelu and Raja Ganjigunta, Supervisors: T.V. Gopal (CS Dept.) and Murali (Physics Dept.), CEG at Guindy in Anna University, India, 2001.

Srikumar Ramalingam, Peter Sturm and Suresh K. Lodha, Generic Calibration of Axial Cameras, INRIA Research Report, RR5827, 2005.

Srikumar Ramalingam, Peter Sturm and Suresh K. Lodha, Theory and experiments towards complete generic calibration, RR 5562, INRIA Rhone Alpes, France, 2005.

Peter Sturm and Srikumar Ramalingam, A generic calibration concept-theory and algorithms, RR 5058, INRIA Rhone Alpes, France, 2003.

Suresh K. Lodha, Amin P. Charaniya, Srikumar Ramalingam and Nikolai M. Faaland, Challenges of uncertain reality in mobile situational visualization, Tech Report UCSC-CRL-02-22, Dept of Computer Science, University of California, Santa Cruz, USA, 2002.

Interactive Demonstrations

Srikumar Ramalingam, Nikolai Faaland, Amin P. Charaniya and Suresh Lodha, GeoSpatial registration and consistent visualization of heterogeneous geoSpatial intelligence, Interactive demonstration in IEEE Vis., Boston, USA, 2002.

Amin Charaniya, Srikumar Ramalingam, Suresh Lodha, William Ribarsky, Nicholas Faust, Zach Wartell, and Tony Wasilewski, Real-time uncertainty visualization of mobile objects within VGIS, Interactive demonstration and poster, IEEE Vis., Boston , USA, 2002.

[3]**Selected Projects**

Global Minimization of Multilabel Higher Order Clique Energy Functions: Most problems in computer vision involve energy functions with multi-label (non binary) variables. Further, they can be of arbitrary order. In this work, we study the problem of transforming multi-label functions of any order into binary second order functions. There are many ways to perform this transformation. The choice of the transformation dictates the size of the resulting binary energy function and the class of multilabel higher order energy functions that can be characterized. Our transformations enable the use of the st-mincut in a graph for minimizing multilabel higher order energy functions, which has not possible earlier. Further, it can be used to derive the transformation which leads to a binary energy with minimum number of variables and can handle the most general class of functions. Our main contributions are two-fold. First, we provide a principled general purpose framework that provides researchers the choice of different transformations. Second, we enlarge the subclass of submodular energy functions that can be solved exactly using graph cuts.

Online calibration of camera families in structure-poor-scenes. we consider the calibration of families of cameras—specifically stereo rigs—where each rig is assumed to have parameters drawn from an unknown prior distribution. We show how estimation of the prior model using a small number of offline-calibrated cameras leads to a robust prior which allows online recalibration of any single camera using as few as one or two point correspondences. We show that by appropriate overparameterization of the rig geometry we can find an accurate Gaussian model despite limited training data, and that estimation under this prior, using a small number of correspondences, yields more accurate calibrations than using all point matches in the scene.

Theory and algorithms for generic imaging models: Generic imaging model refers to a camera consisting of a set of unconstrained projection rays without any parametric relation with the pixels in the image. Generic calibration refers to the mapping of projection rays to corresponding image pixels using a nonparametric method. We were successful in calibrating a wide variety of cameras such as pinhole, central catadioptric camera with hyperbolic mirror, noncentral catadioptric camera with spherical mirror, fisheye lens, eye based catadioptric camera and multicamera setups.

Towards generic camera self-calibration of central cameras: We consider the self-calibration problem for the generic imaging model. In this project, we consider the *central* variant of this model, which encompasses all camera models with a single effective viewpoint. Self-calibration refers to calibrating a camera's projection rays, purely from matches between images, i.e. without knowledge about the scene such as using a calibration grid.

Semi-automated reconstruction of UCSC buildings: We model and reconstruct the buildings and terrain in UCSC campus using a semi-automated algorithm. A coarse texture mapped 3D model for the campus is first constructed using various sensors. For example, we model the terrain, height of the buildings and wall textures using the information obtained from DEM, LiDAR and cameras respectively.

3D reconstruction from multi-scale images: The input to this project consists of a

[3]Project details available at http://www.soe.ucsc.edu/∼srikumar/projects.html

coarse 3D urban model and image pairs of important scenes captured from successively closer distances. The goal is to improve the resolution of specific subscenes. First, from the image pairs at successively closer distances, we extract 3D models of successively higher resolutions. Then we use a new hierarchical approach to register these 3D models on the coarse urban model. This is done by matching images at different scales using a scale invariant image matching algorithm (similar to the usage of SIFT feature). (Masters Thesis work)

ROAM on LiDAR data: We applied Real Time Optimally Meshing algorithm (ROAM) algorithm on the LiDAR data of UC Santa Cruz campus using two different heap structures. The project focused on comparing the real-time performance of rendering the data using binary heap and pairing heap implementations. The coding was done in C++ with OpenGL libraries. (part of Analysis of Algorithms course in Winter 2003 under Prof. Allen Van Gelder)

Plugin for adobe photoshop: Implementation of scalar and vector quantization modules in VC++ for Adobe Photoshop. (part of multimedia systems course under Prof. Roberto Manduchi)

Quantum computer simulator: A quantum computer simulator was designed and implemented to develop algorithms using qbits and quantum gates. We demonstrated three basic quantum algorithms such as shor's factorization, deutsch algorithm and quantum search. The project was done in Java. (B.E final project at Anna University, India.

General Activities

- IEEE member, Reviewer for PAMI, ECCV, CVPR, ICCV, Omnivis, ICPR, ACCV, MVA and CVIU.
- Winner of logical programming contests (Softest, Softalk, Impromptu and Cryptic Coding) during the years 1998,1999 and 2000 in Anna university, India.
- Best paper award for a paper on steganography in Shaastra-2000, a national technical symposium at IIT Madras, India.

Citizenship and Visa Status

- Citizen of India, Currently holding work permit in UK.

References

- Peter Sturm, INRIA Rhone Alpes, France, Peter.Sturm@inrialpes.fr
- Phil Torr, Oxford Brookes University, Oxford, UK philiptorr@brookes.ac.uk
- Suresh K. Lodha, University of California, Santa Cruz, USA, lodha@soe.ucsc.edu
- Andrew Fitzgibbon, Microsoft Research, Cambridge, UK awf@microsoft.com
- Hai Tao, University of California, Santa Cruz, USA, tao@soe.ucsc.edu