// Vineet R. Kamat, Ph.D.

Associate Professor of Civil Environmental | John L. Tishman Faculty Scholar
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EDUCATION

Doctor of Philosophy, Civil Engineering, May 2003
Major: Construction Engineering and Management
School: Virginia Polytechnic Institute & State University, Blacksburg, VA
Dissertation Title:
VITASCOPE: Extensible and Scalable 3D Visualization of Simulated Construction Operations

Master of Science, Civil Engineering, December 2000
Major: Construction Engineering and Management
School: Virginia Polytechnic Institute & State University, Blacksburg, VA
Thesis Title:
Enabling 3D Visualization of Simulated Construction Operations

Bachelor of Engineering, Civil Engineering, June 1998
4 Year Professional Degree
Graduated with *First Class Honors and Distinction (Summa cum Laude)*
School: Goa University, Taleigao, Goa, India

PROFESSIONAL EXPERIENCE

Associate Professor of Civil and Environmental Engineering, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI, 2009 – Present

Co-Founder and Chief Science Officer, Perception Analytics & Robotics LLC (PeARL), Ann Arbor, MI, 2013 – Present

Assistant Professor of Civil and Environmental Engineering, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI, 2003 – 2009

Adjunct Assistant Professor of Civil and Environmental Engineering, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI, 2003

Research Assistant, Department of Civil and Environmental Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA, 1998 – 2003

HONORS AND AWARDS

- **John L. Tishman CM Faculty Scholarship**
    - University of Michigan, 2015
    - *This award recognizes excellence, productivity, commitment, and leadership of Tishman Construction Management Program (TCMP) faculty. In addition to recognizing sustained productivity and excellence in Construction Management research and education, the award recognizes leadership and commitment in the administration of the TCMP graduate program.*
- **Best Paper Award**
    - International Symposium on Automation and Robotics in Construction and Mining (ISARC), 2014
    - *Awarded for the paper titled "Towards Autonomous Robotic In-Situ Assembly on Unstructured Construction Sites Using Monocular Vision".*
- **Best Paper Award**
    - ASCE Construction Research Congress, 2014
    - *Awarded for the paper titled "Leveraging Structural Health Monitoring for Bridge Condition Assessment".*
- **Daniel W. Halpin Award for Scholarship in Construction**
    - American Society of Civil Engineers (ASCE), 2012
    - *The Daniel W. Halpin Award for Scholarship in Construction recognizes an ASCE member who has demonstrated outstanding scholarship that advances construction engineering as a science. The award was presented to Prof. Kamat for "… demonstrating outstanding scholarship in construction engineering through pioneering research and education in construction visualization."*
- **PartnerBot Award for Research in Construction Robotics**
    - ClearPath Robotics, 2012
    - *The ClearPath Robotics PartnerBot Award is provided for innovative robotics development, prototyping, and research. The specific project that received this award is titled "Evaluation of Autonomous Mobile Robotics for Repetitive Construction Tasks in Unstructured Outdoor Environments."*
- **Frank and Brooke Transue CEE Faculty Scholarship**
    - University of Michigan, 2011
    - *This endowed award is granted to a faculty member who has demonstrated outstanding achievement and promise in multiple dimensions of the Department of Civil and Environmental Engineering and the University of Michigan missions.*
- **Outstanding Early Career Researcher Award**
    - Celebration of Engineering & Technology Innovation (CETI) Program, FIATECH, 2010
    - *This award honors individuals who have made significant strides in advancing innovation in research and development that impacts the design, engineering, construction, and maintenance of large capital assets.*

- **Civil and Environmental Engineering Award for Outstanding Accomplishment**
    - University of Michigan, 2007
    - *The Civil and Environmental Engineering Award for Outstanding Accomplishment is awarded annually by the College of Engineering to recognize outstanding achievements in research, teaching and service.*
- **Keynote Speaker**
    - 7th International Conference on Construction Applications of Virtual Reality, Pennsylvania State University, 2007
    - *Invited to provide the keynote address on "Advanced Applications of Mobile Augmented Reality in Architecture, Engineering, and Construction".*
- **Outstanding Young Alumnus Award**
    - Department of Civil and Environmental Engineering
    - Virginia Polytechnic Institute & State University, 2007
    - *This award honors young alumni for their overall career accomplishments and contributions to the profession, their community, and service to Virginia Tech.*
- **Outstanding Young Alumnus Award**
    - Myers-Lawson School of Construction
    - Virginia Polytechnic Institute & State University, 2006
    - *This award honors young alumni for their overall career accomplishments in construction research and education or construction professional practice.*
- **Best Paper Award**
    - ASCE Construction Research Congress, 2005
    - *Awarded for the paper titled "Rapid Post-Disaster Evaluation of Building Damage Using Augmented Situational Visualization".*
- **Best Paper Award**
    - ASCE Journal of Computing in Civil Engineering, 2004
    - *Awarded for the paper titled "Dynamic Three-Dimensional Visualization of Fluid Construction Materials".*
- **NSF CAREER Award**
    - National Science Foundation, 2005 – 2010
    - *This award is the National Science Foundation's most prestigious award for junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research.*
- **Vecellio Fellowship**
    - Virginia Polytechnic Institute & State University, 2002 – 2003
    - *This endowed fellowship is awarded to Ph.D. students based on their outstanding academic and professional achievements.*
- **Tuition Scholarship and Research Assistantship**
    - Virginia Polytechnic Institute & State University, 1998 – 2003
- **First Class Honors with Distinction in Baccalaureate Degree**
    - Goa University, India, 1998
    - *Equivalent to Summa cum Laude in Latin honors*

- **Merit Scholarship**
    - Goa University, India, 1997 –1998
    - *This scholarship is awarded at the end of the junior year to the top-most undergraduate students in Mechanical, Electrical, Electronics, Computer Science, and Civil Engineering from undergraduate programs at Goa University.*
- **Tau Beta Pi**
    - The Engineering Honor Society, 2013
- **Chi Epsilon**
    - The National Civil Engineering Honor Society, 2004

COURSES TAUGHT AT THE UNIVERSITY OF MICHIGAN

CEE 501(020): Automation and Robotics in Construction (3 credits)
Introduction to construction automation and robotics; Human-machine interactions; Localization, pose estimation, navigation, and manipulation of construction robots in unstructured environments; tele-operated construction robots; Autonomous construction robots; Augmented Reality interfaces for construction robots; Rapid prototyping of construction robots and automation systems; Examples and case studies from construction.

CEE 930(047): Advanced Topics in Computer-Integrated Construction (3 credits)
Advanced topics in computerized systems for real-time planning, monitoring, and control of civil infrastructure projects; Topics include building information modeling systems for computer-integrated construction, real-time monitoring of construction processes, visual simulation of construction operations, data analysis for construction information systems, and robotic systems for construction automation. Students design and implement computerized systems and apply them to planning, monitoring, and control problems in construction.

CEE 930(020): Construction Industry Institute (CII) Best Practices (3 credits)
Current issues in the construction industry; Introduction to the Construction Industry Institute (CII) Best Practices defined and developed by CII over the last 25 years; The course covers the majority of CII Best Practices, such as Front End Planning, Zero Accident Techniques, Constructability and Materials Management; Each lecture focuses on one Best Practice or practice, and critical issues facing the construction industry.

CEE 431: Construction Contracting (4 credits)
Construction contracting for contractors, architects, and owners; Organization and administration; Industry structure; Construction contracts, bonds, and insurance; Planning, estimating, and control; Quantity takeoff and pricing; Labor and equipment estimates; Estimating excavation and concrete; Proposal preparation; Scheduling; Accounting and cost control.

CEE 531: Construction Cost Engineering (3 credits)
Cost engineering for construction organizations, projects, and operations; Construction financing; Break-even, profit, and cash flow analyses; Capital budgeting; Equipment cost and procurement decisions; Construction financial accounting, cost accounting, cost control systems, and databases; Cost indices, parametric estimates, and unit price proposals.

CEE 539: Construction Management Information Systems (MIS) (3 credits)
Automation of construction engineering and management functions using modern analysis, design, and productivity tools; Modeling and graphical 3D visualization of construction processes and products; Mobile computing and information systems to support engineering tasks.

CEE 633: Construction Management Information Systems (MIS) (3 credits)
Design of computerized construction management information systems (MIS); Introduction to databases and information management systems for computer-aided construction engineering and management; Topics include engineering data modeling issues, relational and object-oriented models, and data mining for textual and graphical information systems.

TABULATION OF COURSE EVALUATIONS

Classes taught at the University of Michigan are evaluated on a scale of 5.0:
Q1: Overall, this was an excellent course Q2: Overall, this was an excellent instructor

Course #	Title	Term	Students	Q1	Q2
CEE 531	Construction Cost Engineering	F-14	24	4.56	5.00
CEE 501	Automation and Robotics in Const.	W-14	09	4.83	4.83
CEE 531	Construction Cost Engineering	F-13	19	4.92	4.92
CEE 930	Computer-Integrated Construction	W-13	06	4.83	4.83
CEE 531	Construction Cost Engineering	W-13	14	4.30	4.50
CEE 539	Construction MIS	F-12	17	4.86	4.94
CEE 930	CII Best Practices	F-12	09	4.00	4.25
CEE 531	Construction Cost Engineering	W-12	28	4.64	4.64
CEE 539	Construction MIS	F-11	23	4.42	4.56
CEE 539	Construction MIS	W-11	27	4.50	4.50
CEE 531	Construction Cost Engineering	W-11	27	4.00	4.67
CEE 539	Construction MIS	W-10	17	4.25	4.13
CEE 431	Construction Contracting	FA-09	40	4.19	4.40
CEE 531	Construction Cost Engineering	FA-09	10	4.63	4.80
CEE 431	Construction Contracting	W-09	38	3.80	4.33
CEE 431	Construction Contracting	FA-08	41	4.59	4.67
CEE 531	Construction Cost Engineering	FA-08	15	4.40	4.58
CEE 431	Construction Contracting	W-08	57	4.00	4.25
CEE 633	Construction MIS	FA-07	09	4.83	4.93
CEE 531	Construction Cost Engineering	FA-07	14	3.60	3.75
CEE 431	Construction Contracting	W-07	38	3.97	4.19
CEE 431	Construction Contracting	FA-06	31	3.92	4.11
CEE 531	Construction Cost Engineering	FA-06	20	4.60	4.75
CEE 431	Construction Contracting	W-06	42	3.86	4.32
CEE 633	Construction MIS	FA-05	08	4.50	4.50
CEE 531	Construction Cost Engineering	FA-05	16	4.00	4.25
CEE 431	Construction Contracting	W-05	37	3.79	4.75

CEE 531	Construction Cost Engineering	FA-04	27	4.04	4.44
CEE 431	Construction Contracting	W-04	47	3.74	4.29
CEE 531	Construction Cost Engineering	FA-03	13	4.15	4.69

SHORT COURSES

Instructor, "Information Technology in Construction: Advanced Topics in Computer-Integrated Construction", Taught at Hanyang University, Seoul, Korea, 2015

Instructor, "Project Management and Heavy Construction Equipment", Taught at JayPee University of Information Technology (JUIT), Waknaghat, India, 2011

Instructor, "Practical Techniques for Accounting, Estimating, and Cost Control in Construction", Taught at the Hong Kong Polytechnic University, Kowloon, Hong Kong, 2008

POST-DOCTORAL SCHOLARS SUPERVISED

Jeonghwan Kim, Ph.D., Post-Doctoral Scholar, 2014-16
Project: Human-Robot Collaboration. (Co-advised with S. Lee)

Manu Akula, Ph.D., Post-Doctoral Scholar, 2013-14
Currently Co-Founder and Chief Executive Officer, Perception Analytics and Robotics LLC.
Project: Real Time Knowledge-Based Excavator Control.

Suyang Dong, Ph.D., Post-Doctoral Scholar, 2013-14
Currently Co-Founder and Chief Technology Officer, Perception Analytics and Robotics LLC.
Project: Augmented Reality Visualization for Excavator Guidance.

Ehsan Rezazadeh-Azar, Ph.D., Post-Doctoral Scholar, 2013-14
Currently Assistant Professor at Lakehead University, Canada.
Project: Proximity Monitoring for Real Time Knowledge-Based Excavator Control.

HyounSeok Moon, Ph.D., Post-Doctoral Scholar, 2012-13
Currently Senior Researcher at Korea Institute of Construction Technology.
Project: Graphical Human Modeling and Ergonomic Analysis of Repetitive Construction Work.

RESEARCH STAFF SUPERVISED

Steve Chapel, Software Programmer, 2014-15
Project: Machine Control of Construction Equipment Using Computer Vision.

Melora Goosey, Software Programmer, 2014-15
Project: Machine Control of Construction Equipment Using Computer Vision.

PH.D. STUDENTS SUPERVISED

Kurt Lundeen, Ph.D. Student, Expected to become Ph.D. candidate by December 2016, and expected to graduate by May 2018, Chair.
Dissertation: Manipulation Problems in Mobile Articulated Construction Robots.

Yong Xiao, Ph.D. Student, Expected to become Ph.D. candidate by December 2015, and expected to graduate by May 2017, Chair.

Dissertation: Spatial Reasoning and Mapping for Intelligent Construction Robots.
Chen Feng, Ph.D. Candidate, Expected to graduate by May 2015, Chair.
Dissertation: Localization and Pose Estimation Problems in Mobile Construction Robotics.

Ihab A. Ismail, Ph.D., Graduated in April 2014, Chair.
Currently Co-Founder and Managing Director at Enovio Consulting.
Dissertation: Financial Cash Flow Determinants of Company Failure in the Construction Industry.

Manu Akula, Ph.D., Graduated in May 2013, Chair.
Currently Co-Founder and Chief Executive Officer, Perception Analytics and Robotics LLC.
Dissertation: Real-Time Context-Aware Computing with Applications in Civil Infrastructure Systems.

Sanat A. Talmaki, Ph.D., Graduated in December 2012, Chair.
Currently Research Engineer (Leadership Development Track) at Caterpillar, Inc.
Dissertation: Real-Time Visualization for Prevention of Excavation Related Utility Strikes.

Suyang Dong, Ph.D., Graduated in August 2012, Chair.
Currently Co-Founder and Chief Technology Officer, Perception Analytics and Robotics LLC.
Dissertation: Scalable and Extensible Augmented Reality with Applications in Civil Infrastructure Systems.

Hiam M. Khoury, Ph.D., Graduated in June 2009, Chair.
Currently Assistant Professor at the American University of Beirut (AUB).
Dissertation: Context-Aware Information Access and Retrieval for Rapid On-Site Decision Making in Construction, Inspection and Maintenance of Constructed Facilities.

Amir H. Behzadan, Ph.D., Graduated in May 2008, Chair.
Currently Assistant Professor at the University of Central Florida (UCF).
Dissertation: ARVISCOPE: Geo-referenced Visualization of Dynamic Construction Processes in Three-Dimensional Outdoor Augmented Reality.

MASTER'S STUDENTS AND SCHOLARS SUPERVISED

Zhiyuan Zuo, MSE (Robotics), Expected to graduate in December 2015.
Project: Data Collection Using UAVs.

Kurt Lundeen, MSE (ME), Expected to graduate in December 2015.
Project: End-Effector Monitoring of Articulated Construction Robots.

Bharadwaj Mantha, MSE (CE&M), Graduated in December 2014.
Project: Building Energy Simulation. (Co-advised with C. Menassa)

Chao-Chung Yang, M.S., Visiting Master's Scholar, 2014-2015
Project: Interactive Building Information Modeling on Construction Sites.

Aakash Mittal, MSE (CE&M), Graduate in December 2014.
Project: Pose Estimation of Articulated Construction Excavator.

Varsha Venkatesh, M.Eng. (Robotics), Graduated in December 2013.
Project: Worker Tracking on Construction Sites Using Computer Vision.

Nicholas Fredricks, M.Eng. (CE&M), Graduated in December 2013.
Project: Robot Navigation in Low Dynamic Environments.

Srinath Sridhar, MSE (EE), Graduated in May 2012.
Project: Semantic Object Recognition for Augmented Reality.

Ali Golabchi, MSE (CE&M), Graduated in December 2012.
Project: Interoperability Issues between Different BIM Software Products.

Chen Feng, MSE (CE&M), Graduated in May 2012.
Project: Local Pose Tracking Leveraged by Global Constraints for Context-Aware Applications.

Lin Liu, MSE (CE&M), Graduated in December 2011.
Project: Building Information Modeling and its use in Facilities Management.

Shen Wang, MSE (CE&M), Graduated in December 2011.
Project: Evaluating Building Information Modeling for Earned Value Analysis.

Manu Akula, MSE (CE&M), Graduated in May 2010.
Project: Integrated Tracking System for Context Aware Engineering Applications.

Sanat A. Talmaki, MEng (CE&M), Graduated in May 2010.
Project: Rapid Geometric Modeling and Visualization of Underground Infrastructure.

Suyang Dong, MEng (CE&M), Graduated in May 2010.
Project: Real-Time Visualization of Buried Utilities in Augmented Reality.

Dai Fei, M.S., Visiting Doctoral Scholar, 2009-2010
Project: Photogrammetry Assisted Rapid Measurement of Earthquake-Induced Building Damage.

Souha Alameddine, MEng (CE&M), Graduated in May 2009.
Project: Sustainability Aspects of Steel Construction

Matthew Weber, MEng (CE&M), Graduated in May 2009.
Project: Modular Construction Techniques in the Construction and Shipbuilding Industries

Donald Klokkenga, MEng (CE&M), Graduated in May 2007.
Project: From BIM to buildingSMART: A Construction Manager's Vision.

Jin Lee, MEng (CE&M), Graduated in December 2005.
Project: Automated Pavement Condition Assessment Using GIS, GPS and Accelerometers.

Hiam M. Khoury, MSE (CE&M), Graduated in May 2005.
Project: Simulation and Visualization of Airside Operations at Detroit Metropolitan Airport.

Amir H. Behzadan, MEng (CE&M), Graduated in May 2005.
Project: Visualization of Construction Graphics in Outdoor Augmented Reality.

Chachrist Srisuwanrat, MEng (CE&M), Graduated in May 2004.
Project: Virtual Reality Time Lapse Video (VTLV) Using 3D Laser Scanned As-Built Models

Laila Badran, MSE (CE&M), Graduated in May 2006.
Project: CIMSTEEL Integration Standard (CIS/2) for Definition of Building Structural Damage.

UNDERGRADUATE STUDENTS SUPERVISED

Brendan Hart, BSE Student at University of Michigan, Research Advisor.
Project (2014-15): User Interface for Command Input in Machine Pose Tracking

Crystal Fletcher, LS&A Student at University of Michigan, Research Advisor.
Project (2014-15): Design of Rover Tripod for Camera Network in Machine Pose Estimation

Jiannan Huang, BSE Student at University of Michigan, Research Advisor.
Project (2014-15): Design of Servo Hardware System for Continuous Motion Tracking of Articulated Construction Machine

Youjia Lu, BSE Student at University of Michigan, Research Advisor.
Project (2014-15): Design and Implementation of Software System for Continuous Motion Tracking of Articulated Construction Machine

Reid Rossberger, BSE Student at University of Michigan, Research Advisor.
Project (2014-15): Design of Camera Network Housing Case for Rugged Outdoor Environments

Sumayya Atmeh, BSE Student at University of Michigan, Research Advisor.
Project (2014-15): Robust Visual Marker Holder for Rigid Mounting on Articulated Machines

Matthew Stone, BSE Student at University of Michigan, Research Advisor.
Project (2014-15): User Interface for Excavator Bucket Position Monitoring and its Proximity to Underground Pipelines

Andrea Mercier, BSE Student at University of Michigan, Research Advisor.
Project (2014-15): Optimization of Marker Placement to Avoid Occlusion in Machine Control

Theodore Arapoglou, BSE Student at University of Michigan, Research Advisor.
Project (2014-15): Algorithms for Asynchronous Capture and Storage of Camera Images

Ritika Mehta, BSE Student at University of Michigan, Research Advisor.
Project (2014): Post-Processing Visual Markers to Analyze Accuracy for Machine Control

Jack Kosaian, BSE Student at University of Michigan, Research Advisor.
Project (2014-15): Intrinsic and Extrinsic Camera Calibration for Machine Control

Tracey Lo, BSE Student at University of Michigan, Research Advisor.
Project (2014): User Interface for Visual Marker Calibration and Tracking in Machine Control

Karan Veer Singh, BSE Student at University of Michigan, Research Advisor.
Project (2013-14): Evaluating Potential of Augmented Reality Interfaces for Driver Safety

Malia Taqbeem, BSE Student at University of Michigan, Research Advisor.
Project (2013-14): Evaluating Potential of Augmented Reality Interfaces for Driver Safety

Bradley Hecht, BSE Student at University of Michigan, Research Advisor.
Project (2013-14): Machine Control of Construction Equipment Using Computer Vision

Joshua Rios, BSE Student at University of Michigan, Research Advisor.
Project (2013-14): Isolation of Mounted Cameras from Machine Vibration on Excavators

Gabriel Bartosiewicz, BSE Student at University of Michigan, Research Advisor.
Project (2013-15): Machine Control of Construction Equipment Using Computer Vision

Raghav Grover, B.Tech. Student at IIT-Guwahati, Research Advisor.
Project (Su-13): Evaluation of Lego Mindstorms NXT, Matlab, and LabView for Rapid Prototyping of Mobile Construction Robots

Chelsea Woods, BSE Student at New Mexico Inst. of Mining and Tech., Research Advisor.
Project (Su-11): Improving Excavation Safety Using Web-Based Virtual Reality

Swetha Viswanatha, BSE Student at UM, Research Advisor.
Project (W-11): High Level Architecture (HLA) for Distributed Construction Simulation

Yinzhen Jin, BSE Student at UM-CEE, Research Co-Advisor (with Prof. Nik Katopodes)
Project (Su-10): Visualization of Large-Scale Object Flow in Flood Waters

Akash Garg, B.Tech. Student at IIT-Guwahati, Research Advisor.
Project (Su-10): Development of Automated Rebar Cage Fabrication Robotic System

Asif Iqbal, B.Tech. Student at IIT-Bombay, Research Advisor.
Project (Su-08): Exploring Applications of Augmented Reality in Construction Education

Brian W. Timm, BSE Student at UM-EECS, Graduated in 2008, Research Advisor.
Project (Su-06): Design of Mobile Augmented-Reality Backpack for Engineering Visualization
Project (F-06): Design of Signalized Traffic Intersections using Simulation and 3D Visualization

PH.D. AND MASTER'S THESES, COMMITTEE MEMBER

Bharadwaj Mantha, Ph.D. Student (CEE), University of Michigan.
Dissertation: Data Collection and Analysis for Multiscale Building Energy Simulation.

Yilan Zhang, Ph.D. Student (CEE), University of Michigan.
Dissertation: Automated Data Processing Tools for Structural Monitoring Systems.

Albert Thomas, Ph.D. Student (CEE), University of Michigan.
Dissertation: Multi-Scale Modeling and Simulation of Building Energy Systems.

JoonOh Seo, Ph.D. Student (CEE), University of Michigan.
Dissertation: On-Site Biomechanical Analysis During Construction Tasks.

Kyle Anderson, Ph.D. Student (CEE), University of Michigan.
Dissertation: Sustainability of Building Design Decisions.

SeungJun Ahn, Ph.D. (CEE), Graduated in 2014 from University of Michigan.
Dissertation: Construction Workers' Absence Behavior Under Social Influence.

A. J. Antony Chettupuzha, Ph.D. (CEE), Graduated in 2014 from University of Waterloo.
Dissertation: Construction Workflow and Document Diagnostics.

JaeHoon Jung, Ph.D. (CEE), Graduated in 2014 from Yonsei University.
Dissertation: Productive 3D Indoor Modeling for As-built BIM with Developed Kinematic Laser Scanning System.

Grace Tsai, Ph.D. (CSE), Graduated in 2014 from University of Michigan.
Dissertation: On-Line, Incremental Visual Scene Understanding for Indoor Navigating Robots.

Beng Heng Ng, Ph.D. (CSE), Graduated in 2013 from University of Michigan.
Dissertation: Towards Least Privilege Principle: Limiting Unintended Accesses in Software Systems.

Yongjun Park, Ph.D. (EE), Graduated in 2013 from University of Michigan.
Dissertation: Libra: Achieving Efficient Instruction and Data Parallel Execution for Mobile Applications.

Jonathan Brown, Ph.D. (EE), Graduated in 2012 from University of Michigan.
Dissertation: Low-Power RF Integrated Circuits for Wireless Sensor Network Synchronization and Communication.

Hua Xie, Ph.D. (CEE), Graduated in 2011 from University of Alberta.
Dissertation: Improving Dynamic Project Control in Tunnel Construction.

William Harrison, Ph.D. (ME), Graduated in 2011 from University of Michigan.
Dissertation: Hardware-in-the-Loop and Emulation-in-the-Loop as a Part of Hybrid Process Simulation: A Formalized Approach within Manufacturing Automation.

Youngmin Park, Ph.D. (EE), Graduated in 2011 from University of Michigan.
Dissertation: A Cell-Based Design Methodology for Synthesizable RF/Analog Circuits.

Andrew Zimmerman, Ph.D. (CEE), Graduated in 2010 from University of Michigan.
Dissertation: Agent-Based Computational Architectures for Distributed Data Processing in Wireless Sensor Networks.

Rita Awwad, Ph.D. (CEE), Graduated in 2010 from University of Michigan.
Dissertation: Neutral and Risk-Sensitive Models for Competitive Bidding Methods based on Average and Order Statistics.

Youngjae Kang, Ph.D. (CEE), Graduated in 2010 from University of Michigan.
Dissertation: Surface Scaling Mechanism and Prediction for Concrete

Prasant Rekapalli, Ph.D. (CEE), Graduated in 2008 from Purdue University.
Dissertation: Discrete-Event Simulation based Virtual Reality Environments for Construction Operations.

Sangwon Han, Ph.D. (CEE), Graduated in 2008 from University of Illinois at Urbana-Champaign.
Dissertation: Modeling and Representation of Non-Value Adding Activities due to Errors and Changes in Design and Construction Projects.

Chachrist Srisuwanrat, Ph.D. (CEE), Graduated in 2008 from University of Michigan.
Dissertation: Sequence Step Algorithm for Continuous Resource Utilization in Probabilistic Repetitive Construction Projects.

Samuel T. King, Ph.D. (EE), Graduated in 2006 from University of Michigan.
Dissertation: Analyzing Intrusions Using Operating System Level Information Flow.

GRANTS AND CONTRACTS

Federal Agencies

1. **National Science Foundation (NSF):** Scalable and Autonomous Post-Event Subsurface Characterization from UAV-based Quantitative Surface Measurements, Co-Principal Investigator, 2014-2017, $389,845 (Share: $130,000)

2. **National Science Foundation (NSF):** REU Supplement to PFI: AIR Technology Translation - Development and Evaluation of Field Prototype for Determining Excavator Proximity to Buried Utilities, Principal Investigator, 2013-15, $12,000

3. **National Science Foundation (NSF):** PFI: AIR Technology Translation - Development and Evaluation of Field Prototype for Determining Excavator Proximity to Buried Utilities, Principal Investigator, 2013-15, $150,000

4. **National Science Foundation (NSF):** I-Corps: Determining Excavator Proximity to Buried Utilities, Principal Investigator, 2013-2014, $50,000

5. **National Science Foundation (NSF):** Collaborative Research: Correlating Geospatial Data Lineage and Positional Accuracy for Excavation Damage Prevention, Principal Investigator, 2013-16, $300,000 (Share: $150,000)

6. **National Science Foundation (NSF):** GOALI: Georeferenced Visualization and Emulated Proximity Monitoring for Real Time Knowledge-Based Excavator Control, Principal Investigator, 2012-15, $300,000

7. **National Academy of Sciences (NAS) – Department of Transportation:** Exploratory Analysis of Augmented Reality Visualization for Right-of-Way Excavation Safety, Principal Investigator, 2013-14, $125,242

8. **National Science Foundation (NSF):** Context-Aware Information Access for Rapid On-Site Decision Making in Construction, Maintenance, and Inspection of Civil Infrastructure Systems, Principal Investigator, 2009-13, $444,994 including UM cost share of $45,000

9. **National Institute of Standards and Technology (NIST):** Cyber-Enabled Wireless Monitoring Systems for the Protection of Deteriorating National Infrastructure Systems, Co-Principal Investigator, 2009-14, $19,162,000 including UM and research partners' cost share of $ 10,164,000 (Share: Approximately $ 625,000)

10. **National Science Foundation (NSF):** A Robust Method for Resolving Incorrect Visual Occlusion in Dynamic Augmented Reality Environments of Animated Engineering Operations, Principal Investigator, 2008-13, $343,747 including UM cost share of $45,000

11. **National Science Foundation (NSF):** Rapid Post-Disaster Reconnaissance for Building Damage Using Augmented Situational Visualization and Simulation Technology, Co-Principal Investigator, 2007-11, $276,062 including UM cost share of $ 41,264 (Share: 50%)

12. **National Science Foundation (NSF):** CAREER: Interactive Process Visualization in Virtual and Augmented Reality for Innovative Learning, Analysis, and Design of Field Construction Operations, Principal Investigator, 2005-11, $432,998 including UM cost share of $32,000

13. **National Science Foundation (NSF):** Inverse Kinematics and Interoperability Standards for Visualization of Construction Activities at the Operations Level of Detail, Principal Investigator, 2004–07, $186,226 including UM cost share of $6,430

14. **National Science Foundation (NSF):** NEESR-II Highly Damage Tolerant and Intelligent Slab-Column Frame Systems Through Combination of Advanced Materials and Embedded Wireless Sensing, Participating Researcher, 2004–07, $449,998 (Share: $4,500)

University of Michigan

1. **Transforming Learning for a Third Century (TLTC), University of Michigan:** Experiential Learning in Construction: The Case for Construction, Co-Principal Investigator, 2013-15, $50,000 (Share: Approximately $25,000)

2. **MCubed, University of Michigan:** Virtual Prototyping of Human-Robot Collaboration in Unstructured Construction Environments, Principal Investigator, 2012-14, $60,000

3. **Office of the Vice President for Research, University of Michigan:** Exploring Augmented Reality Visualization for Improved Excavation Safety, Principal Investigator, 2012, $8,851

4. **Rackham School of Graduate Studies, University of Michigan:** Location-Aware Contextual Information Access and Retrieval for Rapid On-Site Decision Making in Urban Disasters, Principal Investigator, 2007, $15,000

5. **Office of the Vice President for Research, University of Michigan:** Interactive Visualization of Engineering Graphics in Mobile Outdoor Augmented Reality, Principal Investigator, 2006, $4,000

PATENTS AND TECHNOLOGY DISCLOSURES

Patents

- U.S. Serial No. 14/568,870, "Estimating Three-Dimensional Position and Orientation of Articulated Machine Using One or More Image-Capturing Devices and One or More Markers," Patent application filed by UM with the U.S. Patent and Trademark Office, December 2014.

- U.S. Serial No. 14/153,766, "Monitoring Proximity of Objects at Construction Jobsites Via Three-Dimensional Virtuality in Real-Time," Patent application filed by UM with the U.S. Patent and Trademark Office, January 2014.

- U.S. Serial No. 14/096,378, "Method for Extracting Planes from 3D Point Cloud Sensor Data," Patent application filed by MERL with the U.S. Patent and Trademark Office, December 2013.

- U.S. Serial No. 61/985,262, "Blending Real and Virtual Construction Jobsite Objects in a Dynamic Augmented Reality Scene of a Construction Jobsite in Real-Time," Provisional patent application filed with the U.S. Patent and Trademark Office, April 2014.

Technology Disclosures

- Disclosure #5961, "CraneVision: Real-Time Visual Information Support for Improved Productivity and Safety in Crane Operations," University of Michigan Office of Tech Transfer, September 2013.

- Disclosure #5945, "CaddieBot: Semi-Autonomous Robotic Platform for Golfer Assistance Based on an Outdoor Implementation of the Real-Time Follow-Me Algorithm," University of Michigan Office of Tech Transfer, September 2013.

- Disclosure #5820, "3D Pose Estimation of Articulated Earth Excavating Machine in Real-Time Using Networked Cameras," University of Michigan Office of Tech Transfer, May 2013.
- Disclosure #5811, "Displaying Buried Utility Locations in Excavator Cabin Using Geo-referenced Augmented Reality," University of Michigan Office of Tech Transfer, April 2013.
- Disclosure #5601, "Collision Avoidance System for Monitoring a Digging Excavator's Proximity to Invisible Underground Assets," University of Michigan Office of Tech Transfer, November 2012.
- Disclosure #5607, "KEG Tracker: A Hybrid Marker and Algorithms for High-Precision 3D Pose Estimation of Mobile Cameras," University of Michigan Office of Tech Transfer, December 2012.
- Disclosure #5627, "Algorithm and Software for Ubiquitous, Multi-Sensory Localization of Mobile Asset in Unstructured Environments," University of Michigan Office of Tech Transfer, December 2012.
- Disclosure #5628, "Algorithms and Software for Implementing Real-Time Occlusion in Augmented Reality Visualizations," University of Michigan Office of Tech Transfer, December 2012.
- Disclosure #5629, "Scalable and Modular Augmented Reality Template (SMART): Reusable and Extensible Software Framework for Augmented Reality Applications," University of Michigan Office of Tech Transfer, December 2012.
- Disclosure #5630, "Augmented Reality Mobile Operating Rover (ARMOR): Mobile Hardware Platform Augmented Reality Applications," University of Michigan Office of Tech Transfer, December 2012.
- Disclosure #4244, "Augmented Reality Visualization System," University of Michigan Office of Tech Transfer, November 2008.
- Disclosure #4245, "Mobile Augmented Reality Backpack," University of Michigan Office of Tech Transfer, November 2008.
- Disclosure #05.006, "VITASCOPE: Extensible and Scalable 3D Visualization of Simulated Construction Operations," Virginia Tech Intellectual Properties, Inc., March 2005.

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Single-underlined names are Graduate Student or Post-Doctoral advisees.
Double-underlined names are Undergraduate Student advisees.

Book Chapters (In-Review)

1. Behzadan, A. H., Dong, S., and Kamat, V. R. (2014). "Augmented Reality for Civil Engineering Applications", In Fundamentals of Wearable Computers and Augmented Reality, 2nd edition, Edited by W. Barfield, B. Thomas, and T. Martin, CRC Press, Boca Raton, FL.

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1. Behzadan, A. H., Dong, S., and Kamat, V. R. (2012). "Chapter 5 - Mobile and Pervasive Construction Visualization using Outdoor Augmented Reality", In Mobile and Pervasive Computing in Construction, Edited by C. Anumba and X. Wang, John Wiley & Sons, Hoboken, NJ, ISBN 0470658010, 54-85.

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1. Li, S., Cai, H., and Kamat, V.R. (2015). "A Virtual Sensor Approach for Underground Utility Mapping and Compliance Checking", Journal of Construction Engineering and Management, American Society of Civil Engineers, Reston, VA. (In Review).

2. Feng, C., Xiao, Y., Willette, A., McGee, W., and Kamat, V.R. (2015), "Vision Guided Autonomous Robotic Assembly and As-Built Scanning on Unstructured Construction Sites", Automation in Construction, Special Issue of the 31st ISARC, Elsevier Science, New York, NY. (In Review).

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1. Golabchi, A., Akula, M., and Kamat, V.R. (2014). "Interoperable Building Information Modeling for Fault Detection and Diagnostics in Commercial HVAC Systems", Facilities, Emerald Group Publishing, Bingley, UK. (In Press).

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32. Khoury, H. M., and Kamat, V. R. (2009). "Evaluation of Standard Product Models for Location-Aware Information Access and Retrieval in Construction and Other Engineering Applications", Proceedings of the 2009 ASCE International Workshop on Computing in Civil Engineering, American Society of Civil Engineers, Reston, VA.

33. Behzadan, A.H., and Kamat, V. R. (2009). "Interactive Augmented Reality Visualization for Improved Damage Prevention and Maintenance of Underground Infrastructure", Proceedings of 2009 Construction Research Congress, American Society of Civil Engineers, Reston, VA.

34. Prakash, A., Heng, B., Lau, B., and Kamat, V. (2009). "Dependable Opportunistic Communication in a Multi-Tier Sensor Network Architecture", Proceedings of the 2009 Workshop on Research Directions in Situational Self-managed Proactive Computing in Wireless Ad-Hoc Networks, Air Force Research Laboratory, St. Louis, MO, 1-3.

35. Behzadan, A.H., and Kamat, V. R. (2008). "Simulation and Visualization of Traffic Operations in Augmented Reality for Improved Planning and Design of Road Construction Projects", Proceedings of the 2008 Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Piscataway, NJ, 2447-2454. (**Invited Paper**).

36. Khoury, H. M., and Kamat, V.R. (2008). "Indoor User Localization for Rapid Information Access and Retrieval on Construction Sites", Proceedings of the 15th Annual Workshop of the European Group for Intelligent Computing in Engineering (EG-ICE), European Group for Intelligent Computing in Engineering, Plymouth, UK.

37. Behzadan, A. H., and Kamat, V.R. (2008). "Resolving Incorrect Occlusion in Augmented Reality Animations of Simulated Construction Operations", Proceedings of the 15th Annual Workshop of the European Group for Intelligent Computing in Engineering (EG-ICE), European Group for Intelligent Computing in Engineering, Plymouth, UK.

38. Behzadan, A.H., and Kamat, V. R. (2007). "Enabling Smooth and Scalable Dynamic 3D Visualization of Discrete-Event Construction Simulations in Outdoor Augmented Reality", Proceedings of the 2007 Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Piscataway, NJ, 2168-2176. (**Invited Paper**).

39. Khoury, H. M., and Kamat, V. R. (2007). "Automated Georeferenced User Position Tracking for Contextual Information Retrieval on Construction Sites", Proceedings of the 24th International Symposium on Automation and Robotics in Construction, International Association for Automation and Robotics in Construction, Munchen, Germany, 1-5.

40. Behzadan A.H., and Kamat V. R. (2007). " Reusable Modular Software Interfaces for Outdoor Augmented Reality Applications in Engineering ", Proceedings of the 2007 International Workshop on Computing in Civil Engineering, American Society of Civil Engineers, Reston, VA, 825-837.

41. Khoury, H. M., and Kamat, V. R. (2007). "WLAN Based User Position Tracking for Contextual Information Access in Indoor Construction Environments", Proceedings of the 2007 International Workshop on Computing in Civil Engineering, American Society of Civil Engineers, Reston, VA, 838-845.

42. Khoury, H. M., and Kamat V. R. (2007). "A Framework for Georeferencing Based Automated Retrieval of Contextual Project Information on Construction Sites", Proceedings of 2007 Construction Research Congress, American Society of Civil Engineers, Reston, VA, 1-9.

43. Behzadan, A. H., Khoury, H. M., and Kamat, V. R. (2006). "Structure of an Extensible Augmented Reality Framework for Visualization of Simulated Construction Processes", Proceedings of 2006 Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Piscataway, NJ, 2055-2062. (**Invited Paper**)

44. Khoury, H.M., Kamat, V.R., and Ioannou, P.G. (2006). "Simulation and Visualization of Air-Side Operations at Detroit Metropolitan Airport", Proceedings of the 2006 Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Piscataway, NJ, 2029-2038.

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46. Kamat, V. R., and Lipman, R. R. (2006). "Emulation of Automated Structural Steelwork Erection Using CIMSteel Integration Standards", Proceedings of the 2006 Joint International Conference on Computing and Decision-Making in Civil & Building Engineering, American Society of Civil Engineers, Reston, VA, 3938-3947.

47. El-Tawil, S., and Kamat, V. R. (2006). "Rapid Reconnaissance of Post-Disaster Building Damage Using Augmented Situational Visualization", Proceedings of the 2006 Structures Congress, American Society of Civil Engineers, Reston, VA, 1-10.

48. Kamat, V. R., and Lipman, R. R. (2006). "Standard Product Models for Supporting Automated Erection of Structural Steelwork", Proceedings of the 23rd International Symposium on Automation and Robotics in Construction (ISARC), Japan Society of Civil Engineers (JSCE), Tokyo, Japan, 1-6.

49. Behzadan, A. H., and Kamat, V. R. (2005). "Visualization of Construction Graphics in Outdoor Augmented Reality", Proceedings of the 2005 Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Piscataway, NJ, 1914-1920.

50. Ioannou, P. G., and Kamat, V. R. (2005). "Intelligent Preemption in Construction of a Manmade Island for an Airport", Proceedings of the 2005 Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Piscataway, NJ, 1515-1523.

51. Kamat, V. R., and El-Tawil, S. (2005). "Rapid Post-Disaster Evaluation of Building Damage Using Augmented Situational Visualization", Proceedings of the 2005 Construction Research Congress, American Society of Civil Engineers, Reston, VA, 1-10. (**Best Paper Award**)

52. Ismail, I. A., and Kamat, V. R. (2005). "Legal Risk Analysis, Modeling and Programming for E-Commerce in Construction", Proceedings of the 2005 Construction Research Congress, American Society of Civil Engineers, Reston, VA, 1-13.

53. Kamat, V. R., and Martinez, J. C. (2005). "Efficient Interference Detection in 3D Animations of Simulated Construction Operations", Proceedings of the 2005 International Conference on Computing in Civil Engineering, American Society of Civil Engineers (ASCE), Reston, VA, 1-12. (**Invited Paper**)

54. Kamat, V. R., and El-Tawil, S. (2004). "Structure of an Augmented Situational Visualization Framework for Rapid Building Damage Evaluation", Proceedings of the CONVR2004 Conference on Construction Applications of Virtual Reality, ADETTI/ISCTE, Lisbon, Portugal, 101-107.

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56. Kamat, V. R., and Martinez, J. C. (2004). "Practical 3D Animation of Multiply Articulated Construction Equipment", Proceedings of the 2004 Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Piscataway, NJ, 1229-1237.

57. Kamat, V. R., and Martinez, J. C. (2003). "Variable-Speed Resource Motion in Animations of Discrete-Event Process Models", Proceedings of the 2003 Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Piscataway, NJ, 1518-1526.

58. Kamat, V. R., and Martinez, J. C. (2003). "Automated Generation of Large-Scale Dynamic Terrain in 3D Animation of Simulated Construction Processes", Proceedings of the CONVR2003 Conference on Construction Applications of Virtual Reality, Centre for Construction Innovation and Research, University of Teesside, Middlesbrough, UK, 63-76.

59. Kamat, V. R., and Martinez, J. C. (2003). "Interactive Discrete-Event Simulation of Construction Processes in Dynamic Immersive 3D Virtual Worlds", Proceedings of the CONVR2003 Conference on Construction Applications of Virtual Reality, Centre for Construction Innovation and Research, University of Teesside, Middlesbrough, UK, 197-201.

60. Kamat, V. R., and Martinez, J. C. (2003). "Visualizing Fuzzy Construction Materials Using VITASCOPE's ParticleWorks Add-On", Proceedings of the 2003 Construction Research Congress, American Society of Civil Engineers, Reston, VA, 1-8.

61. Kamat, V. R., and Martinez, J. C. (2002). "Comparison of Simulation-Driven Construction Operations Visualization and 4D CAD", Proceedings of the 2002 Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Piscataway, NJ, 1765-1770.

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63. Kamat, V. R., and Martinez, J. C. (2001). "Validating Complex Construction Simulation Models Using 3D Visualization", Proceedings of EUROSIM 2001, the 4th International EUROSIM Congress, Delft, Netherlands, 1-6.

64. Kamat, V. R., and Martinez, J. C. (2000). "3D Visualization of Simulated Construction Operations", Proceedings of the 2000 Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Piscataway, NJ, 1933-1937.

65. Kamat, V. R., and Martinez, J. C. (2000). "3D Visualization of Construction Processes and Products", Proceedings of CIT2000 - The CIB-W78, IABSE, EG-SEA-AI International Conference on Construction Information Technology, Reykjavik, Iceland, 506-512.

Non- Refereed Conference Papers

1. Kamat, V. R., and Dong, S. (2011). "Resolving Incorrect Visual Occlusion in Outdoor Augmented Reality Using TOF Camera and OpenGL Frame Buffer", Proceedings of 2011 NSF CMMI Engineering Research and Innovation Conference, Atlanta, Georgia, 1-8.

2. Kamat, V. R., and Akula, M. (2011). "Integration of Global Positioning System and Inertial Navigation for Ubiquitous Context-Aware Engineering Applications", Proceedings of 2011 NSF CMMI Engineering Research and Innovation Conference, Atlanta, Georgia, 1-5.

3. Kamat, V. R., and Dong, S. (2011). "Robust Mobile Computing Framework for Visualization of Simulated Processes in Augmented Reality", Proceedings of 2011 NSF CMMI Engineering Research and Innovation Conference, Atlanta, Georgia, 1-10.

4. Behzadan, A. H., and Kamat, V. R. (2009). "A Robust Method for Resolving Incorrect Visual Occlusion in Dynamic Augmented Reality Environments of Animated Engineering Operations", Proceedings of 2009 NSF CMMI Engineering Research and Innovation Conference, Honolulu, Hawaii.

5. Behzadan, A. H., and Kamat, V. R. (2009). "Visualization of Vehicular Traffic in Augmented Reality for Improved Planning and Analysis of Road Construction Projects", Proceedings of 2009 NSF CMMI Engineering Research and Innovation Conference, Honolulu, Hawaii.

6. Kamat, V. R., and El-Tawil, S. (2009). "Rapid Post-Disaster Reconnaissance for Building Damage Using Augmented Situational Visualization and Simulation Technology", Proceedings of 2009 NSF CMMI Engineering Research and Innovation Conference, Honolulu, Hawaii.

Technical Reports

1. Lundeen, K., and Kamat, V. R. (2014). "Identification and Improvement of Camera-Marker Sensor Performance Characteristics for Use in Excavator Pose Monitoring", ME 590 Report, Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI.

2. Lundeen, K., and Kamat, V. R. (2013). "Development of a an Affordable Excavator Pose Monitoring System", ME 590 Report, Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI.

3. Dong, S., Feng, C., and Kamat, V. R. (2012). "Sensitivity Analysis of Augmented Reality-Assisted Building Damage Reconnaissance Using Virtual Prototyping", UMCEE Report No. 12-01, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

4. Golabchi, A. and Kamat, V. R. (2012). "Interoperability Issues between Different BIM Software Products", UMCEE Report No. 12-02, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

5. Liu, L. and Kamat, V. R. (2011). "Building Information Modeling and its use in Facilities Management", UMCEE Report No. 11-02, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

6. Wang, S., Kamat, V. R., and Lee, S. (2011). "Evaluating Building Information Modeling for Earned Value Analysis", UMCEE Report No. 11-03, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

7. Sridhar, S., and Kamat, V. R. (2011). "CAMFPLAN: A Real-time Markerless Camera Pose Estimation System for Augmented Reality", UMCEE Report No. 11-01, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

8. Feng, C. and Kamat, V. R. (2011). "Creating 3D Sketch Up Models From Google Street Views", Technical Report, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

9. Akula, M. and Kamat, V. R. (2010). "Integrated Tracking System and Framework for Context Aware Engineering Applications", UMCEE Report No. 10-02, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

10. Alameddine, S., and Kamat, V. R. (2009). "Sustainability Aspects of Steel Construction", CEE 630 Report, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

11. Weber, M. G., and Kamat, V. R. (2009). "A Comparative Study of the Use of Modular Construction Techniques in the Construction and Shipbuilding Industries", CEE 630 Report, Dept. of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

12. Behzadan, A. H., and Kamat, V. R. (2006). "PlotStrobe: Dynamic Excel Chart Plotter for the Stroboscope Simulation System", UMCEE Report No. 06-01, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

13. Lee, J., and Kamat, V. R. (2005). "Evaluation of an Automated Pavement Condition Assessment Technique Using GIS, GPS AND Accelerometers", UMCEE Report No. 05-13, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

14. Khoury, H. M., and Kamat, V. R. (2005). "Simulation and Visualization of Airside Operations at Detroit Metropolitan Airport", UMCEE Report No. 05-10, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

15. Behzadan, A. H., and Kamat, V. R. (2005). "Visualization of Construction Graphics in Outdoor Augmented Reality", UMCEE Report No. 05-09, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

Theses and Dissertations

1. Kamat, V. R. (2003). "VITASCOPE: Extensible and Scalable 3D Visualization of Simulated Construction Operations", Ph.D. Dissertation, Dept. of Civil and Environmental Engineering, Virginia Tech, Blacksburg, VA.

2. Kamat, V. R. (2000). "Enabling 3D Visualization of Simulated Construction Operations", M.S. Thesis, Dept. of Civil and Environmental Engineering, Virginia Tech, Blacksburg, VA.

Other Publications

1. Kamat, V. R., Dong, S., and Talmaki, S. (2010). "Excavation Safety Technology: Saving Property-Saving Lives", Newsletter for Alumni and Friends, Winter 2010, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI.

2. Kamat, V. R. (2009). "Special Issue on Graphical Three-Dimensional Visualization in Architecture, Engineering, and Construction", Editorial Article, Journal of Computing in Civil Engineering, 23(6), American Society of Civil Engineers, Reston, VA, 309-310.

3. Kamat, V. R. (2008). "Arbortech AS160 Brick and Mortar Saw", Investigation Report for NOVA Award, Construction Innovation Forum (CIF), Walbridge, OH, 1-8.

4. Kamat, V. R. (2007). "Call for Papers: Special Issue of the Journal of Computing in Civil Engineering on Graphical 3D Visualization in Architecture, Engineering, and Construction", Editorial Article, Journal of Computing in Civil Engineering, Vol. 21, No. 6, American Society of Civil Engineers, Reston, VA, 383.

5. Kamat, V. R. (2007). "Musings from the 13th European Group for Intelligent Computing in Engineering (EG-ICE) Workshop on Intelligent Computing in Engineering and Architecture", Editorial Article, Journal of Computing in Civil Engineering, Vol. 21, No. 1, American Society of Civil Engineers, Reston, VA, 1-2.

6. Kamat, V. R. (2006). "Asphalt Pavement Radar Analysis", Investigation Report for NOVA Award, Construction Innovation Forum (CIF), Walbridge, OH, 1-9.

7. Khoury H.M., V.R. Kamat and P.G. Ioannou (2006). "Simulation and Visualization Of Air-Side Operations at Detroit Metropolitan Airport", Newsletter for Alumni and Friends, Winter 2006, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI, 20-22.

8. Kamat, V. R. (2005). "5D Virtual Construction", Investigation Report for NOVA Award, Construction Innovation Forum (CIF), Walbridge, OH, 1-10.

9. Kamat, V. R. and Behzadan, A. H. (2005). "Visualization of Construction Activities in Outdoor Augmented Reality", Newsletter for Alumni and Friends, Fall 2005, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI, 19-21.

10. Kamat, V. R. (2004). "Object Genome Project", Investigation Report for NOVA Award, Construction Innovation Forum (CIF), Walbridge, OH, 1-10.

11. Kamat, V. R. and El-Tawil, S. (2004). "Rapid Evaluation of Building Damage Using Augmented Reality", Newsletter for Alumni and Friends, Fall 2004, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI, 13-15.

12. Kamat, V. R. (2004). "Interactive Process Visualization in Virtual and Augmented Reality for Innovative Learning, Analysis, and Design of Field Construction Operations", Newsletter for Alumni and Friends, Fall 2004, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI, 11-12.

13. Kamat, V. R. (2003). "Dynamic 3D Visualization of Simulated Construction Processes", Newsletter for Alumni and Friends, Fall 2003, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI, 12-13.

INVITED SEMINARS AND PRESENTATIONS

1. "Augmented Reality Visualization Techniques for Civil Infrastructure Applications", Co-presented with Stephen Strickland at AR Detroit, Bloomfield Hills, MI, 2014.

2. "Towards Autonomous Robotic In-Situ Assembly on Unstructured Construction Sites", Presented at the University of Waterloo, Waterloo, Canada, 2014.

3. "Augmented Reality Interfaces for Occupational Safety in Engineering Tasks", Presented at the University of Michigan, Department of Industrial and Operations Engineering, Ann Arbor, MI, 2013.

4. "Graphical Visualization Techniques for Civil Engineering and Construction", Presented at the National Taiwan University of Science and Technology (NTUST), Taipei, Taiwan, 2012.

5. "Applications of Mobile Augmented Reality and Pervasive Computing in Architecture, Engineering, and Construction", Presented at the Mitsubishi Electric Research Laboratories (MERL), Boston, MA, 2012.

6. "Research in Visualization Techniques for Field Construction", Presented at the Georgia Institute of Technology, Atlanta, GA, 2012.

7. "Visual Simulation of Construction Processes", Presented at the Catholic University of America, Washington, DC, 2012.

8. "Exploring the Potential of Context-Aware Augmented Reality in Construction Engineering Education", Co-presented with A.H. Behzadan at the 23rd International Conference on College Teaching and Learning (ICCTL), Ponte Vedra Beach, FL, 2012.

9. "Augmented Reality Visualization for VDC: Applications, Opportunities, and Challenges", Presented at the 2011 Transportation Research Board (TRB) Visualization in Transportation Symposium, Chicago, IL, 2011

10. "Visualization of Engineering Graphics in Augmented Reality for Integrated and Automated Project Processes", Presented to the FIATECH consortium members, Tech Tuesday Webinar Series, Ann Arbor, MI, 2010

11. "Improving Safety in Urban Excavation with Mobile Information and Visualization Technologies", Presented at the FIATECH 2010 Technology Conference, Austin, TX, 2010

12. "Augmented Situational Visualization for Improved Safety in Civil Engineering and Construction", Presented at the Indian Institute of Technology, Madras (IIT-M), Department of Civil and Environmental Engineering, Chennai, India, 2009

13. "Advanced Applications of Mobile Augmented Reality in Civil Engineering", Presented to the Institution of Engineers (India), Goa State Center, Panaji, India, 2009

14. "3D Visualization of Engineering Operations in Virtual and Augmented Reality", Presented at the University of Michigan, Department of Industrial and Operations Engineering, Ann Arbor, MI, 2008

15. "Advanced Applications of Mobile Augmented Reality and Pervasive Computing in Architecture, Engineering, and Construction", Presented at the Hong Kong Polytechnic University, Kowloon, Hong Kong, 2008

16. "Rapid Post-Disaster Reconnaissance for Building Damage using Augmented Situational Visualization and Simulation Technology", Presented at the University of Puerto Rico at Mayaguez, Mayaguez, PR, 2007

17. "Advanced Applications of Mobile Augmented Reality in Architecture, Engineering, and Construction", Keynote, Presented at the 7th International Conference on Construction Applications of Virtual Reality (CONVR), Pennsylvania State University, University Park, PA, 2007

18. "Dynamic 3D Visualization of Simulated Construction Operations in Virtual and Augmented Reality", Presented to the University of California at Berkeley (via Video), Berkeley, CA, 2007

19. "Location-Aware Information Visualization Applications in Civil Engineering", Presented at Purdue University, West Lafayette, IN, 2007

20. "Integration of Visualization and Positioning Technologies for Applications in Civil Engineering and Disaster Response", Presented at the National Institute of Standards and Technology (NIST), Gaithersburg, MD, 2007

21. "Advanced Applications of Visualization and Positioning Technologies in Civil Engineering", Presented at Virginia Polytechnic Institute and State University, Blacksburg, VA, 2007

22. "Location-Aware Information Retrieval and Visualization in Post-Disaster Reconnaissance and Engineering First-Response", Presented at the Carnegie-Mellon Univ., Pittsburgh, PA, 2007

23. "Advanced Applications of Visualization and Positioning Technologies in Civil Engineering", Presented at the U.S. Army Corps of Engineers Construction Engineering Research Laboratory (CERL), Champaign, IL, 2007

24. "GPS and 3DOF Tracking for Georeferenced Registration of Construction Graphics in Outdoor Augmented Reality", Presented at the Univ. of Illinois at Urbana-Champaign, Urbana, IL, 2006

25. "Visualization of Construction Graphics in Outdoor Augmented Reality", Presented at the Pennsylvania State University (via AccessGrid), University Park, Pennsylvania, 2006

26. "Augmented Situational Visualization for Efficient Interaction with Civil Structures", Presented at the 2005 Skidmore Owings & Merrill (SOM) Building Science and Design Research Symposium, New York, NY, 2005

27. "Applications of Interactive Virtual and Augmented Reality in Construction Engineering", Presented at the 2005 Civil and Environmental Engineering Friends Association (CEEFA) Spring Meeting and Technical Session, University of Michigan, Ann Arbor, Michigan, 2005

28. "Visualizing Construction Activities at the Operations Level of Detail", Presented at the Pennsylvania State University, University Park, Pennsylvania, 2005

29. "Immersive Visualization of Construction Activities at the Operations Level of Detail", Presented at the 2003 ASCE Civil Engineering Conference and Exposition, Nashville, Tennessee, 2003

30. "Link between Discrete Event Simulation and Animated Visualization in 3D: Key to Virtual, Immersive, and Interactive Construction 3D Visualization of Discrete-Event Simulation Models", Presented at the ASCE Special Conference on Fully Integrated and Automated Project Processes in Civil Engineering, Blacksburg, VA, 2002

31. "3D Visualization of Discrete-Event Simulation Models", Presented at the North American SIMMOD User's Group meeting, Chicago, Illinois, 2000

SOFTWARE SYSTEMS DEVELOPED

The following software implements discoveries from my academic research. Most software is readily available for download and can be freely used for research and teaching.

1. **cv2cg**: cv2cg is a lightweight library for computer vision and computer graphics interactions. It includes a compact version of the AprilTag library implemented in C++, sparse point cloud reconstruction from 2 views, camera simulation tools for multiple view geometry algorithm tests, and a camera switch tool for visualization of point cloud and camera (images).

2. **SMART:** Scalable and Modular Augmented Reality Template (SMART) provides a reusable and extensible software framework for AR applications, and provides several software components required for AR applications as generic C++ libraries that can be readily combined to build specific applications.

3. **ARQuake:** ARQuake is virtual prototyping software for simulating seismic damage to high rise buildings, and assessing building structural integrity by measuring the Interstory Drift Ratio (IDR) using an augmented reality assisted algorithm.

4. **ARVita:** ARVita is an acronym for Augmented Reality Vitascope. ARVita takes advantage of the Add-On Application Programming Interface (API) provided by Vitascope, and its basic set of animation scripting statements to visualize simulated operations in a fiducial marker based tabletop Augmented Reality environment.

5. **KEG Tracker**: The KEG Tracker estimates a camera's position and orientation for a general class of mobile context-aware and robotic applications. The algorithm integrates two classic natural marker-based registration algorithms, Homography-from-detection and Homography-from-tracking, and overcomes their specific limitations of jitter and drift by applying two global constraints (geometric and appearance) to prevent tracking errors from propagating.

6. **ARVISCOPE:** ARVISCOPE is an acronym for Augmented Reality VIsualization of Simulated Construction OPErations. ARVISCOPE is an open, loosely-coupled, user-extensible 3D animation description language designed specifically for 1) Visualizing simulated construction processes and resulting products in 3D augmented reality; and 2) Developing higher-level augmented reality tools for construction and other domains.

7. **ARMOR:** ARMOR is the second generation of UM-AR-GPS-ROVER, and is an acronym for Augmented Reality Mobile OpeRation platform (ARMOR). ARMOR improves the design of its predecessor in two aspects: Rigidity and Ergonomics.

8. **UM-AR-GPS-ROVER:** UM-AR-GPS-ROVER is an augmented reality based platform that can be used together with corresponding pieces of peripheral equipment (Head-Mounted Display, GPS receiver, and Tracker) to generate a mixed view of the real world and superimposed virtual construction graphics in outdoor environments.

9. **WISE:** Widely Integrated Simulation Environment (WISE) is a JavaScript enabled web application powered by Google Earth API and ASP.NET 2.0. A ubiquitous trajectory containing time-stamped location and orientation records of a mobile user tracked using RTK-GPS, PDR (inertial navigation), and electronic compass is encoded using the Keyhole Markup Language (KML) and logged on the web server. A web browser can then query the server and visualize the trajectory either online or offline.

10. **PlotStrobe:** PlotStrobe is a real time chart plotting tool for the Stroboscope simulation system that can be conveniently integrated in any simulation model to generate graphical output of simulation statistics at model run-time. PlotStrobe provides the Stroboscope user with a set of new statements and functions that add programmatic chart plotting communication capability between Stroboscope and Excel.

11. **AutoCIS2:** AutoCIS2 implements algorithms that automatically extract the geometry, position, and orientation of steel beams and columns from a structural frame described in the CIMSteel Integration Standards (CIS/2) format. The extracted steel member geometry and pose information can be used to program installation instructions for a kinematically smart crane inside a 3D virtual world to support automated animation of simulated steel erection operations. Due to the conceptual similarity between virtual pieces of equipment and robots (both need programmed instructions to execute an elementary set of motions), AutoCIS2 also demonstrates the efficacy of the CIS/2 standard in supporting automated erection of structural steelwork. AutoCIS2 was developed in collaboration with NIST.

12. **VTLV**: VTLV is an acronym for Virtual-Reality Time Lapse Video. By improvising on the use of laser scanners to create 3D as-built models of constructed facilities, VTLV combines a series of obtained 3D as-built models to monitor and measure progress on a construction site.

13. **VITASCOPE:** VITASCOPE is an acronym for VIsualizaTion of Simulated Construction OPErations. VITASCOPE is an open, loosely-coupled, user-extensible 3D animation description language designed for 1) Visualizing simulated construction processes and resulting products in 3D; and 2) Developing higher-level construction visualization tools.

14. **ParticleWorks:** The ParticleWorks add-on for VITASCOPE implements efficient methods to visualize construction processes involving "fluid", unstructured materials that are generally capable of flowing (e.g. concrete, dirt, mortar, sand, slurry, and water). The work capitalizes on a classical computer graphics concept called particle systems to design simple, parametric text methods to represent arbitrary dynamic volumes of fluid construction materials in 3D virtual construction worlds.

15. **KineMach:** The KineMach add-on for VITASCOPE implements "smart" pieces of virtual construction equipment that can be instantiated and manipulated using simple text statements in a higher-level, contextual, construction work-like terminology. KineMach uses robust forward and inverse kinematics algorithms from robotics literature to design high-level statements for visualizing the dynamics of articulated construction equipment.

16. **PathFinder:** The PathFinder add-on for VITASCOPE provides methods to describe the accurate, variable-speed motion of virtual simulation objects on realistically shaped motion trajectories in 3D visualizations of discrete-event process models. The add-on also implements virtual terrain following algorithms.

17. **ViTerra:** The ViTerra add-on for VITASCOPE implements mechanisms to automatically generate photorealistic, digital, 3D terrain CAD databases to represent construction jobsite terrains in visualizations. ViTerra also implements animation methods to describe the evolution of virtual jobsites by depicting deformations to the 3D terrains in response to construction operations such as earthmoving (e.g. digging and dumping) and trenching.

18. **CCollide:** The C-Collide add-on for VITASCOPE can identify and report any and all undesirable conflicts that can occur among static (e.g. structure in-place, idle equipment), dynamic (e.g. active machines and workers), and abstract (e.g. hazard or protected spaces) construction resources in dynamic 3D construction process visualizations.

19. **ExcelWorks:** The ExcelWorks add-on for VITASCOPE allows engineers to juxtapose dynamic displays of quantitative, numerical simulated operation data alongside 3D view ports during visualization of the modeled processes. ExcelWorks capitalizes on VITASCOPE's add-on interface and the OLE automation features of MS Excel to design a text statement-controlled dynamic charting tool.

PROFESSIONAL LEADERSHIP AND SERVICE ACTIVITES

- **Member of the Board of Directors**, International Association for Automation and Robotics in Construction (IAARC), 2014-present

- **Chair of the Awards Committee**, American Society of Civil Engineers Construction Institute (ASCE-CI), 2013-2014

- **Member of the Board of Governors**, American Society of Civil Engineers Construction Institute (ASCE-CI), 2011-2012

- **Chair of the Executive Committee**, Construction Research Council (CRC), American Society of Civil Engineers (ASCE), 2011-2012

- **Member of the Board of Directors**, Construction Innovation Forum (CIF), 2004-present

- **Vice-Chair of the Executive Committee**, Construction Research Council (CRC), American Society of Civil Engineers (ASCE), 2010-2011

- **Secretary**, Construction Research Council (CRC), American Society of Civil Engineers (ASCE), 2009-2010

- **Past-Chair**, Visualization, Information Modeling, and Simulation (VIMS) Committee, Technical Council on Computing and Information Technology, American Society of Civil Engineers, 2011-present [Note: This is a formal officer position in the committee]

- **Chair**, Visualization, Information Modeling, and Simulation (VIMS) Committee, Technical Council on Computing and Information Technology (TCCIT), American Society of Civil Engineers (ASCE), 2010-2012

- **Chair**, Database and Information Management (DIM) Committee, Technical Council on Computing and Information Technology (TCCIT), American Society of Civil Engineers (ASCE), 2008-2010

- **Invited Participant**, National Institute of Standards and Technology (NIST) and FIATECH joint workshop titled "The Intelligent and Automated Construction Job Site Testbed", Gaithersburg, MD, 2008.

- **Secretary**, Database and Information Management (DIM) Committee, Technical Council on Computing and Information Technology (TCCIT), American Society of Civil Engineers (ASCE), 2005-2007.
- **Associate Technical Co–Chair**, 2005 International Conference on Computing in Civil Engineering, American Society of Civil Engineers (ASCE), 2005.

- **Invited Participant**, National Science Foundation (NSF) and FIATECH workshop titled "Setting an Academic Research Agenda for the FIATECH Capital Projects Technology Roadmap Initiative", Houston, TX, 2004.

EDITORIAL ACTIVITIES

- **Associate Editor**, American Society of Civil Engineers (ASCE) Journal of Computing in Civil Engineering, 2005-present

- **Guest Editor**, American Society of Civil Engineers (ASCE) Journal of Computing in Civil Engineering, Special Issue on Graphical 3D Visualization in Architecture, Engineering, and Construction, 2007-2009

- **Member of the Editorial Board**, Automation in Construction, Elsevier, 2007-present

- **Member of the Editorial Board**, Advanced Engineering Informatics, Elsevier, 2008-present

- **Member of the Editorial Board**, Korean Journal of Construction Engineering and Project Management, KICEM, 2011-present

PROPOSAL AND PAPER REVIEW ACTIVITIES

- **Proposal Reviewer**, The Dutch Technology Foundation STW, Utrecht , Netherlands (Years withheld for confidentiality)

- **Proposal Reviewer**, Qatar National Research Foundation, Doha, Qatar (Years withheld for confidentiality)

- **Grant Reviewer**, Natural Sciences and Engineering Research Council (NSERC), Canada (Years withheld for confidentiality)

- **Panel Member**, Civil Infrastructure Systems (CIS) Program, Directorate of Engineering, National Science Foundation (Years withheld for confidentiality)

- **Panel Member**, Information Technology and Infrastructure Systems (ITIS) Program, Directorate of Engineering, National Science Foundation (Years withheld for confidentiality)

- **Reviewer**, Building and Environment, Elsevier, 2012-present

- **Reviewer**, Energy and Buildings, Elsevier, 2012-present
- **Reviewer**, Visualization in Engineering, Springer, 2013-present

- **Reviewer**, Journal of Computing in Civil Engineering, American Society of Civil Engineers (ASCE), 2003-present

- **Reviewer**, Journal of Construction Engineering and Management, American Society of Civil Engineers (ASCE), 2003-present

- **Reviewer**, Journal of Computer-Aided Civil and Infrastructure Engineering, Blackwell Publishers, 2004-present
- **Reviewer**, Journal of Management in Engineering, American Society of Civil Engineers (ASCE), 2004-present
- **Reviewer**, Automation in Construction, Elsevier, 2006-present
- **Reviewer,** Electronic Journal of Information Technology in Construction (ITcon), International Council for Research and Innovation in Building and Construction (CIB), 2007-present
- **Reviewer**, Advanced Engineering Informatics, Elsevier, 2007-present
- **Reviewer**, Reviewed several abstracts and papers for major conferences and workshops over the last 10 years including the ASCE Construction Research Congresses, the IEEE Winter Simulation Conferences, Conferences on Construction Applications of Virtual Reality, and ASCE Computing in Civil Engineering Conferences and Workshops.

CONFERENCE PLANNING AND ORGANIZATION ACTIVITIES

- **Track Chair (Robotics)**, Construction Research Congress, American Society of Civil Engineers (ASCE), San Juan, Puerto Rico, 2016.
- **International Scientific Committee Member**, International Symposium on Automation and Robotics in Construction (ISARC), International Association for Automation and Robotics in Construction, Oulu, Finland, 2015.
- **Technical Committee Member**, Construction Research Congress, American Society of Civil Engineers (ASCE), Atlanta, GA, 2014.
- **Session Chair**, Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Washington, DC, 2013.
- **International Scientific and Advisory Committee Member / Session Chair**, 30th International Symposium on Automation and Robotics in Construction (ISARC 2013), Montreal, Canada, 2013.
- **Scientific Committee Member**, International Conference on Construction Applications of Virtual Reality (CONVR), London, UK, 2013.
- **Technical Committee Member**, Construction Research Congress, American Society of Civil Engineers (ASCE), West Lafayette, IN, 2012.

- **Scientific Committee Member**, International Conference on Construction Applications of Virtual Reality, Taipei, Taiwan, 2012.

- **Session Chair**, Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), Phoenix, AZ, 2011.

- **Scientific Committee Member**, International Workshop on Computing in Civil Engineering, ASCE, Miami, FL, 2011.

- **Session Chair**, Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), 2010.

- **Scientific Committee Member**, 10th International Conference on Construction Applications of Virtual Reality, Miyagi University, Miyagi, Japan, 2010.

- **Technical Committee Member / PhD Student Poster Session Organizer**, Construction Research Congress, American Society of Civil Engineers (ASCE), Banff, Canada, 2010.

- **Scientific Committee Member / Special Session Coordinator**, International Conference on Computing in Civil and Building Engineering, Nottingham, UK, 2010.

- **Scientific Committee Member**, International Conference on Sustainable Urbanization (ICSU), Hong Kong Polytechnic University, Hong Kong, 2010.

- **Scientific Committee Member**, 9th International Conference on Construction Applications of Virtual Reality, University of Sydney, Sydney, Australia, 2009.

- **Technical Committee Member**, Construction Research Congress, American Society of Civil Engineers (ASCE), Seattle, WA, 2009.

- **Scientific Committee Member**, 8th International Conference on Construction Applications of Virtual Reality, International Islamic University of Malaysia, Kuala Lumpur, Malaysia, 2008.

- **Session Chair**, Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), 2008.

- **Track Chair**, Construction Research Congress, American Society of Civil Engineers (ASCE), Grand Bahama Island, Bahamas, 2007.

- **Technical Committee Member**, ASCE International Workshop on Computing in Civil Engineering, American Society of Civil Engineers (ASCE), 2007.

- **Scientific Committee Member**, 7th International Conference on Construction Applications of Virtual Reality, The Pennsylvania State University, University Park, PA, 2007.

- **Session Chair**, Joint International Conference on Computing and Decision-Making in Civil and Building Engineering, American Society of Civil Engineers (ASCE), 2006.

- **Session Coordinator**, Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), 2006.

- **Track Chair**, Construction Research Congress, American Society of Civil Engineers (ASCE), San Diego, CA, 2005.

- **Track Coordinator**, Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), 2005.

- **Scientific Committee Member**, 4th International Conference on Construction Applications of Virtual Reality, ADETTI/ISCTE, Lisbon, Portugal, 2004

- **Program Committee Member**, 3rd International Conference on Construction Applications of Virtual Reality, Virginia Polytechnic Institute & State University, Blacksburg, VA, 2003.

- **Session Chair**, Winter Simulation Conference, Institute of Electrical and Electronics Engineers (IEEE), 2003.

UNIVERSITY LEADERSHIP, SERVICE, AND OUTREACH ACTIVITIES

Department of Civil and Environmental Engineering

- **Program Advisor**, Tishman Construction Management Program (TCMP), Department of Civil and Environmental Engineering, University of Michigan, 2011-present

- **Associate Director**, UM Construction Industry Alliance Program (UMCIAP), Department of Civil and Environmental Engineering, University of Michigan, 2011-present

- **Director**, Laboratory for Interactive Visualization in Engineering, Department of Civil and Environmental Engineering, University of Michigan, 2009-present

- **Co-Director**, Construction Engineering Laboratory, Department of Civil and Environmental Engineering, University of Michigan, 2003-present

- **Chair,** CEE Information Technology Committee, University of Michigan, 2013-2014

- **Chair**, Tenure and Promotion Casebook Committee of Professor SangHyun Lee, Department of Civil and Environmental Engineering, University of Michigan, 2013-2014.

- **Chair,** Ad-Hoc Search Committee for Construction Faculty Position, Department of Civil and Environmental Engineering, University of Michigan, 2013

- **Co-Chair,** CEE Information Technology Committee, University of Michigan, 2012-2013

- **Member,** Search Committee for Transportation Faculty Positions, Department of Civil and Environmental Engineering, University of Michigan, 2013

- **Member,** Tenure and Promotion Casebook Committee of Professor Ann Jeffers, Department of Civil and Environmental Engineering, University of Michigan, 2014-2015.

- **Member,** CEE MS Subcommittee, University of Michigan, 2014-present

- **Member,** CEE Graduate Committee, University of Michigan, 2003-2014

- **Member,** CEE Space Planning Committee, University of Michigan, 2012-present

- **Member,** CEE External Relations Committee, University of Michigan, 2012-present

- **Member,** CEE Strategic Plan Implementation Committee, University of Michigan, 2013-present

- **Chair,** CEE Strategic Plan Implementation Committee, University of Michigan, 2011-2012

- **Member,** CEE Executive Committee, Department of Civil and Environmental Engineering, University of Michigan, 2012

- **Member,** Search Committee for CEE Faculty Positions, Department of Civil and Environmental Engineering, University of Michigan, 2011-2012

- **Acting Program Advisor**, Construction Engineering and Management Program, Department of Civil and Environmental Engineering, University of Michigan, 2008-2011

- **Co-Chair,** Search Committee for CE&M Faculty Position, Department of Civil and Environmental Engineering, University of Michigan, 2009-2010

- **Member,** CEE Strategic Planning Committee, University of Michigan, 2009-2011

- **Member,** CEE Mentoring Committee, University of Michigan, 2009-present

- **Invited Presenter,** “Civil and Environmental Engineering at the University of Michigan”, Presentation made to students and faculty at the University of Puerto Rico at Mayaguez, Mayaguez, PR, 2007

- **CEE Coordinator**, College of Engineering Tech-Day Organizing Committee, University of Michigan, 2006, 2007, and 2008

- **Member,** Search Committee for CE&M Faculty Position, Department of Civil and Environmental Engineering, University of Michigan, 2003-2005, 2008-2009
- **Member,** CEE Research Committee, University of Michigan, 2006-2008
- **Member,** CEE Student Awards Committee, University of Michigan, 2005-2008
- **Member,** CEE Information Technology Committee, University of Michigan, 2003-2008

College of Engineering

- **College of Engineering Representative**, Electrical Engineering and Computer Science Faculty Search Committee, University of Michigan, 2014.
- **Faculty Mentor,** Master of Entrepreneurship Program, College of Engineering, University of Michigan, 2013-present
- **Chair,** 2013 Michigan Robotics Day Planning Committee, College of Engineering, University of Michigan, 2012-2013
- **Invited Panelist**, Michigan I-Corps, Center for Entrepreneurship, College of Engineering, University of Michigan, 2013.
- **College of Engineering Representative**, Electrical Engineering and Computer Science Faculty Search Committee, University of Michigan, 2008.
- **Member,** College of Engineering Research Strategy Committee, University of Michigan, 2007. Committee won first place in college-wide competition for presenting the best proposal outlining specific research thrusts that the college must pursue over the upcoming decade.
- **College Representative for CSE Faculty Candidate,** Department of Computer Science and Engineering, University of Michigan, 2008

PROFESSIONAL AFFILIATIONS

- **Member**, International Association for Automation and Robotics in Construction (IAARC), 2009-present
- **Member**, FIATECH consortium, 2009-present
- **Member**, Technical Committee on Information Technology and Computing in Construction, American Society of Civil Engineers (ASCE), 2004-present

- **Member**, Intelligent Computing Committee, Technical Council on Computing and Information Technology (TCCIT), American Society of Civil Engineers, 2005-present

- **Member**, American Society of Civil Engineers (ASCE), 2000-present

- **Member**, American Society for Engineering Education (ASEE), 2004-present

- **Member**, Institute for Operations Research and the Management Sciences – College on Simulation (INFORMS-CS), 2003-present