

Gurjot Singh

Curriculum Vitae

Assistant Professor, Computer Science
Department of Mathematics, Computer Science, & Physics
Fairleigh Dickinson University

Contact Information

 285 Madison Ave, Office 120
Mail Stop: M-ZN2-02
Madison, NJ 07940, USA

 973-443-8647

 gurjot@acm.org

 <http://www.singhgurjot.com>

Research Interests

- Augmented and Virtual Reality
- Human-Computer Interaction (HCI)
- Visual Perception and Cognition in Virtual Environments
- Mixed Reality Educational and Training Systems
- Technology-Enhanced Learning
- Human Factors
- Empirical Methods (User Studies and Evaluation)
- Data Analysis and Statistics

Education

- August 2013** **PhD in Computer Science & Engineering**
Mississippi State University, GPA – 3.94
Concentration: Graphics & Visualization, Human-Computer Interaction, Perception
Dissertation Topic: Near-Field Depth Perception in Optical See-Through Augmented Reality
Advisor: Dr. John Edward Swan II
- 2010** **M. S. in Computer Science & Engineering**
Mississippi State University, GPA – 4.0
Concentration: Graphics & Visualization, Human-Computer Interaction, Visual Perception
Dissertation Topic: Near-Field Depth Perception in See-Through Augmented Reality
Advisor: Dr. John Edward Swan II
- 2004** **B.Tech. in Computer Science & Engineering**
Punjab Technical University, India

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Honors and Awards

- 2012 PhD Fellowship Award**
"Given for excellence in research and leadership"
Bagley College of Engineering, Mississippi State University.
- 2012 Graduate Student Association Research Award Nominee**
Department of Computer Science & Engineering, Mississippi State University.
- 2012 Honorable Mention Award**
IEEE Virtual Reality 2012. For the poster abstract
"Depth Judgments by Reaching and Matching in Near-Field Augmented Reality".
- 2012 Featured in NSF Science Nation**
Special report for the online technology magazine by the National Science Foundation.
☞ "Improving Our Depth Perception in Augmented Reality".
- 2007 Elected to Upsilon Pi Epsilon**
Honor Society in the Computing Sciences, Mississippi State Chapter.

Experience

- 2013-2015 Postdoctoral Associate**
3D Interaction Group
Virginia Tech, Blacksburg, Virginia
- Managed the development of a mixed reality system for scaffolding history inquiry learning to explore potential of AR/VR in technology enhanced learning.
 - Responsible for usability research to design an outdoors mobile AR app and a desktop VR system for in-situ evidence presentation and analysis.
 - Collaborated with history, education, arts, HCI, and CS faculty and students and mentoring undergraduate students.
- 2007-2013 Graduate Research Assistant**
Department of Computer Science & Engineering
Mississippi State University
- Studied human-computer interaction and user perception.
 - Conducted human factors research on visual perception in AR/VR environments.
 - Developed immersive and video see-through augmented and virtual reality systems.
 - Designed and built an augmented reality display (Haploscope).
 - Constructed a table-top apparatus for studying augmented reality depth perception.
 - Integrated eye-tracking with AR haploscope for vergence driven scene rendering.
 - Designed and developed interaction techniques for manipulating 3D virtual objects.
 - Received IRB certification to conduct research with human subjects.
- 2011-2013 Lab Manager**
ARVR Perception Lab
Mississippi State University, Starkville, Mississippi

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- Administrated procurement and management of lab equipment.
- Arranged and scheduled subjects for human factors research.
- Coordinated and hosted lab tours for university management and local community.

2004 Software Engineer Intern

Ralson India Ltd., Ludhiana, India

- Developed an automated production and inventory system for a tire manufacturing plant.
- Performed business analysis to elicit then current processes and requirements.
- Replaced the earlier paper-based manual system with automated inventory system.

Teaching

2015 Lecturer, Fairleigh Dickinson University, Fall, 2015

CSCI 1205 - Introduction to Computer Programming

CSCI 2232 - Data Structures

CSCI 2255 - Discrete Structures

2015 Lecturer, Virginia Tech, Spring, 2015

CS 3724 - Introduction to Human-Computer Interaction

2014 Guest Lecturer, Virginia Tech

CS 5754 - Virtual Environments

Skills

- **Programming Languages:** C++, JAVA, OpenGL, Perl, Obj-C.
- **Statistical Softwares:** Minitab, SPSS, PipeStat, R.
- **Modeling Softwares:** Blender, Unity3D.
- **Tracking Systems:** Intersense IS-1200, ARTtrack/ TrackPack, ARToolkit.

Publications

- **Gurjot Singh**, Doug A. Bowman, David Hicks, David Cline, J. Todd Ogle, Aaron Johnson, Rosemary Zlokas and Eric Ragan, "CI-Spy: Designing A Mobile Augmented Reality System for Scaffolding Historical Inquiry Learning", *ISMAR, 2015 (Accepted)*.
- J. Edward Swan II, **Gurjot Singh**, and Stephen R. Ellis, "Matching and Reaching Depth Judgments with Real and Augmented Reality Targets", *IEEE Transactions on Visualization and Computer Graphics*, Vol. 21(11), 2015, pp. 1289-1298.
- **Gurjot Singh**, Doug A. Bowman, David Hicks, David Cline, J. Todd Ogle, Aaron Johnson, Rosemary Zlokas and Eric Ragan, "CI-Spy: Using Mobile-AR for Scaffolding Historical Inquiry Learning", *ISMAR, 2014*, September 10-12, 2014, pp. 73-74.
- J. Adam Jones, J. Edward Swan II, **Gurjot Singh**, Sujan Reddy, Kenneth Moser, Chunya Hua, and Stephen R. Ellis, "Improvements in Visually Directed Walking in Virtual Environments Cannot be Explained by Changes in Gait Alone", *In Proceedings of the ACM SIGGRAPH Symposium on Applied Perception (SAP 2012)*, August 3-4, 2012, pp. 11-16.

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- **Gurjot Singh**, J. Edward Swan II, J. Adam Jones, Stephen R. Ellis, “Depth Judgments by Reaching and Matching in Near-Field Augmented Reality”, *Poster Compendium, Proceedings of IEEE Virtual Reality 2012*, March 4-8, 2012, pp. 165-166.
Winner of an “Honorable Mention” award at IEEE Virtual Reality 2012.
Award rate: 4% (2 out of 55).
- J. Adam Jones, J. Edward Swan II, **Gurjot Singh**, and Stephen R. Ellis, “Peripheral Visual Information and Its Effect on Distance Judgments in Virtual and Augmented Environments”, *In Proceedings of the Symposium on Applied Perception in Graphics and Visualization (APGV 2011)*, August 2011, pp. 29-35.
- J. Adam Jones, J. Edward Swan II, **Gurjot Singh**, and Stephen R. Ellis, “Peripheral Visual Information and Its Effect of the Perception of Egocentric Depth in Virtual and Augmented Environments”, *Poster Compendium, Proceedings of IEEE Virtual Reality 2011*, March 2011, pp. 215-216.
- **Gurjot Singh**, J. Edward Swan II, J. Adam Jones, and Stephen R. Ellis, “Depth Judgment Tasks and Environments in Near-Field Augmented Reality”, *Poster Compendium, Proceedings of IEEE Virtual Reality 2011*, March 2011, pp. 241-242.
- **Gurjot Singh**, J. Edward Swan II, J. Adam Jones, and Stephen R. Ellis, “Depth Judgment Measures and Occluding Surfaces in Near-Field Augmented Reality”, *In Proceedings of the Symposium on Applied Perception in Graphics and Visualization (APGV 2010)*, July 2010, pp. 149-156.
- J. Adam Jones, J. Edward Swan II, **Gurjot Singh**, Josh Franck, and Stephen R. Ellis, “The Effects of Continued Exposure to Medium Field Augmented and Virtual Reality on the Perception of Egocentric Depth”, *In Poster Compendium, Proceedings of Symposium on Applied Perception in Graphics and Visualization (APGV 2009)*, September 2009, pp. 138.
- **Gurjot Singh**, J. Edward Swan II, J. Adam Jones, Lorraine Lin, and Stephen R. Ellis, “Depth Judgment Measures and Occluders in Near-Field Augmented Reality”, *Poster Compendium, Proceedings of Symposium on Applied Perception in Graphics and Visualization (APGV 2009)*, September 2009, pp. 127.
- J. Adam Jones, J. Edward Swan II, **Gurjot Singh**, Eric Kolstad, and Stephen R. Ellis, “The Effects of Virtual Reality, Augmented Reality, and Motion Parallax on Egocentric Depth Perception”, *In Proceedings of the Symposium on Applied Perception in Graphics and Visualization*, August 2008, pp. 9-14.
- Adam Jones, J. Edward Swan II, **Gurjot Singh**, and Eric Kolstad, “The Effects of Virtual Reality, Augmented Reality, and Motion Parallax on Egocentric Depth Perception”, *Poster Compendium, Proceedings of IEEE Virtual Reality 2008*, March 2008, pp. 267-268.

Presentations

- Invited Talk: “Near Field Depth Perception in Optical See-through Augmented Reality”. *Department of Computer Science*, University of Alaska, Anchorage. Presented: July 03, 2013.
- Invited Talk: “Near Field Depth Perception in Optical See-through Augmented Reality”. *Institute for Creative Technologies*, University of Southern California, California. Presented: April 22, 2013.
- Invited Talk: “Depth cues and Depth Perception”. *Graduate Seminars in Computer Science*, Mississippi State University, Mississippi. Presented: November 18, 2009.

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- Invited Talk: “Depth Perception in Augmented Reality”. *Empirical Software Engineering Research Group*, Mississippi State University, Mississippi. Presented: October 26, 2009.

Research/Academic Projects

- **CI-Spy**: *A multi-user iOS augmented reality application for history education.*
 - Developed for elementary/middle school teachers to teach history.
 - Presents historical buildings and in-situ evidence to provide historical context.
 - Facilitates historical evidence collection and analysis.
- **AR Haploscope**: *A table-top based augmented reality display.*
 - Presents virtual objects with different accommodative demands.
 - Provides correct convergence and accommodation cues.
- **Vergence Driven Scene Rendering**: *Augmented reality X-ray vision using eye tracking.*
 - Solves visual clutter problem of multiple layers of visual information in AR.
 - Virtual objects rendering based on eye convergence information.
 - Selected layer of information is rendered based on observer’s attention.
- **Depth Perception Measurement Apparatus**: *A table-top based depth judgment apparatus.*
 - Measures depth judgments in near visual field (up to 1 meter) with an accuracy of ~ 0.5 mm.
 - Facilitates depth judgment measurements using *reaching* and *matching* tasks.
 - Depth judgment measurements for both real and virtual objects.
- **AR 3D Pointer**: *An interaction device for manipulating virtual objects in 3D.*
 - Can manipulate virtual objects using natural gestures e.g grab, rotate, translate, scale.
 - Supports virtual object manipulation in both immersive and video AR.

Professional Service

- **International Program Committee**, *International Symposium on Visual Computing*, 2015.
- **Student Volunteer Chair**, *IEEE Virtual Reality Conference*, 2014.
- **Reviewer**, *International Journal of Human-Computer Studies*, 2012, 2013.
- **Reviewer**, *Presence: Teleoperators and Virtual Environments*, 2011, 2015.
- **Reviewer**, *IEEE Virtual Reality Conference*, 2010, 2011, 2014.
- **Reviewer**, *IEEE International Symposium on Mixed and Augmented Reality*, 2009, 2011.
- **Reviewer**, *Transactions on Visualization and Computer Graphics*, 2007, 2014, 2015.
- **Student Volunteer**, *IEEE Virtual Reality Conference*, 2010, 2013.
- **Student Volunteer**, *IEEE International Symposium on Mixed and Augmented Reality*, 2012.

University Service

- **PhD Qualifying Committee Member**, *Human-Computer Interaction*, Virginia Tech, 2014-2015.

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- **President**, *Upsilon Pi Epsilon (Honor Society in the Computing Sciences)*, Mississippi State Chapter, 2009-2013.
- **Public Relations Officer**, *Indian Students Association*, Mississippi State University, 2008-2009.
- **Secretary**, *Upsilon Pi Epsilon*, Mississippi State Chapter, 2008-2009.

Publicity

- **ACM Tech News:** ☞ “New mobile app uses augmented reality to enhance learning experiences at historic sites”, May 12, 2014
technews.acm.org/archives.cfm?fo=2014-05-may/may-12-2014.html
- **Virginia Tech News:** ☞ “New mobile app uses augmented reality to enhance learning experiences at historic sites”, May 5, 2014
www.vtnews.vt.edu/articles/2014/05/050514-engineering-historyappcburg.html
- **NSF Science Nation for PBS:** ☞ “Improving Our Depth Perception in Augmented Reality”, Special report by the National Science Foundation for Science Nation, September 17, 2012
www.nsf.gov/news/special_reports/science_nation/augmentedreality.jsp
- **The Dispatch:** ☞ “MSU team’s research focuses on ‘augmented’ reality”, GTR area newspaper, October 6, 2012
www.cdipatch.com/news/article.asp?aid=19443
- **BCoE Quarterly E-Newsletter:** ☞ “NASA funding helps keep research a reality”, Quarterly E-Newsletter, James Worth Bagley College of Engineering, Mississippi State University, June 2010.
<http://www.bagley.msstate.edu/newsletter/june2010/estory5.html>

Affiliations

- Upsilon Pi Epsilon Honor Society
- Association of Computing Machinery, 2010 - Present
- IEEE Computer Society, 2010 - Present