ZAHID HOSSAIN

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EXPERIENCE & OBJECTIVE

I am interested in the core technologies for AR/VR, especially **inside-out tracking (e.g., SLAM) and rendering**—the two components that must work in unison for low-latency tracking experience. I have a well-rounded research and a long industry experience with **graphics**, **signal processing**, **computer vision**, and **mechatronic automation**, and take a holistic engineering approach to address the core tech problems of AR/VR.

My PhD research combined **computer vision**, **embedded systems**, and **distributed computing** to develop a biology cloud lab system that allows online students to execute real biology experiments interactively at scale, for the first time, over the Internet. Prior to that, I conducted research in **computer graphics**, specifically combining **signal processing** and **visualization**.

EDUCATION

- **PhD, Computer Science, Stanford University, USA (Jan 2017)**
  Thesis: *Interactive Biology Cloudlab System Architecture and Applications in Large Scale Online Education*
  Committee: *Ingmar Riedel-Kruse, David Dill, Paulo Blikstein, Michael Bernstein.
- **MSc, Computer Science, Stanford University, USA (Jun 2015)**
  Concentration: Applied Computing (Graphics, Robotics, Vision), **GPA:** 3.89 / 4.00.
- **MSc, Computer Science, Simon Fraser University, Canada (Apr 2011)**
  Research: Graphics, Visualization & Signal Processing, **GPA:** 4.06 / 4.33.
  Thesis: *Edge Aware Anisotropic Diffusion for 3D Scalar Data on Regular Lattices*
  Committee: *Torsten Möller, Steven J. Ruuth, Hao-Min Zhou.
- **BSc, Computing Science, North South University, Bangladesh (Sep 2006)**
  Minor: Electrical & Telecommunications.
  Thesis: *Solving 2D Strip-Packing Problem Using Genetic Algorithm.* GPA: 3.93 / 4.00.
  Faculty Advisors: *Khaled Mahmud, Md. Kaykobad, Munirul Islam.

WORK EXPERIENCE

Applied Research Scientist & Manager — Facebook Reality Labs, Redmond, WA USA — **May 2018 - Present**

Lead a team within AR/VR that takes interest in the general registration problem of the real and the virtual world.

Sr. Engineer, Team Lead (SLAM) — Meta Co., San Mateo, CA USA — **May 2017 - 2018**

I lead the SLAM (6 members) and the rendering team (3 members). I was one of the core contributors of the compositor (takes in the application images, warps them for the display, and applies and extra warp to hide latency using the latest pose estimates); developed a much improved version of a GPU-based real-time hand glove mesh (for occlusion) from depth data; developed a depth reprojection (3D-warp/spacewarp) method with adaptive GPU tesselation that dramatically reduced motion-to-photon latency and stabilized SLAM performance and bumped up Meta's SLAM NPS (net promoter score) by a large margin (compare SDK v2.4 vs v2.6); developed adaptive late-warp to make 3D-warp/spacewarp portable across machines; architected, with 2 other engineers, the infrastructure for ground truth benchmarking of SLAM performance; re-architected the tracking module such that external tracking systems, such as OpiTrack/Lighthouse, can be integrated with the on-board IMU sensorfusion with automatic clock synchronization; core part of the team that architected the run-time system.

Summer Intern — Apple Inc., Cupertino, CA USA — **Jun 2014 - Sep 2014**

Developed algorithms and rendering techniques to efficiently select and vividly highlight landmarks from a large collection of unlabeled streamed mesh in Apple Maps.

Parallelization Consultant — Samsung Info. Systems America, San Jose, CA USA — **Sep 2012 - Jan 2013**

Worked in a group of 5 people on end-to-end GPU parallelization of the Bullet Physics engines on small devices.

Summer Intern Samsung Telecommunications America **Jul 2012 - Sep 2012**
San Jose, CA USA
Solely developed novel UI interfaces on mobile devices using Physics simulations and sensors.

Senior Software Developer ReliSource Technologies Ltd. **Jul 2011 - Sep 2011**
Dhaka, Bangladesh / Boston, MA, USA
Designed and implemented OSX client for third party calendar synchronization.

Software Developer ReliSource Technologies Ltd. **Jul 2006 - Aug 2008**
Dhaka, Bangladesh / Boston, MA, USA
Ported OpenGL 1.4 rendering pipeline to DirectX 9c for animation tools used by Electronic Arts (Redwood).

Graphics Developer eSophers Ltd. **Feb 2003 - Jul 2004**
Dhaka, Bangladesh
Graphics lead in a computer games startup comprising 6 people. Developed the Rendering Engine.

SELECTED PROJECTS & CODE

- Vision System to Track Hundreds Motile Cells in Realtime, (C++, OpenCV, NaCL, Matlab) - (2016).
- Lightfield Camera Simulation (**2nd Prize Winner in CS348b - Stanford Rendering Competition**), (C++, PBRT, OpenCV, Intel TBB) - (2014).
- Depthmap Extraction from Lightfield Imaging using Lytro, (C++, OpenCV, OpenGL, Intel TBB) - (2012).
- HDR Photo Compositing Using Short Exposure Bursts (**Ranked among top 5 projects in CS478 - Computational Photography, Stanford**), (C++, OpenCV, nVidia Tegra, Intel TBB) - (2011).
- Lattice Tracer - A General Purpose Multi-Threaded Volume Raycaster for Regular Lattices (incl. Body Centric Cubic) with High Order Derivative Filters, (C++, OpenGL, Matlab, MPI) - (2010).

TECHNICAL SKILLS

- General Programming: C/C++11, Python 2.X, Matlab, Golang, Java, Obj-C
- Platform / API: OpenCV, OpenGL 3.X, DirectX 11
- GPU Programming: GLSL, HLSL, OpenCL, DirectCompute

TEACHING

- Instructor of CS148 (Stanford University): Introduction to Computer Graphics & Imaging, Summer 2016. Taught this class of 80 students, composed of undergrads, grads, and visiting students.

SELECTED PUBLICATIONS (showing 8 out of 11)

- **Zahid Hossain**, Engin W. Bumbacher, Alison Brauneis, Monica Diaz, Andy Saltarelli, Paulo Blikstein, Ingmar H Riedel-Kruse, "Design Guidelines and Empirical Case Study for Scaling Authentic Inquiry-based Science Learning via Open Online Courses and Interactive Biology Cloud Labs," *International Journal of Artificial Intelligence in Education* (2017): 1-30.
- **Zahid Hossain**, Ingmar Riedel-Kruse, "Life-science Experiments Online: Technological Frameworks and Educational Use Cases," Book Chapter, 2017 (to appear).
- **Zahid Hossain**, Engin W. Bumbacher, Paulo Blikstein, Ingmar H. Riedel-Kruse, "Authentic Science Inquiry Learning at Scale Enabled by an Interactive Biology Cloud Lab," *Proceedings of the Fourth ACM Conference on Learning@scale.* ACM, 2017. (to appear)
- **Zahid Hossain**, Engin W. Bumbacher, Alice M. Chung, Honesty Kim, Casey Litton, Ashley D. Walter, Sachin N. Pradhan, Kemi Jona, Paulo Blikstein, Ingmar H. Riedel-Kruse, "Interactive and Scalable Biology Cloud Experimentation for Scientific Inquiry and Education." *Nature Biotech*, 34(12):1293-1298, 12 2016.
- Dominik L. Michels, Dmitry A. Lyakhov, Vladimir P. Gerdt, **Zahid Hossain**, Ingmar H. Riedel-Kruse, and Andreas G. Weber, "On the General Analytical Solution of the Kinematic Cosserat Equations." *International Workshop on Computer Algebra in Scientific Computing. Springer International Publishing*, 2016.
- **Zahid Hossain**, Xiaofan Jin, Engin W. Bumbacher, Alice M. Chung, Stephen Koo, Jordan D. Shapiro, Cynthia Y. Truong, Sean Choi, Nathan D. Orloff, Paulo Blikstein, Ingmar H. Riedel-Kruse, "Interactive Cloud Experimentation for Biology: An Online Education Case Study," **(Honorable Mention: Best Paper)** *Proceedings of the 33rd annual ACM conference on Human factors in computing systems. ACM SIGCHI, 2015.*
- **Zahid Hossain**, Usman R. Alim and Torsten Möller, "Toward High-Quality Gradient Estimation on Regular Lattices," *IEEE Transactions on Visualization and Computer Graphics*, TVCG on 17.4 (2011): 426-439.

- **Zahid Hossain** and Torsten Möller, "Edge Aware Anisotropic Diffusion for 3D Scalar Data," *IEEE Transactions on Visualization and Computer Graphics (Proceedings Visualization / Information Visualization 2010)*, vol. 16, no. 6, pp. 1375–1384, Nov.-Dec. 2010.

SELECTED AWARDS & RECOGNITIONS

- Stanford Teaching Fellow (May 2015 - Sep 2016), for CS148: Intro to Computer Graphics and Imaging.
- MPC-VCC Scholarship (2015 - 2017) Max Planck Center for Visual Computing and Communications
- BioX SIGF (Sep 2014 - Jan 2017): School of Engineering, Stanford University.
- Second prize in Stanford Rendering Competition.
- Graduate Fellowship (Spring 2010): Simon Fraser University.
- Graduate Entrance Scholarship (Sep 2008 - Dec 2010): Simon Fraser University.
- Ebco/Eppich Scholarship (Jan 2011 - Apr 2011): Applied Sciences, Simon Fraser University.

EXTRACURRICULAR ACTIVITIES

- **Founder and President** of Bangladesh Alumni Foundation (`www.bdalumnifoundation.org`), a non-profit organization that provides scholarships to talented undergraudate students in Bangladesh.
- **Vice president**, NSU Wireless Forum (2006-2007), an undergrad engineering club.

ADDITIONAL SKILLS & INTERESTS

- **Spoken Languages**: Bengali, English.
- **Communications Skills**: Taught a full class (CS148) at Stanford, presented a papers in ACM SIGCHI and IEEE Visualization Conferences.
- **General Interests**: Playing soccer, hiking, collecting miniature (1:400) airplane models, and building electronics.