

# MUHAMMAD MOBEEN MOVANIA

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## OBJECTIVE

To make a name in the field of computer graphics programming and advance 3D computer graphics research and development.

## EDUCATION

**Doctor of Philosophy (PhD)** January 2008 – October 2012

**Nanyang Technological University**, Singapore.

CGPA: 4.85/5.0

My main research area was GPU based advanced volumetric rendering. Initially some algorithms for visualization of laser scanning confocal endomicroscopic (LSCM) imagery were developed for National Cancer Center Singapore (NCCS). Then methods for simultaneous visualization and deformation of volume datasets on the GPU were studied.

**Bachelor of Computer Science Honors (BCS-H)** April 2001 – May 2005

**Iqra University**, Karachi, Pakistan.

CGPA: 3.91/4.0

Specialized in computer graphics and animation. In addition, core modules like digital image processing, data structures and computer languages were my main interest.

## EXPERIENCE

**Assistant Professor,** October 2013 – to date

**DHA Suffa University**, Karachi, Pakistan.

I am currently serving as an Assistant Professor in the Department of Computer Science at DHA Suffa University, Karachi. Currently, I am teaching computer architecture, parallel computing using CUDA and data structure courses to undergraduate students. I have also established a [computer graphics and visualization research group](#) to carry out research and development in the areas of computer graphics, physically based rendering, physically based animation and GPU based volume rendering.

**Research Scientist,** June 2012 – September 2013

**Institute for Infocomm Research, A-Star**, Singapore.

As a research scientist at Institute for Infocomm Research (I<sup>2</sup>R), I was involved in computer graphics and visualization research and development. My main responsibilities were in two projects there. The first project was an augmented reality based system called MagicMirror for retail shopping that allows users to try-on virtual clothes. More details about the project can be obtained from this website <http://www.i2r.a-star.edu.sg/project/virtualclothes/>. In the second project called HDRi (High Dynamic Range imaging), my main responsibilities were to provide GPU support for the whole imaging and image processing pipeline.

## Skills at a glance

### Languages:

Visual C/C++,  
Visual C#,  
Java.

### Graphics API:

OpenGL, WebGL,  
DirectX/XNA,  
OGRE, Irrlicht.

### Physics API:

PhysX, Bullet.

### Shader

**Languages:**  
GLSL, HLSL, Cg.

### GPGPU:

CUDA/OpenCL.

### UI Libraries:

Qt, wxWidgets,  
MFC.

### Numerical

**Methods:**  
Matlab, R.

### Visualization

**Libraries:**  
VTK, ITK, MeVis Lab,  
VL, OpenInventor,  
OpenGLVolumizer.

**Research Officer,**  
**Nanyang Technological University, Singapore**

Jan 2012 – June 2012

As a research officer at Nanyang Technological University, Singapore, I was involved in research in computer graphics and visualization. Specifically, my focus was on introducing new algorithms for pervasive image processing and visualization on the mobile phones and tablets using the new WebGL standard. In addition, I was also involved in carrying out the summer camp for students.

**Senior Programmer,**  
**Data Communication & Control Pvt. Ltd., Karachi, Pakistan.**

July 2005 – June 2007

Development of dynamic integrated training simulators and action speed tactical trainers. These systems are massive interconnected simulation platforms for tactical training. I was responsible for integration of the graphics layer with the rest of the simulators running on the RTI middleware. In addition, simulation scenario building tools were also developed. The tools and skills learnt included Visual C++ (STL, MFC, wxWidgets, Qt, DirectX API) and Visual C#.

## RESEARCH WORK

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### **Cel-FI (Cellular Fluorescence Imaging) for NCCS.**

This is the real-time 3D volume rendering application that was developed for the visualization of LSCM datasets for National Cancer Center Singapore (NCCS). Previously, the scanning machine would just visualize the z depth scans and so the doctors would not be able to see the other dimensions (for e.g. the cross sectional view). To enable this, we developed a real-time 3D volume rendering application that would visualize the dataset across a network instantly. Thus, the operator would grab a scan on one end and the 3D volume will be visualized instantly on the other end. The whole visualization system was built in house without using any third party libraries.

### **OpenCloth.**

I am the author of the open source cloth simulation library (OpenCloth: <http://code.google.com/p/opencloth>) that is specifically geared towards beginners and researchers. It implements all of the basic cloth simulation algorithms in as simple a manner as possible so that beginners know exactly what goes underneath a cloth simulation package or a physics engine. Rather than wrapping the code into a lot of classes, all of the codes are written in just a single file. The package is not just limited to cloth simulation; it also shows how to do basic soft bodies using co-rotated linear FEM. For details, visit the project website.

### **GPU-VR (GPU based volume rendering).**

During my survey of the volume rendering field, I developed applications to implement the state of the art in volume rendering. The algorithms implemented include 2D and 3D texture slicing, shear warp, cell projection, marching cubes and marching tetrahedra, ray casting and splatting. All of these were implemented on the GPU.

## KEYNOTES/TALKS/LECTURES/SEMINARS/COURSES/TUTORIALS

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- [1] **MOVANIA Muhammad Mobeen**, *“Introduction to GPU Programming”*, an invited talk held at the School of Marine Science and Technology, Northwestern Polytechnic University (NPU), Xi’an, China, 7 November 2018.
- [2] **MOVANIA Muhammad Mobeen**, *“Computer Graphics Research Activities at DHA Suffa University”*, an invited talk held at the School of Marine Science and Technology, Northwestern Polytechnic University (NPU), Xi’an, China, 7 November 2018.
- [3] **MOVANIA Muhammad Mobeen**, *“What universities need to do- A growing disconnect between academic curriculum and market needs”*, an invited talk at the O10 TECH Meetup,

held at the National Incubation Center, NEDUET, Karachi, 1 September 2018.

- [4] **MOVANIA Muhammad Mobeen**, "*Computer Graphics: A domain worth exploring*", an invited keynote speech at the IEEE Intellect 2017 Conference held at PAF KIET University, Karachi, 15-16 November 2017.
- [5] **MOVANIA Muhammad Mobeen**, "*Computer Graphics: A domain worth exploring*", an invited talk at eCompetencia 2017, Iqra University, Karachi, 29 April 2017.
- [6] **MOVANIA Muhammad Mobeen**, "*Virtual Reality (VR) Technology in 2017*", an invited talk at the seminar on Technology for Future : Digitalizing Engineering by AI/IoT/VR, DHA Suffa University, Karachi, 25 April 2017.
- [7] **MOVANIA Muhammad Mobeen**, "*High Quality Biomedical Volume Rendering in a Web Browser Using WebGL*," a keynote speech at the 1st International Conference on Emerging Trends in Engineering, Sciences and Technology (ICEEST2016), Iqra University, Karachi, 2-3 June 2016.
- [8] **MOVANIA Muhammad Mobeen**, "*Consolidating C++*," An invited lecture under the ACM@DSU series at the DHA Suffa University, Karachi, Pakistan, 5 April 2016.
- [9] **MOVANIA Muhammad Mobeen**, "*Data Level Parallelism in Parallel Computing Architectures*," An invited lecture at the DHA Suffa University, Karachi, Pakistan, 8 and 15 December 2015.
- [10] **MOVANIA Muhammad Mobeen**, "*Applications of Numerical Methods in Computer Graphics*," An invited lecture at the Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology (SZABIST), Karachi, Pakistan, 19 November 2015.
- [11] **MOVANIA Muhammad Mobeen**, "*Introduction to Parallel Computing using CUDA*," An invited lecture at the DHA Suffa University, Karachi, Pakistan, 27 January 2015.
- [12] **MOVANIA Muhammad Mobeen**, "*Introduction to Modern OpenGL in C++*," Tutorial at the 12<sup>th</sup> International Conference on Frontiers of Information Technology (FIT 2014), Islamabad, Pakistan, 17-19 December 2014.
- [13] **MOVANIA Muhammad Mobeen**, "*Applications of Computer Science: Graphics, Games, Movie Special Effects and Beyond*," An invited talk at the DHA Suffa University, Karachi, Pakistan, 12 November 2013.
- [14] **MOVANIA Muhammad Mobeen**, "*Introduction to GPU programming using OpenGL shaders*," A two day course at the Institute for Infocomm Research (I<sup>2</sup>R), A-Star, Singapore, 14 and 16 August 2013.

## PUBLICATIONS

### BOOKS

- [1] **MOVANIA Muhammad Mobeen**, David Wolff, Raymond C. H. Lo, William C. Y. Lo, "*OpenGL – Build high performance graphics*," Packt Publishing, pp: 982, May 2017, Ebook ISBN-10: 1788296893, ISBN-13: 9781788296892. URL: <https://www.packtpub.com/application-development/opengl-%E2%80%93-build-high-performance-graphics>.
- [2] **MOVANIA Muhammad Mobeen**, "*OpenGL Development Cookbook*," Packt Publishing, pp: 300, 2013, ISBN-10: 1849695040, ISBN-13: 978184969504. URL: <http://www.packtpub.com/opengl-development-cookbook/book>.

### BOOK CHAPTERS

- [1] **MOVANIA Muhammad Mobeen**, "*Simulating Soft Bodies using Strain Based Dynamics*," Chapter 12 in Game Engine Gems 3, A.K. Peters/CRC Press, pp:159-181, April 2016, URL: <http://www.gameenginegems.com/geg3.php>.
- [2] **MOVANIA Muhammad Mobeen** and Lin Feng, "*Realtime Volumetric Lighting for WebGL*," Chapter 17 in WebGL Insights, A.K. Peters/CRC Press, pp:261-284, July 2015, URL: <http://www.webglinsights.com>.
- [3] **MOVANIA Muhammad Mobeen** and Lin Feng, "*Realtime Physically-based Deformation Using Transform Feedback*," Chapter 17 in OpenGL Insights, A.K. Peters/CRC Press, pp: 233-

## INTERNATIONAL JOURNALS

- [1] Ishtiaq Rasool Khan, Susanto Rahardja, Muhammad Murtaza Khan, **MOVANIA Muhammad Mobeen**, Fidaa Abed, "A tone-mapping technique based on histogram using a sensitivity model of the human visual system," IEEE Transactions on Industrial Electronics, Vol 63(10), 6 October 2017, IEEE, DOI: 10.1109/TIE.2017.2760247. (URL: <http://ieeexplore.ieee.org/document/8061010/>). (IF: 7.168 – JCR 2016)
- [2] ZHU Zhong-xian, YIN Yong, **MOVANIA Muhammad Mobeen**, "A Novel Parallel Algorithm for Computing the Mooring Line Based on Lumped-Mass Method," International Journal of Modeling, Simulation, and Scientific Computing, Vol 7(4), 2016, World Scientific Publishing Co Pte Ltd, DOI: <http://dx.doi.org/10.1142/S1793962317500040>. (URL: <http://www.worldscientific.com/doi/abs/10.1142/S1793962317500040>). (ISI/ESCI Indexed)
- [3] **MOVANIA Muhammad Mobeen**, CHIEW Wei Ming, LIN Feng, "On-Site Volume Rendering with GPU-Enabled Devices," Wireless Personal Communications, Vol 1(2), 2013 (URL: <http://link.springer.com/article/10.1007%2Fs11277-013-1354-y>). (IF: 0.951 - JCR 2016)
- [4] **MOVANIA Muhammad Mobeen**, LIN Feng, "Mobile Visualization of Biomedical Volumetric Datasets," Journal of Internet Technologies and Secured Transaction (JITST), Volume 1, No. 1/2, pp:52-60, 2013, ISSN 2046-3723 (Available online: <http://infonomics-society.ie/wp-content/uploads/jitst/published-papers/volume-1-2012-3/Mobile-Visualization-of-Biomedical-Volume-Datasets.pdf> ).
- [5] **MOVANIA Muhammad Mobeen**, Feng Lin, Kemao Qian, WeiMing Chiew and Hock-Soon Seah, "Coupling between Meshless FEM Modeling and Rendering on GPU for Real-time Physically-based Volumetric Deformation," Journal of WSCG, Vol. 20(1), pp:1-10, 2012. (IF: 0.79)
- [6] **MOVANIA Muhammad Mobeen** and Lin Feng, "A Novel GPU-based Deformation Pipeline," in ISRN Computer Graphics, Vol 2012(2012), Article ID 936315, doi:10.5402/2012/936315, 2012.
- [7] Patricia S. P. Thong, Malini Olivo, **MOVANIA Muhammad Mobeen**, Stephanus S. Tandjung, Hock-Soon Seah, Feng Lin, Kemao Qian and Khee-Chee Soo, "Towards Real-time Virtual Biopsy of Oral Lesions using Confocal Laser Endomicroscopy Interfaced with Embedded Computing," in Journal of Biomedical Optics, SPIE, Vol. 17(5), DOI: 10.1117/1.JBO.17.5.056009, 2011. (IF: 2.530 - JCR 2016)
- [8] Patricia SP Thong, Malini Olivo, Stephanus S Tandjung, **MOVANIA Muhammad Mobeen**, Feng Lin, Kemao Qian, Hock-Soon Seah, Khee-Chee Soo, "Review of Confocal Fluorescence Endomicroscopy for Cancer Detection," in Journal of Selected Topics in Quantum Electronics, IEEE Photonics Society (IPS), Vol. 18(4), pp: 1355-1366, 2011. (IF: 3.971 - JCR 2016)
- [9] Patricia S. P. Thong, Malini Olivo, **MOVANIA Muhammad Mobeen**, Stephanus S. Tandjung, Hock-Soon Seah, Feng Lin, Kemao Qian and Khee-Chee Soo, "Hypericin Fluorescence Imaging of Oral Cancer: From Endoscopy to Real-time 3-Dimensional Endomicroscopy," in Journal of Medical Imaging and Health Informatics, American Scientific Publishers, Vol. 1(2), pp:139-143, 2011. (IF: 0.621 - JCR 2016)

## CONFERENCES/SYMPOSIA

- [1] **MOVANIA Muhammad Mobeen** and LIN Feng, "Coupling between In Vivo Endomicroscopic Imaging and Visualization Computing," in Proceedings of the 8th International Conference on Complex, Intelligent and Software Intensive Systems (CISIS 2014), Birmingham City University, Birmingham, UK, 2-4 July 2014.
- [2] **MOVANIA Muhammad Mobeen**, FARBIZ Farzam, "Depth Image Based Cloth Deformation for Virtual Tryon," ACM SIGGRAPH 2013 Posters, 2013. URL: <http://dl.acm.org/citation.cfm?id=2503464&CFID=349164039&CFTOKEN=80015959>.
- [3] **MOVANIA Muhammad Mobeen**, Chiew Wei Ming, LIN Feng, "Pervasive Computing for 3D Image Rendering," in Proceedings of the 10th IEEE International Conference on Pervasive

- Intelligence and Computing (PICom 2012), Changzhou, China, December 17-19 2012.
- [4] **MOVANIA Muhammad Mobeen**, Chiew Wei Ming, LIN Feng, Qian Kemao, Seah Hock-Soon, "Coupling between Meshless FEM Modeling and Rendering on GPU for Real-time Physically-based Volumetric Deformation," in Proceedings of the 20th International Conferences in Central Europe on Computer Graphics, Visualization and Computer Vision (WSCG 2012), Prague, Czech Republic, 25-28 June 2012.
- [5] **MOVANIA Muhammad Mobeen** and LIN Feng, "High-Performance Volume Rendering on the Ubiquitous WebGL Platform," in Proceedings of the 14th International Conference on High Performance Computing and Communication (HPCC 2012), Liverpool UK, pp: 381-388, 25-28 June 2012.
- [6] **MOVANIA Muhammad Mobeen** and LIN Feng, "Ubiquitous Medical Volume Rendering on Mobile Devices," in Proceedings of the 3rd IEEE International Conference on Information Society (i-Society 2012), London, UK, pp: 93-98, 25-28 June 2012.
- [7] Patricia S. P. Thong, Ramaswamy Bhuvaneshwari, Malini Olivo, **MOVANIA Muhammad Mobeen**, Stephanus S. Tandjung, Hock-Soon Seah, Feng Lin, Kemao Qian and Khee-Chee Soo, "Toward 3-dimensional virtual biopsy of oral lesions through the development of a confocal endomicroscope interfaced with embedded computing," in proceedings of SPIE-OSA Biomedical Optics, SPIE Vol. 8086, 80860W, Munich, Germany, 2011.
- [8] **MOVANIA Muhammad Mobeen**, CHEONG Lee Sing, ZHAO Feng, LIN Feng, QIAN Kemao, SEAH Hock Soon, "GPU-based Surface Oriented Interslice Directional Interpolation for Volume Visualization," in proceedings of Isabel 2009, 2nd International Symposium on Applied Sciences in Biomedical and Communication Technologies, November 24-27 2009, Bratislava, SlovA.K. Republic, 2009.
- [9] **MOVANIA Muhammad Mobeen**, LIN Feng, QIAN Kemao, SEAH Hock Soon, "Automated Local Adaptive Thresholding for Real-time Feature Detection and Rendering of 3D Endomicroscopic Images on GPU," in proceedings of the 2009 International Conference on Computer Graphics & Virtual Reality, CGVR 2009, July 13-16, 2009, Las Vegas Nevada, USA. CSREA Press 2009.
- [10] **MOVANIA Muhammad Mobeen**, LIN Feng, SEAH Hock Soon, QIAN Kemao, "On-Demand Volumetric Feature Rendering through GPU Acceleration," in proceedings of the 3rd Asian Conference on Computer Aided Surgery, ACCASS 2007, 1-2 December, Singapore, 2007.

## PROFESSIONAL ACTIVITIES

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- Reviewer of Recent OpenGL Books: OpenGLInsights, WebGLInsights, OpenGL 4 Shading Language Cookbook (Second Edition) and online course: Building Android Games with OpenGL ES.
- Member of National Curriculum Review Committee (NCRC), HEC, Islamabad.
- Member of Technical Program Committee for ICICT2017, INTELLECT2017, iCoMET2017, ICET2018, iCoMET2018.
- Member of Board of Reviewers for Winter School of Computer Graphics (WSCG2015), URL: <http://wscg.zcu.cz/wscg2015/IPC-Board-2015-All.pdf>

## AWARDS & ACHIEVEMENTS

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- HEC Approved PhD Supervisor
- Featured author of CRC Press, URL: <https://www.crcpress.com/authors/i12607-muhammad-mobeen-movania>
- Gold medalist for highest CGPA during undergraduate studies.

References: Available upon request.

Github: <http://github.com/mmmovania>

Blog: <http://mmmovania.blogspot.com/>