



**Dr. Madhav Rao**

Curriculum Vitae

August 26, 2015

## Contact Information

Address: 112 International institute of information technology-Bangalore  
Hosur Road, Electronics City  
Bangalore - 560100  
Telephone: 080-41407777  
E-mail: mr@iiitb.ac.in  
madhavrrao@gmail.com  
URL: <http://www.iiitb.ac.in/faculty/madhav-rao/>  
Lab webpage: <http://www.iiitb.ac.in/hides/hides/>

## Research Interests

Self assembly	Magnetic logic devices
IC processing	MEMS/NEMS
3D integration	Plastic electronics
Computer assisted music	Smart PCB solutions

## Personal Data

Date of Birth: October 29 1982  
Nationality: Indian  
Marital status: Married

## Education

2008{2012	PhD	Electrical and Computer Engineering	The University of Alabama, USA
2006{2007	MS	Microelectronics and Photonics	University of Arkansas, USA
2000{2004	BE	Electronics and Telecommunication	Mumbai University, India

Dissertation Advisor: Professor S. L. Burkett and Professor J. C. Lusth  
Dissertation Title: Self assembled structures for 3D integration

## Employment History

Assistant Professor, July 2012 - Present,  
International institute of information technology-Bangalore, India

Senior Research Assistant, January 2011 - May  
2012, The University of Alabama, Tuscaloosa, Al

Instructor, August 2009 - December 2010,  
The University of Alabama, Tuscaloosa, Al

Research Assistant, January 2008 - July 2009,  
The University of Alabama, Tuscaloosa, Al

Research Assistant, August 2006 - December 2007  
University of Arkansas, Fayetteville, Arkansas

Software Embedded Engineer, July 2004 - June 2006  
Larsen And Toubro-Embedded Systems, Mysore, India

## Research Projects

Design and development of 3D antenna for 24 GHz ISM band applications. Design and development of magnetic logic device.

Development of self assembled anchored micronscale 3D structures, for 3D hybrid integration of circuits.

## Student Projects

Developed a Raspberry Pi based facilitative tool to report harrasment in public space in India. The tool was designed as a solution for womens safety.

A shoe based wearable human activity level pollution detector system.

Developing a graphical robot programming environment with augmented reality simulator for introductory programming courses.

## Sponsored Research

1. Science and Engineering Research Board (SERB-DST) grant of Rs. 22.20 Lakhs for a research project titled Developing electric current driven nanomagnetic logic device.  
PI: Dr. Madhav Rao  
Duration: Starting from May 2014 to May 2017.
2. Intel grant of Rs. 2 Lakhs to develop Curriculum material on Galileo board  
PI: Dr. Madhav Rao  
Duration: 2 months starting from June 2014.
3. Government of Karnataka (GOK) ESDM grant of Rs. 1.27 Crore to develop Electronics System Design and Manufacturing center at IIITB  
PI: Dr. Madhav Rao, Co-PI: Dr. Poonacha. P. G, Dr. Subir Roy, Dr. Debabrata Das, Dr. JyostnaBapat.  
Duration: July 2013 to June 2015.
4. Networking resource center for materials (NC-M) grant of Rs. 30,000 for proposal titled Micro-fabrication and characterization of solder alloy based self assembled 3-D structures  
PI: Dr. Madhav Rao,

CO-PI: Dr. Chandan Srivastava, IISc.  
Duration: November 2012 to April 2013.

5. NASA, USA and Alabama space consortium grant of 10,000 USD for proposal entitled Telerobotic controlled lunar excavation system  
PI: Dr. Kenneth Ricks, CO-PI: Madhav Rao, CO-PI: Justin Headley.  
Duration: September 2009 to May 2010.

## Publications

### Referred Journal Articles

1. M. Rao, N. Oraon, J. C. Lusth, and S. L. Burkett, A simulation study of processing parameters for solder- lled self-assembled 3D micro-scale structures, Journal of modelling and simulation in materials science and engineering (impact factor 1.9), (manuscript submitted), 2015.
2. M. Rao, J. C. Lusth, and S. L. Burkett, A solder based self assembly project in an introductory IC fabrication course, American journal of engineering education (impact factor 1.5), June, issue 1, 2015.
3. M. Rao, Solder based self-assembled structures for 3D integration, Advanced Materials Research (impact factor 1.9), vol. 875-877, February, 2014. (link)
4. M. Rao, J. C. Lusth, and S. L. Burkett, Demonstration of electrical connectivity between self assembled structures, Journal of Vacuum Science Technology-B (impact factor 2.0), vol. 31, issue. 3, May, 2013. (link)
5. M. Rao, J. C. Lusth, and S. L. Burkett, A study of solder bridging for the purpose of assembling three dimensional structures, in Journal of Vacuum Science Technology-B (impact factor 2.0), vol. 30, issue. 3, May, 2012. (link)
6. M. Rao, J. C. Lusth, and S. L. Burkett, Analysis of a dip-solder process for self assembly, in Journal of Vacuum Science Technology-B (impact factor 2.0), vol. 29, issue. 4, August, 2011. (link)
7. M. Rao, J. C. Lusth, and S. L. Burkett, Self assembly Solder Process to form 3D structures on silicon substrate, in Journal of Vacuum Science Technology-B (impact factor 2.0), vol. 27, issue. 1, January, 2009. (link)

### Referred Conference proceedings and presentations

1. P. Sravani, G. Gupta, A. R. Harish, and M. Rao, Design of 3D posts based antenna, (manuscript submitted) International Symposium of Antennas and Propagation, to be held, in October, Ho-bart, Australia, 2015.
2. M. Rao, A solder based self assembly process to form metal embossing on three dimensional struc-tures, 15th International conference of IEEE Nanotechnology, July 27-30, Rome, Italy, 2015.

3. Sowmya N, N. Oraon, Subhajit Sen, and M. Rao, Development of 3D shadow mask using 3D printer, 2nd International Conference on Communications, Computer Science, and Electronics, July 10-11, Bangalore, 2015.
4. M. Rao, N. Oraon and Ranganatha S, Design and Simulation of magnetic logic device for next generation data processing, 19th International conference of VLSI Design and Test, June 27-29, Ahmedabad, 2015.
5. Ranganatha. S, N. Oraon, M. Rao, Nanomagnetic logic device, INUP familiarizatio workshop, 29th May, 2015.
6. PutluruSravani and M. Rao, Design of 3D antennas for 24 GHz ISMband applications, 28th International Conference on VLSI Design 2015, January 3-5, Bangalore, India, 2015.
7. Rahul R, AshwinWhitchurch and Madhav Rao, An open source graphical robot programming environment for undergraduates , 2nd IEEE International Conference on MOOCs, Innovation and Technology in Education , December 19-20, Chandigarh, India, 2014.
8. Neha Oraon, and M. Rao, Study of solder based self assembled 3D micro scale structures via surface evolver, 2nd IEEE International Conference on Emerging Electronics Materials to Devices conference, December 3-6, 2014.
9. YashvanthKondi, Daksh Varshneya, Sruthi K, and Madhav Rao, An Interdisciplinary, Dialogic Approach to Develop an Electronic Device to Enhance Freedom and Mobility of Women in Public Spaces in the Indian Context - Illustrated by the Case of Convers[t]ation, IEEE GHTC-SAS 2014, September 26-27, Trivandrum, India, 2014.
10. M. Rao, Neha Oraon, and PutluruSravani, Self assembly based high frequency 3D heatsink antenna, IEEE Regional TENSYP 2014 conference, April 14-16, Kuala Lumpur, Malaysia, 2014.
11. MitaliSodhi, and Madhav Rao, Development and simulation of Pacman Game using Multi-Client Architecture via Player/Stage Tool , 5th International Conference on Recent Trends in Informa-tion, Telecommunication and Computing - ITC 2014, March 21-22, Chandigarh, India, 2014.
12. Neha Oraon, Punith Kumar M. K, Chandan Srivastava, and Madhav Rao Self assembly based 3D heatsink antenna for high density 3D integration, International IEEE conference of Circuits, Controls, and Communication, Bangalore, December 27-28, 2013.
13. Neha Oraon, J. C. Lusth, S. L. Burkett, and M. Rao Simulation Study of Processing Parameters for Solder Filled Self Assembled 3D Micro-scale Structures, AVS 60th International Symposium & Exhibition (AVS '13), Long Beach, USA October 27 - November 1, 2013.
14. S. Burkett, M. B. Jordan, M. Rao, R. Divan, A. V. Sumant, and L. Ladani, Growth of Carbon nanotubes inside a silicon via to enable IC stacking applications, in International Vacuum Congress Conference, Paris, France September 9-13, 2013.
15. M. Rao, Electric current driven polarity change of nanomagnets , IEEE international multi conference on automation, computing, control, communication and compressed sensing conference, Palai, India on March 22-23, 2013.

16. M. B. Jordan, M. Rao, A. V. Sumant, R. Divan, and S. L. Burkett, Filling through Silicon vias with a carbon nanotube/copper matrix, AVS 59th International Symposium & Exhibition (AVS '12), Tampa, Florida, USA October 28 - November 2, 2012.
17. M. B. Jordan, M. Rao, A. V. Sumant, R. Divan, and S. L. Burkett, Process ow for growing aligned Carbon nanotubes in blind vias, Global interposer workshop, November 2012.
18. M. Rao, Solder based self assembled structures for three dimensional integration, International conference on Advanced Material and Manufacturing Science (ICAMMS), Beijing, China on De-cember 20-21, 2012.
19. M. Rao, 3D damascene and embossing via solder based self assembly process, presented at the 2nd International Conference on Nanotechnology, Pune on October 18-19, 2012.
20. M. B. Jordan, M. Rao, A. V. Sumant, R. Divan, and S. L. Burkett, Process ow for CNT interconnects grown in blind TSVs, International materials research congress conference on August 12-17, Cancun, Mexico, 2012.
21. M. Rao, J. C. Lusth, and S. L. Burkett, A dip soldering process for three dimensional integration, 39th International Conference on Metallurgical Coatings and Thin Films on April 23-27, San Diego, CA, USA, 2012.
22. M. Rao, J. C. Lusth, and S. L. Burkett, Self assembly driven three dimensional integration, National Science Foundation (NSF) Workshop on Micro, Nano, Bio Systems, March 30-31, Arlington, VA, USA, 2012.
23. M. Rao, and J. C. Lusth, RRA: An audio format for single-source music and lyrics, 50th Southeast ACM conference on March 29-31, Tuscaloosa, Al, USA, 2012.
24. M. Rao, A. Nagabhushana, A. Sumant, R. Divan, J. C. Lusth, and S. L. Burkett, Fabrication of carbon nanotube lled through silicon vias, Global Interposer Technology Workshop, Atlanta, November 14-15, 2011.
25. M. Rao, J. C. Lusth, and S. L. Burkett, A study of solder bridging for the purpose of assembling three dimensional structures, AVS 58th International Symposium & Exhibition (AVS '11), Nashville, TN, USA October 30 - November 4, 2011.
26. M. Rao, J. C. Lusth, and S. L. Burkett, Analysis of a dip-solder process for self assembly, AVS 57th International Symposium & Exhibition (AVS '10), Albuquerque, New Mexico, USA, October 17-22, 2010.
27. M. Rao, B. Ajilore, M. Westberry, A. Gilbert, S. Troy, J. Headley, and K. Ricks, A system engineering approach to develop a lunar based robot, Lunar regolith excavation challenge, NASA, Kennedy space center, Florida, USA, May 25-28, 2010.
28. M. Rao, J. C. Lusth and S. L. Burkett, Towards the formation of millimeter wave antenna using a self assembly process, Research Seminar, Center of Materials for Information technology, The University of Alabama, Tuscaloosa, USA, July, 2009.

29. H. Taylor, M. R. Rao and S. L. Burkett, Terahertz Antenna Simulation, in Undergraduate Research Conference, The University of Alabama, Tuscaloosa, USA, April, 2009.
30. M. Rao, J. C. Lusth and S. L. Burkett, Towards the formation of Terahertz antenna using solder self assembly method, Graduate Research Conference, The University of Alabama, Tuscaloosa, USA, March, 2009.
31. M. R. Rao, J. C. Lusth, S. L. Burkett and Y. K. Hong, Magnetic dot polarity switching via current generated magnetic fields, AVS 55th International Symposium & Exhibition (AVS '08), Boston, MA, October 19-24, 2008.
32. M. Rao, J. C. Lusth, S. L. Burkett, Towards the setting of logical inputs in a magnetic edge driven computational device, Research Seminar, Center of Materials for Information technology, The University of Alabama, Tuscaloosa, USA, January, UA, 2008.
33. M. Rao, Master Thesis, Electric current driven polarity changes in magnetic nanodots, University of Arkansas, Fayetteville, USA, December, 2007.
34. M. Rao, J. C. Lusth, S. L. Burkett and J. Shultz, Logic gates using Magnetic Dots, poster at the 14th Semiconducting and Insulating Materials Conference, University of Arkansas, Fayetteville, USA, June, 2007.

#### Invitations and Visits

1. Visited Cambridge University and Imperial College London, UK on March 9 to 16, 2014 to discuss on Electronic System Design collaborations with IIT-Bangalore. The visit was supported by British Deputy High Commission
2. Invited talk on Self assembled 3-D structures in IIT-Bombay on October 2012.
3. Delivered an invited talk on Advanced technologies for electronic applications: 3D structures and magnetic logic in BVB engineering college in KLE-University on 11<sup>th</sup> July, 2015.
4. Visited Argonne National laboratory, Illinois in the spring of 2011, April 3-9 and in the summer of 2011, July 14-31, for 24 days to fabricate vertically aligned carbon nanotubes inside deep silicon vias. The visit was supported by Army Research Laboratory (contract no. W911NF-10-2-0093).
5. Visited Kennedy space center, NASA, Florida in the summer 2010, May 25 to 28, to participate in lunar mining competition, that is organized and sponsored by NASA.

#### Honors and Awards

1. International Travel Award of Rs. 1.59 Lakhs by SERB (Science and engineering research board), Department of Science and Technology, India for presenting a paper in IEEE Nanotechnology conference, held on July 27-30, 2015.
2. Best paper award in International IEEE conference of Circuits, Controls, and Communication, Bangalore, December 27-28, 2013.

3. Third best paper in International materials research congress conference held on August 12-17, at Cancun, Mexico, 2012. (Only three papers are awarded in each academic year).
4. 6<sup>th</sup> place at the inaugural Lunabotics competition held in NASA, Kennedy space center, Florida, on May 25-28, 2010.
5. Excellent teaching evaluation was awarded from International Academic Program, University of Alabama for the Fall 2010 semester.
6. Tri-annual Research Efficiency Award in Microelectronics and Photonics department in University of Arkansas, June, 2007 to promote research productivity. (Only three are awarded each academic year).
7. Fastest Master of science graduate student to date in Microelectronics and Photonics department in University of Arkansas, Dec, 2007. (Microelectronics and photonics program started in 1999 at the University of Arkansas. I was the first to complete M.S degree in 3 full semesters with thesis plan.)
8. 13<sup>th</sup> rank in Bachelor of Engineering final year in Mumbai University, July, 2004.
9. J.R.D scholarship in Undergraduate for good academic performance during first, second and third year of engineering. (Only five were awarded each academic year in the college).

## Teaching in IIITB

1. Contributed in developing an iMTech (dual degree undergraduate and graduate) ECE program in IIITB, to be started in Fall, 2015.
2. Contributed in developing an M.Tech program in Electronic System Design (ESD) in IIITB, started from Fall, 2014.
3. Semiconductor device and circuits for MTech (graduate) and iMTech (undergraduate) students in Spring 2015.
4. Analysis and design of CMOS Integrated Circuits for MTech (graduate) students in Fall 2014, and Fall 2015.
5. Inter device communication course for MTech (graduate) students in Spring 2014 and Spring 2015.
6. Design and fabrication principles of Digital IC for MTech (graduate) students in Fall 2013 and Fall 2014.
7. Basic Electronics laboratory for Integrated MTech (undergraduate) students in Spring 2013, Spring 2014, and Spring 2015.
8. C Programming for Integrated MTech (undergraduate) students in Fall 2012, Fall 2013, Fall 2014, and Fall 2015.
9. Preparatory C Programming for MTech ESD students in Summer 2014, and 2015.



## Students Supervision

### Advisor

Neha Oraon, Ph.D 2013 student

Sowmya N, Ph.D 2015 student

SravaniPutluru, MS 2013 student (Graduated in May 2015)

Rahul R, M.Tech 2013 student (Project Elective and M.Tech thesis)

SusarlaPraneeth Kumar, iMTech 2012 student (Project Elective)

Tony Thomas, M.Tech 2014 student (Project Elective)

Abel Paul, M.Tech 2014 student (Project Elective)

PusaralaSuneel, M.Tech 2014 student (Project Elective)

D. S. Venkateswarlu, M.Tech 2014 student (Project Elective)

Apoorv Gupta, iMTech 2014 student (Project Elective)

BharathKuppam, M.Tech 2014 student (Project Elective)

AnanthHegde, MTech 2013 student (Project Elective)

HarshaBhushan, MTech 2013 student (Project Elective)

MitaliSodhi, M.Tech 2012 student (Graduated)

YashvanthKondi, IMTech 2012 (undergraduate) student

Daksh Varshneya, IMTech 2012 (undergraduate) student

Tanmayee Narendra, IMTech 2012 (undergraduate) student

Nigel Fernandez, IMTech 2013 (undergraduate) student

Kumaresh Krishnan, IMTech 2013 (undergraduate)

student Laasya B, IMTech 2013 (undergraduate) student

Trisha Mittal, IMTech 2013 (undergraduate) student

Akshay Bhatt (summer intern), BTech IIT-Delhi student

### Current students | Committee Member

SitaKondamadugula, Ph.D student

## Past students | Committee Member

PasupatiLeelaram, MTech student, 2015 (Graduated)

Amrita, MTech student, 2014 (Graduated)

Raghavendra S, MS student, 2013 (Graduated)

Payal Prakash, MTech student, 2013 (Graduated)

K. H. Sudeep, MTech student, 2013 (Graduated)

K. A. Prateek, MTech student, 2013 (Graduated)

## Professional Activities

1. IIIT-Bangalore Admission committee member for the academic years 2014, and 2015.
2. IIIT-Bangalore Travel Fellowship committee member for the academic years 2014, and 2015.
3. IIIT-Bangalore Convocation committee member for the academic year of 2014-15.
4. Committee member for the EHealth proposal developed in IIITB starting from May 2015.
5. IIIT-Bangalore Website management committee member for the academic year 2012-13.
6. Served as the chairperson for a nanofabrication session in IEEE Nano 2015 conference, held in Rome, Italy, 2015.
7. Serving as board of studies member for ECE department in KLE-University, Hubbli for the academic year of 2015-16.
8. Coordinated with Prof Edward Sazonov of University of Alabama to get a summer intern position for an iMTech student: YashvanthKondi in the academic year of 2015.
9. Coordinated e-Yantra robotics workshop in IIIT-Bangalore on 6th and 7th February, 2015. 22 students from IIITB participated in this workshop.
10. Technical committee member for IEEE CONNECT'15 conference.
11. Technical committee member for IEEE VDAT'15 conference.
12. Technical committee member for VLSIDesign'15 conference.
13. Nominated three student teams in IIIT-Bangalore for CXC Student Innovation program on IoT, conducted on April 25, and 26, 2015.
14. Mentored four undergraduate student groups to submit project proposals to Intel India Embedded Challenge 2014. A student group with a topic titled A facilitative tool for reporting sexual harassment of women in Indian public spaces as selected for the finals of the Challenge, held on December 9-10, 2014. (Only 20 proposals were selected from the 1000 submitted proposals)

15. Mentored two undergraduate students to submit project proposal entitled A smart shoe based environmental pollution and human activity recognition system to IEEE humanitarian challenge, 2014. The students were selected for naldemonstation round. The student project was funded for 220 USD. The same idea was presented in IDEATHON event organized in VLSI Design 2015 conference.
16. Proctored and coordinated mentoring sessions for undergraduate students for IEEE Xtreme pro-gramming competition and ACM ICPC (Intercollegiate Programming Contest) in IIIT-B in 2012, 2013 and 2014. One student group ranked 3rd in the national level and 107th in IEEE Xtreme programming competition in 2014.
17. Initiated a discussion with Ravi Boonapalli from Mentor Graphics India team for donation of Mentor Graphics tool on Digital, Analog, Veri cation, PCB and Flotherm tools. HiDES lab is installed with ve licenses each, worth of 1.2 million USD.
18. Hosted a lecture by Dr. Walden C Rhines, CEO of Mentorgraphics LTD on Silicon Secure: Enablers for the IOTs on 5th January 2015 in IIITB.
19. Reviewer of IETE Technical Review journal, since November 2014.
20. Reviewer of American journal of engineering education since December 2014.
21. Hosted Infosys Science Foundation 2013 event winner, Prof RamgopalRaos talk on Nanotechnology and multidisciplinary research in IIT-Bombay on 14th August 2014 in IIITBangalore.
22. Hosted a talk by Dr. Simon Deleonibus, Director of CEA, LETI France on Future of Micro/Nano-electronics on January 8th, 2014 in IIITBangalore.
23. Hosted Prof A R Harish, Professor in IIT-Kanpur on December 3, 2013 to discuss on di erent antenna based electronics in IIIT-Bangalore.
24. Attended IESA Vision Summit on February 2013 and February 2014.
25. Professional IEEE member, AVS member, and IESA member.
26. Conference reviewer of IEEE International Conference on Circuits, Control and Communication conference of RNSIT, Bangalore, India.
27. A talk and hands-on session on Programming for electronics which included sessions on robots and Arduino controller was given to Kumaran's school students of age 14-16 years in April, 2013 and in April, 2014.
28. A talk on "Electronics for societal needs" was delivered to JawaharNavidayaVidyalaya (JNV) Simoga school students on August 28th, 2014.
29. A talk on various engineering career options was given to JawaharNavodayaVidyalaya (JNV) school, students on March 23rd, 2013, Kottayam, Kerala.
30. Helped Professor G. Salamo in organizing conference 14<sup>th</sup> Semiconducting and insulating materials conference in June, 2007, University of Arkansas, Fayetteville, Arkansas, USA.

31. Helped Associate Professor J. C. Lusth in organizing an awareness activity on computer engineer-ing in Francias Marian High school in April, 2009.
32. Helped Associate Professor S. Kotru in organizing workshop in electrical engineering in Rocky Quarry High School, Tuscaloosa, Alabama, USA, for 6th grade students in December, 2009 and in November, 2008.
33. Conducted a robotics awareness program in YMCA high school, Tuscaloosa, Alabama, USA on October, 2009.