

G. R. Jayanth

Date of Birth: 2nd July, 1980

Citizenship: Indian

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Research Interests: Precision motion measurement and control, nanometrology and manipulation, scanning probe microscopy, micro-robotics, MicroElectroMechanical Systems (MEMS), optical sensors, early warning systems.

Education

PhD in Mechanical Engineering 2004-2008

Thesis Title: Multi-axis probing system for nano-metrology

The Ohio State University

Advisor: Prof. C. H. Menq

M.S in Mechanical Engineering 2002-2004

Thesis Title: Design and development of a magnetic resonance force microscope that operates in air

The Ohio State University

Advisor: Prof. C. H. Menq

B.Tech in Mechanical Engineering 1998-2002

Indian Institute of Technology Madras (IIT-Madras)

Appointments

Oct. 2016- Present	Associate Professor, Department of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore 560012, India
Oct. 2010- Oct. 2016	Assistant Professor, Department of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore 560012, India
Jan. 2009-Jul. 2010	Post-doctoral Researcher, Department of Mechanical Engineering, The Ohio State University, Columbus, OH 43210, USA
Sept. 2003-Dec. 2008	Graduate Research Assistant, Department of Mechanical Engineering, The Ohio State University, Columbus, OH 43210, USA
Sept. 2002- Aug. 2003	University Fellow, The Ohio State University, Columbus, OH 43210, USA

Academic Recognition

1. Delivered a keynote talk in the International Conference on Manipulation, Automation and Robotics at Small Scales (MARSS 17), held in Montreal, Canada.
 2. A paper co-authored with my student was selected as one of the Highlights of 2016 by the Journal *Measurement Science and Technology*, and was an 'IOP Select' article (equivalent to Editor's pick) in the month of its publication. Please see the list of publications for details.
 3. Invited to conduct a special session on AFM-based nanomanipulation in the International Conference of Manipulation, Automation and Robotics at Small Scales (MARSS 18), to be held in Nagoya, Japan.
 4. A paper co-authored with my student was shortlisted for the best student paper award in the International Conference on Manipulation, Automation and Robotics at Small Scales (MARSS 16), held in Paris, France. Please see the list of publications for details.
 5. University fellowship, The Ohio State University, 2002.
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Professional Responsibilities

1. Associate Editor, IEEE Control System Society (CSS) Conference Editorial Board, December 2016-present
 2. Associate Editor, Sadhana, Proceedings of the Indian Academy of Sciences in Engineering, July 2015-present
 3. Member, Program Committee, International Conference on Manipulation, Automation and Robotics at Small Scales (MARSS), Aug. 2016-Present
 4. Served as a reviewer for the following journals and conferences: (a) IEEE/ASME Transactions on Mechatronics (b) IEEE Transactions on Control System Technology (c) IEEE Transactions on Nanotechnology (d) IEEE Transactions on Robotics (e) IEEE Transactions on Intelligent Transportation Systems (f) Review of Scientific Instruments (g) Journal of Micromechanics and Microengineering (h) Nanoscale (i) Sensors and Actuators B (j) Sadhana (k) IEEE/RSJ Conference on Intelligent Robots and Systems (l) Conference on Automation Science and Engineering
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Membership of professional bodies

1. Member, Institute of Electrical and Electronic Engineers (IEEE)
 2. Life member, Instrument Society of India, India
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Teaching

1. **IN 227 Control Systems Design** (Jan.-April 2011-2017): This is a core course for students of Instrumentation and Applied Physics (IAP), and a soft-core course for students of Electronic Systems Engineering (DESE)
 2. **UP201 Introductory Physics III** (Aug.-Dec. 2015-2017): Taught jointly with Prof. Anil Kumar and Prof. K. P. Ramesh
 3. **PH211 General Physics Laboratory** (Aug.-Dec. 2013-14): Taught jointly with Prof. Vasant Natarajan, Dr. Aweek Bid and Dr. Victor Muthu
 4. **IN269 Variational Methods in Engineering** (Aug.-Dec. 2012): Taught jointly with Dr. M. Chandran
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Student Advising

Guidance of PhD students

No.	Name	Thesis title/topic	Comments
1	R. Sri Muthu Mrinalini	A probing system with replaceable tips for three dimensional nano-metrology	Graduated in 2017
2	Leema Rose Viannie	Design, fabrication and development of polymer microcantilever for flow measurement and thermal actuation	Graduated in 2017, Jointly guided by Prof. K Rajanna
3	R. Sri Ram Shankar	A probing system for dynamic mode atomic force microscopy based on specialized probes	Submitted thesis in July 2017
4	Punyabrahma Panda	Development of magnetic tweezers capable of force sensing	Ongoing, 2014-
5	Piyush Kumar Pandey	Multi-axis motion measurement and control based on optical beam deflection	Ongoing, 2015-
6	Vikrant Kumar Singh	Automated in-line nano-metrology	Ongoing, 2016-
7	Muthuselvi Krishnan	Graphene-based temperature and pressure sensors	Ongoing, 2016- (ERP candidate)
7	S. B. Lavanya	High speed atomic force microscopy	Ongoing, 2017-

Guidance of MSc(Engg) students

No.	Name	Thesis title	Comments
1	Punyabrahma Panda	Development of a magnetic micro-actuator with integrated force sensor	Graduated in 2014
2	Piyush Kumar Pandey	Development of high-precision out-of-plane motion measurement systems based on optical beam deflection	Graduated in 2015

Guidance of MTech project students

No.	Name	Batch	Project title
1	Tamizhanban R	2013	Development of a pipette puller for fabrication of glass micropipettes
2	Leo Mathew	2013	Optical perimeter monitoring system for deployment in remote areas
3	Essa Mahapatra	2014	Development of sparse optical detectors-based object classification system
4	Sreejith K R	2014	Development of a small volume liquid dispenser based on electrohydrodynamic pulling
5	Priyanka Gupta	2016	Development of a two-axis flexure-based high-speed nano-positioner
6	Deepa M K	2016	Development of an optical trip wire capable of self-alignment
7	Praveen Kumar	2017	An optical trip-wire based sensor network for long-range perimeter monitoring
8	Lithin M G	2017	Development of a three-axis flexure based nano-positioner

Sponsored Research

List of funded research projects

No.	Title	Funding Organization	Value	Duration
1	Fabrication and evaluation of atomic force microscope probes with detachable and re-usable tips	IMPRINT, Ministry of Human Resource Development (MHRD)	Rs. 36.0 Lakhs	Dec. 2016- Dec. 2019
2	An automatic tip-exchange module for the atomic force microscope: Development and application	Department of Science and Technology (DST), Instrument Development Programme (IDP)	Rs. 37.18 Lakhs	June 2016- May 2018
3	An optical system for characterization of multi-axis dynamics of MEMS devices	ISRO-IISc Space Technology Cell (STC)	Rs. 11.15 Lakhs	April 2016- March 2018

4	Development of long range, optical trip-wire based early warning systems for accident prevention	Center for Infrastructure, Urban Transport (CiSTUP), IISc	Rs. 6.07 Lakhs	August 2015- July 2017
5	Development of a high speed atomic force microscope with integrated cantilever-based chemical sensor	Department of Science and Technology (DST), Science and Engineering Research Board	Rs. 46 Lakhs	June 2014- May 2017
6	Development of a novel liquid-droplet based bi-stable RF MEMS switch	ISRO-IISc Space Technology Cell (STC)	Rs. 12.65 Lakhs	April 2013- March 2016
7	Cantilever based multiplex sensors	Department of Science and Technology (DST) program for Strategic Initiatives	Rs.19.09 Lakhs	January 2012- December 2014
8	Development of a robust, low-cost traffic measurement system	Center for Infrastructure, Urban Transport (CiSTUP), IISc	Rs. 2.4 Lakhs	April 2012- March 2014
9	Development of a compact Atomic Force Microscope for operation in space	ISRO-IISc Space Technology Cell (STC)	Rs.12.9 Lakhs	April 2011- March 2013

Publications and patents

Total publications in International Peer-reviewed Journals: **26**

Total publications in International Conference Proceedings: **4**

Total patents applied: **4**

Publications in Peer-reviewed International Journals

1. R. Sriramshankar, R. Sri Muthu Mrinalini and **G. R. Jayanth**, "Design and Fabrication of a Flexural Harmonic AFM probe with an Exchangeable tip", *Journal of Micro Bi-robotics*, Vol. 13, pp. 39 (2017).
2. **G. R. Jayanth**, "The fundamental bandwidth limit of piezoelectrically actuated nanopositioners with motion amplification", *ASME Journal of Dynamic Systems, Measurement and Control*, Vol. 139, pp. 114501 (2017)
3. R. Sri Muthu Mrinalini, and **G. R. Jayanth**, "Design and evaluation of an active micro-scale ball and socket joint", *IEEE Journal of Microelectromechanical Systems*, Vol. 26, pp. 886 (2017).

4. P. Punyabrahma, and **G. R. Jayanth**, "A magnetometer for estimating the magnetic moment of magnetic micro-particles", *Review of Scientific Instruments*, Vol. 88, pp. 015008 (2017)
5. R. Sri Muthu Mrinalini, and **G. R. Jayanth**, "A system for replacement and re-use of tips in atomic force microscopy", *IEEE/ASME Transactions on Mechatronics*, Vol. 21, pp. 1943 (2016)
6. L. R. Viannie, **G. R. Jayanth**, V. Radhakrishna and K. Rajanna, "Fabrication and nonlinear thermomechanical analysis of SU8 thermal actuator", *IEEE Journal of Microelectromechanical Systems*, Vol. 25, pp. 125 (2016)
7. P. Piyush, and **G. R. Jayanth**, "An out-of-plane linear motion measurement system based on optical beam deflection", *Measurement Science and Technology*, Vol. 20, pp. 025203 (2016). [This paper has been selected for inclusion in **IOPSelect**. IOPSelect is a collection of journal articles, chosen by IOP Editors for their novelty, significance and potential impact on future research. It was subsequently selected as one of the **2016 Highlights of Measurement Science and Technology**].
8. P. Sathishkumar, P. Punyabrahma, R. Sri Muthu Mrinalini, and **G. R. Jayanth**, "A resonating reflector-based optical system for motion measurement in microcantilever arrays", *Review of Scientific Instruments*, Vol. 86, pp. 096106 (2015)
9. R. Sri Muthu Mrinalini, R. Sriramshankar and **G. R. Jayanth**, "Direct measurement of three-dimensional forces in atomic force microscopy", *IEEE/ASME Transactions on Mechatronics*, Vol. 20, pp. 2184 (2015)
10. R. Sriramshankar, and **G. R. Jayanth**, "Design and evaluation of torsional probes for multifrequency atomic force microscopy", *IEEE/ASME Transactions on Mechatronics*, Vol. 20, pp. 1843 (2015)
11. Essa Mahapatra, P. Sathishkumar, and **G. R. Jayanth**, "An opto-electronic profiling and ranging sensor for monitoring of perimeters", *IEEE Sensors Journal*, Vol. 15, pp. 3692 (2015)
12. P. Punyabrahma and **G. R. Jayanth**, "A magnetic micro-manipulator for application of three dimensional forces", *Review of Scientific Instruments*, Vol. 86, pp. 025004 (2015)
13. **G. R. Jayanth**, and C. H. Menq, "Design and modeling of an active 5-axis compliant micromanipulator", *ASME Journal of Mechanisms and Robotics*, Vol. 6, 041014 (10pp) (2014)
14. R. Tamizhanban, K. R. Sreejith and **G. R. Jayanth**, "An automated pipette puller for fabrication of glass micro-pipettes", *Review of Scientific Instruments*, Vol. 85, pp. 055105 (2014)

15. T. Rashmi, G. Dharsana, R. Sriramshankar, R. Sri Muthu Mrinalini, and **G. R. Jayanth**, "Design and development of an integrated three dimensional scanner for atomic force microscopy", *Review of Scientific Instruments*, Vol. 84, pp. 116102 (2013)
16. R. Sriramshankar, R. Sri Muthu Mrinalini, and **G. R. Jayanth**, "A two-axis in-plane motion measurement system based on optical beam deflection", *Review of Scientific Instruments*, Vol. 84, pp. 105001 (2013)
17. Aravind Rao, **G. R. Jayanth** and M. D. Madhusudan, "Design and evaluation of a robust optical beam-interruption based vehicle classifier system", *IEEE Transactions on Intelligent Transportation Systems*, Vol. 14, No. 3, pp. 1043 (2013)
18. **G. R. Jayanth** and C. H. Menq, "Two axis force sensing and control of a reorientable scanning probe", *IEEE/ASME Transactions on Mechatronics*, Vol. 18, 687 (2013)
19. **G. R. Jayanth** and C. H. Menq, "Tip-motion control and scanning of a reorientable micromanipulator with axially-located tip", *IEEE/ASME Transactions on Mechatronics*, Vol. 17, 801 (2012)
20. **G. R. Jayanth** and C. H. Menq, "Control of two-axis micromanipulator-based scanning probe system for 2.5D nanometrology", *IEEE/ASME Transactions on Mechatronics*, Vol. 15, 661 (2010)
21. **G. R. Jayanth** and C. H. Menq, "Modeling and design of a magnetically actuated two-axis compliant micromanipulator for nanomanipulation", *IEEE/ASME Transactions on Mechatronics*, Vol. 15, 360 (2010)
22. Y. Jeong, **G. R. Jayanth**, S. Jhiang and C. H. Menq, "Design and fabrication of an active multi-axis probing system for high speed atomic force microscopy", *IEEE Transactions on Nanotechnology*, Vol. 9, 392 (2010)
23. **G. R. Jayanth**, Sissy M. Jhiang, and C. H. Menq, "Two-axis probing system for atomic force microscopy", *Review of Scientific Instruments*, Vol. 79, 023705 (2008)
24. Y. Jeong, **G. R. Jayanth** and C. H. Menq, "Control of tip-to-sample distance in atomic force microscopy: A dual-actuator tip-motion control scheme", *Review of Scientific Instruments*, Vol. 78, 093706 (2007)
25. **G. R. Jayanth**, Y. Jeong and C. H. Menq, "Direct tip-position control using magnetic actuation for achieving fast scanning in tapping mode atomic force microscopy", *Review of Scientific Instruments*, Vol. 77, 053704 (2006)
26. Y. Jeong, **G. R. Jayanth**, and C. H. Menq, "Direct tip-sample interaction force control for the dynamic mode atomic force microscopy", *Applied Physics Letters*, Vol. 88, 204102 (2006)

Publications in Conference Proceedings

1. P. Punyabrahma and **G. R. Jayanth**, "A magnetometer for estimating the moment of magnetic micro-particle in three dimensions", *Proceedings of the International Conference on Manipulation, Automation and Robotics at Small Scales 2017 (MARSS'2017)*
2. R. Sriramshankar, and **G. R. Jayanth**, "Design and evaluation of flexural harmonic probes for multifrequency atomic force microscopy", *Proceedings of the International Conference on Manipulation, Automation and Robotics at Small Scales 2016 (MARSS'2016)*
3. R. Sri Muthu Mrinalini, and **G. R. Jayanth**, "Contact-mode imaging using AFM probes with exchangeable tips", *Proceedings of the International Conference on Manipulation, Automation and Robotics at Small Scales 2016 (MARSS'2016)* [**Nominee for the best student paper award**]
4. Leema Rose Viannie, Sudeep Joshi, **G. R. Jayanth** , V. Radhakrishna and K. Rajanna, "AFM cantilever with integrated piezoelectric thin film for micro-actuation", *Proceedings of the IEEE International conference on Sensors 2012 (IEEE Sensors 2012)*, pp. 1838-1841 (2012)

Patents

1. **G. R. Jayanth**, R. Sri Muthu Mrinalini, and Vikrant Kumar Singh, "An active, lockable micro-scale ball and socket joint", **Provisional application** filed (No. 201741039295).
2. **G. R. Jayanth**, Piyush Pandey, R. Sriramshankar, and R. Sri Muthu Mrinalini, "Multiple motion measurement", **Indian Patent application** (No. 2017/CHE/2015) filed on April 20, 2015
3. **G. R. Jayanth** and R. Sri Muthu Mrinalini, "Reusable probe tip for a scanning probe microscope", **Indian Patent application** (No. 1919/CHE/2015) filed on April 14, 2015
4. **G. R. Jayanth** and Aravind Rao, "An automated realtime vehicle classification system", **Indian Patent application** (No. 1213/CHE/2013) filed on March 10, 2014