Bharadwaja Yathirajam

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EDUCATION

PhD in Robotics and Computer Vision — Jan. 2016 – Present
Academy of Scientific & Innovative Research (AcSIR), GPA: 9.0 — *Ghaziabad, India*

M.Tech in Embedded Systems — May 2008 – Dec. 2010
Jawaharlal Nehru Technological University, Marks: 78.2% — *Anantapuramu, India*

B.Tech in Electronics and Communication Engineering — May 2004 – May 2008
Jawaharlal Nehru Technological University, Marks: 65% — *Hyderabad, India*

Intermediate — Mar. 2004
Board of Intermediate Education, Marks: 83.1% — *Andhra pradesh, India*

Class X — Mar. 2002
Board of Secondary Education, Marks: 71.8% — *Andhra pradesh, India*

EXPERIENCE

Senior Research Fellow (UGC-NET) — Jan. 2018 – Present
CSIR-National Aerospace Laboratories — *Bangalore, India*

- Developed a tightly-coupled Vision-Inertial navigation system with faster, accurate and robust initialization.
- Developed a 3D viewing code of ORB-SLAM for Odroid-xu4 using OpenGL ES library.
- Explored LSD-SLAM, DSO and DTAM – For dense monocular SLAM with IMU data fusion for the UAV navigation and obstacle avoidance.
- Photometric calibration of the camera.
- Built a quadrotor, having only camera and IMU sensors for its navigation solution. Conducted several real-time experiments with the built quadrotor for demonstration of complete autonomous system.
- Implemented a two stage trajectory generation method for the quadrotor to avoid obstacles in front.

Junior Research Fellow (UGC-NET) — Jan. 2016 – Dec. 2017
CSIR-National Aerospace Laboratories — *Bangalore, India*

- Developed a vision based target tracking from fixed wing UAV (both onboard and ground based image processing system).
- Developed video stabilization, gimbal stabilization and target's geolocation estimation from NAL fixed wing UAV.
- Generating obstacle avoidance path for UAVs in unknown environments using potential fields, RRT etc. (both in simulation and real-time).
- Geometric calibration of a camera. IMU calibration using allan standard deviation.
- Developed a loosely-coupled Vision-Inertial data fusion method and scale estimation of Monocular SLAM system (using ORB-SLAM and IMU).

Assistant Professor — Dec. 2012 – Dec. 2015
Sree Vidyanikethan Engineering College — *Tirupathi, India*

- Taught various undergraduate courses. Ex: Electronic Devices and Circuits, Electromagnetic Theory and Network Theory etc.
- Conducted various laboratory experiments.
- Supervised and assisted the students in their final year projects.

- Taught various undergraduate courses. Ex: Electronic Devices and Circuits, Microprocessors and Micro-controllers and Network Theory. etc.
- Conducted various laboratory experiments.
- Supervised and assisted the students in their final year projects.

Achievements

- Qualified in GATE-2013, GATE-2014 and GATE-2017 in Electronics and Communication Engineering stream.
- Qualified in UGC-NET 2013 (Assistant Professor) and UGC-NET 2014 (Both JRF and Assistant Professor) in Electronics paper.
- Successfully demonstrated quadrotor navigation with Vision-Inertial navigation system without GPS.

Areas of Expertise

- Multiple Sensor Data Fusion, Monocular SLAM, Computer Vision, Embedded Systems and Path Planning for UAVs.
- Sparse, semi-dense and dense monocular SLAM/odometry systems like ORB-SLAM, VINS, LSD-SLAM, DSO, DTAM, SVO. Dense and global mapping methods with euclidean distance fields for the path planning.
- Multiple view geometry, linear algebra, image processing and variational methods for computer vision.

Technical Skills

Languages: C/C++, Python, Java
Developer Tools: Git, Visual Studio, Eclipse, Qt
Libraries: ROS, OpenCV, NumPy, Matplotlib, MATLAB
Hardware: IMU, Camera, Motion capture system (OptiTrack system), Speed Goat, Arduino boards, Odroid-xu4, UDOO-x86, Raspberry Pi 3 board, Nvidia Jetson TX2

Publications

Bharadwaja, Y., Vaitheeswaran, S. M., and Ananda, C. M. (2019). "Scale estimation of monocular slam using direct acceleration pair measurements". In Proceedings of the Advances in Robotics 2019, AIR 2019, New York, NY, USA. Association for Computing Machinery.

Bharadwaja, Y., Vaitheeswaran, S. M., and Ananda, C. M. (Accepted). "An efficient approach to initialization of visual-inertial navigation system using closed-form solution for autonomous robots". Journal of Intelligent & Robotic Systems, -(-):–.

Bharadwaja, Y., Vaitheeswaran, S. M., and Ananda, C. M. (Under Review). "Superpixels using binary images for monocular visual-inertial dense mapping". Engineering Science and Technology, an International Journal, -(-):–.

Bharadwaja, Y., Vaitheeswaran, S. M., and Ananda, C. M. (2017). "Obstacle avoidance for unmanned air vehicles using monocular slam with chain based path planning in gps denied environments". In Proceedings of the International Conference on Theoretical, Applied, Computational and Experimental Mechanics.

Bharadwaja, Y., Vaitheeswaran, S. M., and Ananda, C. M. (2020). "Obstacle avoidance for unmanned air vehicles using monocular-slam with chain-based path planning in gps denied environments". Journal of Aerospace System Engineering, 14(2):1–11.

Vaitheeswaran S. M., TS Gowthami, S Prasad, Bharadwaja Y. (2017), "Monostatic radar cross section of flying wing delta platforms". Engineering Science and Technology, an International Journal, Elsevier, 2017.

Bharadwaja Y. (2010), "Remote Data-Acquisition System For Internet-Based Interactive Embedded Applications". National Conference on Recent Trends in Communication Technologies and VLSI Design RTCTV-2010, June 2010, Vardhaman College of Engineering, Hyderabad.

Technical Talks

- One day lecture on "Vision based Navigation for Autonomous Robots" ISRO, Tiruvanantapuram, 25th Aug 2020. Through virtual meeting.
- Two day lecture on "MEMS Design Using COMSOL" at Sree Vidyanikethan Engineering College, Department of EConE, 17-18 February 2014.

Courses

- Completed two courses in robotics specialization from coursera: Aerial Robotics and Computational Motion Planning.
- Completed first course in deep-learning specialization from coursera.