Keshav Bimbraw

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EDUCATION

Worcester Polytechnic Institute, Worcester, MA
Candidate for Ph. D. in Robotics Engineering (Medical FUSION Lab)   Aug '20 – now
Concentration – Medical Robotics, Ultrasound Image Processing and Machine Learning

Georgia Institute of Technology, Atlanta, GA
M. S. with Robotics Focus (Music Technology, Computer Software & Media Applications)   Aug '17 – May '19
Concentration – Human Augmentation, Medical Robotics and Robotic Musicianship   3.56/4.00 GPA

Thapar University, Patiala, India
Bachelor of Engineering in Mechatronics Engineering (Research Intern - IIT Delhi from Jan – Jul '16)   July '13 – June '17
Concentration – Robotics and Mechatronics   GPA - 4.00/4.00 GPA (8.34 CGPA)

EXPERIENCE

Worcester Polytechnic Institute   Worcester, MA
Graduate Research Assistant (Medical FUSION Lab)   March 2020 – now
• Working on Ultrasound based angle finger angle estimation using deep learning.
• Developed a novel Augmented Reality based Lung Ultrasound Scanning Guidance system. Link.

Agile Resources Inc.   Peachtree City, GA
Active DSP Engineer at Panasonic Automotive Systems of America   Oct 2019 – March 2020
• Worked on Qualcomm's Hexagon SDK for audio applications in Eclipse on Android framework development.
• Utilized Qualcomm tools (QPST and QACT) to evaluate audio modules such as Bass Mid Treble, Parametric EQ, FNB and AVC.

Bose Corporation   Stow, MA
Active Noise Control Engineering Intern in Automotive Systems Division   May 2019 – Oct 2019
• Worked on sound synthesis for electric vehicles and implementing processor optimized signal processing algorithms.
• Implemented and evaluated a variable bandwidth shifting bandpass filter (in MATLAB) on an electric vehicle with a random noise source. Developed a physical car sound simulation system using Logitech pedals to evaluate models and reduce testing time.

Georgia Tech   Atlanta, GA
Graduate Research Assistant in Robotics   Aug 2017 – May 2019
• Investigated a combination of ultrasound & EMG data using supervised learning algorithms to enhance assistive robot control. Link.
• Took an initiative to improve expressivity of Shimon (Marimba playing robot) by replacing its actuators and control scheme. Link.
• Translated Piano playing to robots using a single DOF system and designed a robotic hand with one DOF per finger. Link.
• Developed an ultrasound in the loop tendon based wearable exoskeleton for upper extremity rehabilitation of stroke survivors. Link.
• Computer-Aided Design (CAD), Fusion 360, 3D printing and Mechatronics Instructor for Project Studio Course. Link.

Autonomous Robotics Laboratory, IIT Delhi   New Delhi, India
Research Intern   Fall and Summer 2016
• Developed a Control Module for RoboAnalyzer using C# to simulate control of mass spring damper & single link robotic arm systems.
• Improved performance of a 6 DOF motion platform at Simulator Development Division, Secunderabad, India. Link.
• Developed a Teach pendant to control virtual robots in RoboAnalyzer. Link.
• Programmed two KUKA KR-5 robotic arms to collaboratively play a guitar. Link.
• Modified the mechanical and electrical design of Tulsi Bead making device under rural development initiative of IIT Delhi.
• Worked on development of line and circular interpolation techniques at MTAB Engineers Pvt. Ltd., Chennai, India.

ACADEMIC PROJECTS

Navigation of a Raspberry-Pi based Robot using various sensors   Fall 2018
• Used data from Raspberry Pi camera to find center of a ball and track it by actuating Dynamixel motors attached to the robot.
• Used Lidar data to avoid obstacles and maintaining a specific distance from them while moving towards a goal.
• Worked on reaching goal position by classification & real time prediction of various waypoints using support vector machines.

Design of an ultrasound guided vein cannulation robot   Spring 2018
- Worked with a 5-person multi-discipline team to develop a medical robot that can hold an ultrasound probe to detect jugular vein.
- PRRRP configuration Robot manufactured and programmed so that end effector can reach specific positions in the robot workspace.

Development of a Hybrid Stewart platform using Arduino   Spring 2017
- Developed a hybrid two stage Stewart platform system as an improvement over the conventional Stewart platform.
- Arduino Mega microcontroller used to control 12 servo motors simultaneously. Control Interface developed in Visual Studio (C#).

SKILLS

- **Software Skills:** MATLAB, Simulink, Python, ROS, Arduino, C, C#, Linux, Microsoft Office, Microsoft PowerPoint, Microsoft Excel, Microsoft Word, LaTeX, Robotics programming, OpenCV, SolidWorks, Inventor, PTC Creo, Fusion 360, exposure to Java, C++ and HTML.
- **Electronic/manufacturing skills:** Arduino, Raspberry Pi, FSR, Sensors, Circuit Design, DC motors, Motors, linear actuators, Hardware & software interfacing, 3D printing, rapid prototyping, Electro-mechanical systems, Machine Learning integration with Robotics.
- **Communication/Writing:** Technical papers, Research presentations, Public speaking, technical reports, interaction with people from different backgrounds & disciplines, written & verbal communication skills, creating & leading teams, creating & teaching curriculum.
- **Research:** Writing experimental proposals, conducting experiments, analyzing data, presenting results, composing scientific reports.

LEADERSHIP

Vertically Integrated Projects Instructor at Robotic Musicianship Lab   Fall 2017 – Spring 2019
- Vertically Integrated Project Instructor leading teams of undergraduates to involve them in research on robotics and Mechatronics.
- Mentoring students to help them work on real life robotics projects as well as development of their presentation skills.

Diversity and Inclusion Fellow at Georgia Institute of Technology   Spring 2019
- Leading efforts in making Georgia Tech a more inclusive campus by organizing student and faculty activities at GTCMT.
- Took an initiative to enroll students & faculty in campus activities related to promoting a diverse & inclusive community.

HONORS AND AWARDS

- Selected to be Diversity and Inclusion Fellow by Georgia Tech Institute Diversity (Stipend - $1000)   February 2019
- Won third place and $500 in the 3-minute thesis competition held at Georgia Tech   November 2018
- $1500 award for being selected as NSF-NRT ARMS (Accessibility, Rehabilitation, & Movement Science) Trainee   August 2018
- Scholarship to pursue masters at Georgia Tech   August 2017
- Awarded merit scholarships and grants totaling INR 336,000 at Thapar University.   June 2017

PUBLICATIONS & PRESENTATIONS

[1] Bimbraw K., Ma X., Zhang Z., Zhang H. (2020) Augmented Reality-Based Lung Ultrasound Scanning Guidance. In: Hu Y. et al. (eds) *Medical Ultrasound, and Preterm, Perinatal and Paediatric Image Analysis. ASMUS 2020, PIPPI 2020*. Lecture Notes in Computer Science, vol 12437. Springer, Cham. https://doi.org/10.1007/978-3-030-60334-2_11. Video: https://vimeo.com/463333665.

[2] K. Bimbraw, E. Fox, G. Weinberg and F. L. Hammond, "Towards Sonomyography-Based Real-Time Control of Powered Prosthesis Grasp Synergies," *2020 42nd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, Montreal, QC, Canada, 2020, pp. 4753-4757, doi: 10.1109/EMBC44109.2020.9176483. Video: https://vimeo.com/444131445.

[3] Bimbraw, K., Fox, E., Hammond, F. L., & Weinberg, G. (2019, April). Sonomyography (SMG) based real-time hand grasp configuration identification via supervised learning to control a soft robotic gripper. In *2019 Spring School on Medical Robotics (SSMR) and 2019 International Symposium on Medical Robotics (ISMR)*. IEEE. (poster and technical presentation)

[4] Rosa, L., Bimbraw, K., Hammond, F. L., & Weinberg, G. (2018, October). Comparison and Integration of SMG and EMG. In *BMES Annual Meeting 2018*. BMES. (technical presentation)

[5] Bimbraw, K. (2015, July). Autonomous cars: Past, present and future. *In 2015 12th International Conference on Informatics in Control, Automation and Robotics (ICINCO)* (Vol. 1, pp. 191-198). IEEE.

[6] Mehta, I., Bimbraw, K., Chittawadigi, R. G., & Saha, S. K. (2016, December). A teach pendant to control virtual robots in Roboanalyzer. In *2016 Int. Conference on Robotics and Automation for Humanitarian Applications (RAHA)* (pp. 1-6). IEEE.

[7] Bimbraw, K., Mehta, I., Venkatesan, V., Joshi, U., Sabherwal, G. S., & Saha, S. K. (2016, December). Performance improvements of a 6-DOF motion platform. In *2016 International Conference on Robotics and Automation for Humanitarian Applications (RAHA)* (pp. 1-5). IEEE.

[8] Kaur, M., Singh, G., Bimbraw, K., & Uniyal, P. (2015, August). Study of phase transformation and microstructure of alcohol washed titania nanoparticles for thermal stability. In *AIP Conference Proceedings* (Vol. 1675, No. 1, p. 030049). AIP Publishing.