Sonia Mary Chacko, PhD

Robotics Engineer

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Motivated and talented robotics engineer with extensive experience in research and development of robotic systems and human-robot interactive approaches. Goal-oriented with a desire to contribute multidisciplinary skills in building innovative autonomous robotic/mechtroics technologies and solutions.

Skills and competencies

Programming Skills: C, C++, Modern C++, Python, C#, Embedded C, Unix Shell Scripting, Verilog/VHDL

Robotics/Embedded/Software Development and Simulation Tools: ROS, Dynamixel SDK, Gazebo, OpenCV, Tensorflow, MATLAB, LabVIEW, AWS Cloud9, Microsoft Visual Studio, Arduino, Raspberry Pi, Gazebo, CARLA, Git/Github

Android/iOS AR Development Platforms/Libraries: Unity3D, ARCore, Vuforia

Automation Tools: PLC (Allen Bradly, Siemens), SCADA (Wonderware InTouch)

Education

2016-07 –
2020-08

PhD in Mechanical Engineering (Robotics specialization)

NYU Tandon School of Engineering - Brooklyn, NY, USA

2010-07 –
2012-05

Master of Technology in Mechatronics Engineering

National Institute of Technology Karnataka - Surathkal, India

2003-06 –
2007-07

Bachelor of Technology in Electronics and Communications Engineering

Mahatma Gandhi University - Kottayam, India

Work History

2016-07 –
2020-08

Doctoral Researcher, Research Mentor

NYU Tandon School of Engineering, Brooklyn, NY

Doctoral Researcher:

- Full-time robotics researcher focusing HRI by applying AR technology
- Designed, developed, and user-tested intuitive augmented reality (AR) user interface (UI) applications for various human-robot interaction (HRI) scenarios and robotic applications such as, unknown object manipulation, robot programming

for manipulator robots, AR spatial referencing system for ROS-enabled mobile robots, and AR visualization interface for displaying mobile robot navigation intentions
- Development of robotics platforms: Dynamixel manipulators(4 and 5 DOF), OpenManipulator, TurtleBot3 mobile robot
- Conducted quantitative studies and qualitative user studies (NASA -TLX, SUS, SAGAT)

Research Mentor, STEM Professional Development Trainer:
- Worked as a professional development STEM trainer for NYC public school teachers for implementing robotics into science and math lessons in an NSF-funded STEM project
- Providing training and guidance to graduate, undergraduate, and high school summer interns

2014-06 – 2016-04

Assistant Professor

RTM Nagpur University, Nagpur, India
- Taught concepts of digital electronics, microprocessors, and microcontrollers, and computer and communication network in undergraduate level
- Curriculum development for micro-controller lab course
- Departmental examination commitee member, RCOEM, Nagpur
- Organized *Virtual Lab* workshop in RCOEM in association with National Program on Education through ICT (An MHRD sponsored program) in association with IITs

2011-06 – 2012-01, 2012-06 – 2012-12

Intern, Software Engineer

Robert Bosch Engineering & Business Solutions Ltd, Bangalore, India

Internship:
Project: Battery management system of autonomous lawn mower
- Carried out battery charging and discharging profile analysis
- Open circuit voltage test and analysis of battery behavior based on its parameters
- Modeling and State of Charge (SOC) estimation
- Technical documentation

Software engineer:
Project: Embedded system development of EMS dongle for thermostatic control unit
- Code Development, porting of API, and developer testing
- Code Coverage Analysis
- Technical documentation

2008-01 - 2009-01

VLSI Engineer

Wipro Technologies, Cochin, India

Project: Physical Layer for DDR Memory
- ASIC design and functional verification
- Project and testing environment setup includes test bench, tasks, run scripts.
- Functional test case coding and simulation, Spyglass Lint cleanup

Project: LVDS macro development in 45nm technology

- Testing environment setup and test plan
- Development of functional and DFT (Design for Test) test cases, coding and simulation
- Code coverage analysis, gate level simulation, Conformal LEC, Fast scan, and test pattern generation

Research Publications

Peer-reviewed journal/conference papers:

1. **S.M. Chacko**, A. Granado, A. RajKumar, and V. Kapila, "An Augmented Reality Spatial Referencing System for Mobile Robots," IEEE International Conference on Intelligent Robots and Systems (IROS), 2020.

2. **S.M. Chacko**, A. Granado, and V. Kapila, "An Augmented Reality Framework for Robotic Tool-path Teaching," CIRP Conference on Manufacturing Systems (CIRP-CMS), Chicago, USA, 2020.

3. **S.M. Chacko** and V. Kapila, "An Augmented Reality Interface for Human-Robot Interaction in Unconstrained Environments," IEEE International Conference on Intelligent Robots and Systems (IROS), Macau, China, 2019.

4. **S.M. Chacko** and V. Kapila, "Augmented Reality as a Medium for Human-Robot Collaborative Tasks," IEEE International Conference on Robot and Human Interactive Communication (RO-MAN), New Delhi, India, 2019.

5. H.S. You, **S.M. Chacko**, and V. Kapila, "Examining the Effectiveness of a Professional Development Program: Integration of Educational Robotics into Science and Math Curricula," Journal of Science Education and Technology (under review).

6. H. Wazir, C. Lourido, **S.M. Chacko**, and V. Kapila "A COVID-19 Emergency Response for Remote Control of A Dialysis Machine with Mobile HRI," Frontiers in Robotics and AI (under review).

7. H.S. You, **S.M. Chacko**, S. B. Rajguru, and V. Kapila, "Designing Robotics-based Science Lessons Aligned with the Three Dimensions of NGSS-plus-5E Model: A Content Analysis (Fundamental)." ASEE Annual Conference and Exposition, Tampa, FL, 2019.

8. H.S. You, **S.M. Chacko**, and V. Kapila, "Teaching Science with Technology: Science and Engineering Practices of Middle School Science Teachers Engaged in a Professional Development for Robotics Integration into Classroom ," ASEE Annual Conference and Exposition, Tampa, FL, 2019.

9. I.F. Ghalyan, **S.M. Chacko**, and V. Kapila, "Simultaneous robustness against random initialization and optimal order selection in Bag-of-Words modeling," Pattern Recognition Letters, 116, pp.135-142, 2018.

10. S.M. Rahman, **S.M. Chacko**, S. B. Rajguru, and V. Kapila, "Fundamental—Determining Prerequisites for Middle School Students to Participate in Robotics-based STEM Lessons: A Computational Thinking Approach," ASEE Annual Conference and Exposition, Salt Lake City, UT, 2018.

11. S.M. Rahman, **S.M. Chacko**, and V. Kapila, "Building trust in robots in robotics-focused STEM education under TPACK framework in middle schools.", ASEE Annual Conference and Exposition, Columbus, OH, 2017.