Godwin Ponraj JOSEPH

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Professional Summary

Experienced engineer with a demonstrated history of working with chip-less RF sensors & robotic manipulators. Skilled in sensor fabrication and integration with measurement and control systems. Strong engineering professional with an Electrical engineering Master's degree specialized in Automation & Control from NUS. Interested in working toward innovative, application oriented product development.

Core Competence

– Analog Simulation, PCB Design & Antenna Simulation (***LTspice, Eagle PCB, CST studio***)
– Programming & 3D modelling (***MATLAB, Arduino, Python, C#, HTML, Fusion 360, Unity 3D***)
– Sensor fabrication, characterization, control & integration with Robotic manipulators
– Project management, Problem solving, Communication and Collaborative working

Education

Doctor of Philosophy (GPA: 4.75/5) — **National University of Singapore (NUS)**
Biomedical Engineering — *Aug'19 – Present*

Master of Science (GPA: 4.45/5) — **National University of Singapore (NUS)**
Electrical Engineering (Automation & Control) — *Aug'14 – Dec'15*

Bachelors of Engineering (GPA: 9.51/10) — **Thiagarajar College of Engineering, India**
Electrical & Electronics Engineering — *Jun'09 – Apr'13*

Research Projects - A Summary

As a Ph. D. student (NUS) *Aug'19 – Present*

1. Chipless wireless sensing and Kirigami inspired sensor design[1–3]

– Developed chip-less RF-based wireless sensing devices that can respond to various mechanical stimuli and used for tracking of intubation tube automation. Designed RF antennas in Eagle PCB software and simulated them in CST studio to analyse their S11 response.
– Conceptualized application scenarios and presented them as animated simulations using Fusion 360 software.
– Designed, simulated (LTspice) and implemented wireless power sharing scheme between two loads using magnetic resonance coupling using only passive components.
– Explored various machine learning algorithms together with principal component analysis to implement hand gesture classification in MATLAB using data from wearable kirigami device measuring skin impedance and achieved a classification accuracy of 91.5%.

As a Research Engineer (Medical Mechatronics Lab, NUS) *May'16 – Jul'19*

2. Sensing & Adaptive Control – Office of Naval Research (ONR), USA[4,5,7,9]

– Implemented coordinated manipulator-robotic arm operation by executing UR Polyscope commands from MATLAB environment via a TCP-IP connection, using Universal Robots' SDK.
– Fabricated flexible tactile sensors for a rigid-soft modular robotic gripper and implemented closed loop control based on its tactile feedback. Strategized manipulator operation for handling objects with varied stiffness and surface textures.
– Coordinated with teleoperation team to demonstrate remote control of two robotic manipulators and UR10 arms using haptic feedback controllers and Leap motion controller.
– Collaborated with other research groups *(Singapore Institute for Neurotechnology (SINAPSE), NUS & Evolution Innovation Lab, NUS)* to realize robotic grippers with tactile sensing capability, compatible with UR10 industrial robotic arm to perform bimanual manipulation tasks. Delivered application demos to the representatives from the *Office of Naval Research (ONR, USA)* for two years.

3. Tactile sensors for Clinical & Surgical tools – National University Health System (NUHS)[6]

– Fabricated piezoresistive tactile sensors with soft encapsulation for use in surgical retractors and drug delivery modules thereby increasing their safety by facilitating tissue contact force monitoring.

4. Human hand tracking – National University of Singapore (NUS)[8]

– Proposed and implemented Kalman filter based sensor fusion of Leap motion controller and flex sensors for human finger tracking application in Unity 3D environment using visual C# and reduced error percentage in self-occluded cases to <5% for the selected hand gestures.

Mentoring Experience

Teaching Assistant - NUS *Aug'20 – Nov'20, Aug'21 – Apr'22*

– Involved in laboratory kit preparation for experiments involving basic Op-amp operations, ECG data collection, heart rate monitoring and bio signals preprocessing using MATLAB.
– Supervised multiple lab sessions for a class size of over 150 students and offered technical support for their group projects involving FFT analysis of ECG signals.
– Co-mentored 12 students organized into 4 teams for their group projects on origami based soft robots.
– Coordinated zoom breakout sessions and discussions between the module coordinator and the students from different groups during interim project presentations.

Industrial Work Experience

Process Control System Engineer – Micron Semiconductors *Jul'15 – Apr'16*

– As a Run-to-Run control engineer, implemented feedback and feed forward control for several processes in the semiconductor chip fabrication workflow and improved the KPI metrics of run coverage to >98% and reduced error percentage to <1%.

Associate System Engineer – IBM India Pvt. Ltd. *Jun'13 – Jun'14*

– Supported maintenance of product and customer details database related to IBM's commercial website and resolved critical performance issues.

Other Skills, Languages & Hobbies

– **Hardware:** Soldering, Silicone (soft material) fabrication via molding, FDM 3D printing
– **Languages:** English & Tamil
– **Hobbies:** Chess, Sudoku, Cycling

Selected Publications

[1]. ***G. Ponraj***, *et al.*, *IEEE RAL*, Apr. 2022, pp. 2369-2376, doi: 10.1109/LRA.2022.3141664.

[2]. ***G. Ponraj***, *et al.*, *IEEE ICRA*, May 2021, pp. 11400–11407, doi: 10.1109/ICRA48506.2021.9561945.

[3]. ***G. Ponraj***, *et al.*, *MDPI MTI*, Aug. 2020, p. 47, doi: 10.3390/MTI4030047.

[4]. ***G. Ponraj***, *et al.*, *MDPI Robotics*, Aug. 2019, p. 67, doi: 10.3390/robotics8030067.

[5]. ***G. Ponraj***, *et al.*, *IEEE CASE*, Aug. 2019, pp. 1808–1813, doi: 10.1109/COASE.2019.8842882.

[6]. ***G. Ponraj***, *et al.*, *IEEE Sens. J.*, Dec. 2018, pp. 9840–9847, doi: 10.1109/JSEN.2018.2871242.

[7]. ***G. Ponraj*** and H. Ren, *IEEE ICRA*, May 2018, pp. 4135–4141, doi: 10.1109/ICRA.2018.8461031.

[8]. ***G. Ponraj*** and H. Ren, *IEEE Sens. J.*, Mar. 2018, pp. 2042–2049, doi: 10.1109/JSEN.2018.2790801.

[9]. ***G. Ponraj***, *et al.*, *IEEE CASE* Aug. 2017, pp. 1451–1456, doi: 10.1109/COASE.2017.8256308.

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External Links

Personal website: godpon.github.io/GodwinPonraj

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