

Kattoju Ravi Kiran

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EDUCATION

PhD Modeling and Simulation , <i>University of Central Florida, USA</i>	2014-2022
Masters Modeling and Simulation , <i>University of Central Florida, USA</i>	2014-2015
Masters Mechatronics , <i>Loughborough University, UK</i>	2009-2011
Bachelors Electronics and Communications Engineering , <i>Anna University, India</i>	2005-2009
<i>Research Fellowship, University of Central Florida</i>	2014-2019
<i>Academic Scholarship, Loughborough University</i>	2009-2011

TECHNICAL EXPERIENCE

GRADUATE RESEARCHER

2014 - Present

Interactive Systems and User Experience Lab

University of Central Florida, USA

- Collaborated with interdisciplinary teams to design, develop, and prototype novel interaction technologies.
- Designed and developed multimodal input/output interface prototypes for VR/AR/XR interactive systems.
- Designed, developed, and evaluated performance of flexible 3D printed wearables with embedded sensors.
- Designed, developed, and tested wearable intervention prototype technology for automatic posture correction utilizing electrical muscle stimulation.
- Designed sensor hardware and machine learning algorithms for poor posture detection.
- Designed and developed IOT-based smart Bio-sensor systems for remote monitoring and human tele-operation.
- Demonstrated capabilities to design, develop, and integrate hardware/software solutions from concept design to prototype, validation, and testing.
- Designed and conducted user studies to measure and evaluate system/user performance with wearable intervention technology. Prepared and presented first-authored publications as part of research activities.

HARDWARE R&D ENGINEER

2013 - 2014

Philips Healthcare

Bangalore, India

- Collaborated with cross functional teams for hardware design, prototyping, testing of ultrasound probes.
- New product design modeling, conducting comparative performance analysis with existing systems.
- Designed, developed and integrated wireless RFID input interfaces for uniquely identifying different varieties of probes and their compatibility with different ultrasound systems.

MECHATRONICS R&D ENGINEER

2012 - 2013

GE Healthcare

Zipf, Austria

- Developed real-time piezo-acoustic models and simulations for ultrasound wave propagation.
- Designed and developed rapid prototypes, testing and evaluation of new ultrasound probes with mechanical and electronic sensor components.
- Development of water ingress and piezo-electric crystal deformation simulations.

TRAINEE

2008 - 2009

Indian Space Research Organization

Sriharikota, India

- Telemetry, tracking, and observation of satellite locations.
- Developed an autonomous drilling robot for land slide monitoring and space navigation as part of Bachelors thesis.

SKILLS

Tools and Languages	C, C#, Python, MATLAB / Simulink, SPSS
Mechanical Design	Solidworks, AutoCAD, Autodesk Fusion 360
Electronics Design	Autodesk Eagle, Altium PCB design
Simulation	COMSOL, Unity3D
Other	Microsoft Office Suite, Adobe Photoshop

PROJECTS

Wearable Intervention Technology: Input/Output Interfaces (*PhD Dissertation*)

- **Automatic Posture Correction:** Designed and developed a novel automatic physiological feedback loop-based wearable intervention technology to detect and correct poor workplace postures such as wrist extension, neck cradling, slouching, balance asymmetry, and improper lifting techniques utilizing sensors and Electrical Muscle Stimulation (EMS).
- **Shared Kinesthetic Experiences:** Designed and developed a novel mimicking input/output interface technique to transfer muscle activity information between two individuals through the use of electromyography (EMG) and EMS in physical/virtual/augmented/mixed reality systems.
- **Voice Actuated Muscle:** Designed and developed a novel input/output interface technique enabling a voice command-based muscle activation to translate voice commands from one individual to induce involuntary physiological responses in another individual using EMS.
- Integrated mechanical, electronic, control and software components to develop wearable intervention technologies from concept to prototype.
- **Wearable Intervention Technology:** Designed and developed electronics hardware, PCB design and fabrication, embedded sensor-based 3D printed flexible wearables, and software applications to enable input/output interaction in VR/AR/XR systems.
- Conducted user studies with (150+ participants) and statistical evaluation of system/user performance, efficiency, user perception, feasibility, and usability of our input/output interfacing techniques and wearable intervention technology.

Smart Bio-Sensors for human motion synthesis and health parametrics (*PhD Dissertation*)

- Designed and developed IOT based EMG, IMU, pulse oximeter, temperature sensors for remote monitoring and human tele-operation.
- **Electronics:** Designed and developed circuits, PCB schematics and fabrication.
- **Mechanical:** Designed and developed mechanical enclosures for the electronic components.
- **Software:** Designed and developed C# based UI applications for establishing sensor connectivity and remote monitoring over the internet.
- Integrated the electronics, mechanical and software components and conducted testing and validation of the system to enable monitoring human motion sensing, muscle activity, and health parametrics.

Soldier-Robot Teaming

- Designed and developed gesture and speech input interface technologies to facilitate soldier-robot communication during spatial navigation tasks with an autonomous robot.
- Conducted user studies on human-robot interaction in an intelligence, surveillance, and reconnaissance task through speech commands and gestures.

Power Harvesting for Low Power Sensors (*Masters Thesis*)

- Design, development, testing and validation of a new vibrational energy harnessing prototype for power generation.
- Developed an electro-magnetic induction-based energy harvester to generate energy from ambient vibrations during physical activities in humans and in heavy industrial machinery.
- Demonstrated energy generation and harvesting to drive low power sensors.

Autonomous Drilling Robot for Landslide Monitoring and Space Navigation (*Bachelors Thesis*)

- Design and development of working prototype of drilling robot for land slide monitoring, navigation and drilling purposes.
- Devised the use of multiple input sensors for detecting presence of water, gas, heat, and fire while establishing constant communication to the operator using ANT wireless networks.

AREAS OF INTEREST

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|------------------------------|------------------------------------|-------------------------------|
| • Human-computer interaction | • Input/Output interfaces | • VR/AR/XR Applications |
| • Sensors and Bionics | • Wearable intervention technology | • Augmented cognition systems |

PUBLICATIONS

- Kattoju, R. K., Pittman, C. R., LaViola, J. (2020, December). Automatic Slouching Detection and Correction Utilizing Electrical Muscle Stimulation. In Graphics Interface 2021.
- Kattoju, R. K., Taranta, E. M., Ghamandi, R., LaViola, J. (2021, December). Automatic Asymmetric Weight Distribution Detection and Correction Utilizing Electrical Muscle Stimulation. In Graphics Interface 2022.
- Kattoju, R. K., Barber, D. J., Abich IV, J., Harris, J. (2016, May). Technological evaluation of gesture and speech interfaces for enabling dismounted soldier-robot dialogue. In Unmanned Systems Technology XVIII (Vol. 9837, p. 98370N). International Society for Optics and Photonics.
- Kattoju, R. K., Taranta, E. M., Ghamandi, R., LaViola, J. Automatic Improper Lifting Posture Detection and Correction Utilizing Electrical Muscle Stimulation. (in progress)