Ranul Vithanage

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RESEARCH INTERESTS

Human-Computer Interaction, Human-Robot Interaction, Robotics, Computer Vision, Autonomous Systems

EDUCATION

University of Moratuwa, Moratuwa, Sri Lanka — January 2020 — Present
BSc Eng (Hons) in Mechanical Engineering — Cumulative GPA: 3.71/4.20
Dean's List in Semesters 1, 2, 6, and 7

PUBLICATIONS

ranulv.github.io/publications

Smart Music Therapist 1.0: Rhythmic Auditory Stimulation Integrated Robotic Walker as a Therapeutic Companion for Gait Rehabilitation
(submitted to IEEE Int. Workshop on Robot and Human Communication (RO-MAN) 2024) *[PDF]*

- Robot-facilitated Music Therapy towards a semi-autonomous solution for gait rehabilitation
- Telerehabilitation platform for Music Therapist to remotely monitor and consult patients
- Intelligent companionship (voice interaction, graphical user interface, music recommendation, etc.) integrated with a robotic walker fusing rehabilitation and socially assistive robotics

Robust Autonomous Summoning Capabilities for a Patient Assistive Mobile Robot
(submitted to IEEE Int. Conference on Advanced Robotics and Mechatronics (ICARM) 2024) *[PDF]*

- Robust navigation without reliance on Indoor Positioning Systems (IPS) for infrastructure-limited areas
- LiDAR-based SLAM for Localization and Mapping
- Sound Source Localization for out-of-line-of-sight navigation and Gesture Recognition with Depth estimation by Stereo Vision for line-of-sight navigation

Intelligent Control System for Active Walking Guidance of a Robotic Walker
(submitted to Moratuwa Engineering Research Conference 2024) *[PDF]*

- Active Navigation Control Interface using armrest-mounted force-sensitive resistor matrix
- Comparative evaluation of Rule-based and Fuzzy Control Methods on intuitiveness and smoothness of control
- Armrest-integrated Haptic feedback for direction-specific obstacle avoidance

Design and Simulation of a Thermally Actuated Microgripper with a Compliant Bistable Release Mechanism for Biomanipulation
(submitted to Moratuwa Engineering Research Conference 2024) *[PDF]*

- MEMS-based Microgripper with an Active Plunger working on the principle of Bistable Compliant Mechanism
- Featuring Double and Cascaded V-shaped (Chevron-shaped) actuators for effective manipulation
- Simulation results of displacement and temperature in the range preferred for bio samples

mWalker: Towards Independent living with a Multi-functional Robotic Walker providing intelligent patient assistance
(Journal Paper in Preparation)

- Human height prediction from anthropometric data obtained using pose estimation for sit-to-stand assistance
- Emergency detection and alerting system, Active guidance, Posture and emotion monitoring
- Fabrication of the Robotic Walker platform with experimental evaluation of compliance to ISO standards using static and dynamic tests

PROJECTS

ranulv.github.io/projects

Design and Development of a Multi-functional Robotic Walker (Final Year Project)

- Able to autonomously be summoned to the user's location for line-of-sight and non-line-of-sight scenarios
- Provides active user guidance suiting the user's pace with intuitive control methodology
- Provides sit-to-stand assistance upon the estimation of user height through computer vision
- Performs onboard Gait Analysis using a walker-mounted 2D LiDAR device and user-worn IMU
- Performs Emotion recognition and posture analysis for fatigue and emergency detection

Design and Development of a Remote Monitoring Robot for Gait Rehabilitation

- Performs Rhythmic Auditory Stimulation as a rehabilitation aid for users with gait disorders
- Able to monitor real-time gait data remotely by a medical professional using wearable IMUs worn by the user
- Provides feedback for gait improvement to the user even without external monitoring

PROFESSIONAL EXPERIENCE

Visiting Instructor Moratuwa, Sri Lanka
Department of Mechanical Engineering - University of Moratuwa March 2023 — Present

- Conducted practical lab sessions under the module ME2041: Fundamentals of Mechatronics
- Facilitated workshops on Single-Board Computers (Raspberry Pi) and Micro-controllers (Arduino)
- Facilitated workshops on Image Processing principles and tools for Robotics projects

Industrial Automation Intern Kottawa, Sri Lanka
Dipped Products PLC January 2023 — June 2023

- Designed a Glove Washing Station following a Latex Dipping Tank for an automated production line
- Designed an automated glove folding mechanism that integrates with a conveyor belt.
- Designed an automated glove cuff-cutting mechanism for Supported gloves improving safety and efficiency
- Designed an automated mechanism for transferring glove formers from drying ovens to latex dipping stations
- Completed 3D designs and detailed drawings for fabrication of components in Glove manufacturing plants

National Head of Talent Management and Organizational Development Kathmandu, Nepal
AIESEC in Nepal July 2022 — January 2023

- Responsible for Membership Experience Program (MXP) implementation
- Responsible for the National Project Managers
- Responsible for the National Ethics Subcommittee and Membership Subcommittee
- Management of the Talent Management Commission and Network
- Responsible for implementation of the Organizational Development (OD) model
- Responsible for local entity process assessment, improvement, and coaching

COURSES

Bachelor's Courses

- Robotics Technology
- Object Oriented Programming Using C++
- Control Systems & Instrumentation
- Industrial Automation
- Micro/Nano Electro Mechanical Systems and Nanotechnology
- Biomedical Engineering Applications
- Calculus
- Linear Algebra
- Operational Research
- Applied Statistics
- Graph Theory

Additional Courses
CIMA (Chartered Institute of Management Accountants) *Certificate Level Completed (Self-learned)*

VOLUNTEERING EXPERIENCES

Diriya Arunalu (Link) Galle, Sri Lanka
Co-Founder & Educator Jan 2019 - Dec 2019

- Co-founded the initiative to support Mathematics education in underprivileged schools in Galle
- Organized numerous teaching sessions in correspondence with school management
- Taught Mathematics to students in Grades 10 and 11 preparing for the G.C.E. O/L Examination
- Organized book donations among peers to donate to ill-resourced libraries in the local area

SKILLS

- **Programming:** Python, C++, MATLAB
- **Frameworks:** ROS, Gazebo
- **Libraries:** OpenCV, Numpy, Matplotlib, SciKit-Learn, TensorFlow, PyTorch
- **Software:** SOLIDWORKS, COMSOL, Solid Edge
- **Soft Skills:** Collaboration, Critical thinking, Written/Oral communication.

REFERENCES

Prof. Y.W.R. Amarasinghe
Mechancial Engineering Department, University of Moratuwa, Sri Lanka
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Dr. Palitha Dassanayake
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Dr. Dumith Jayathilaka
Mechancial Engineering Department, University of Moratuwa, Sri Lanka
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