Isak Martin Simbolon

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EDUCATION

University of Indonesia **Depok, Indonesia**
Bachelor of Electrical Engineering 2015-2019

- **GPA:** 3.55 / 4.00
- **Relevant Coursework:** Robotics, Control Engineering, Automation
- **Thesis:** 6 Degrees of Freedom Robot Control by Using Armband

National Taiwan University of Science and Technology **Taipei, Taiwan**
Master of Science in Electrical Engineering 2020-2021

- **GPA:** 4.00 / 4.20
- **Relevant Coursework:** Robotics, Machine Learning, Deep Learning, IoT
- **Thesis:** Integral Sliding Mode Control Optimization for Network-controlled Ball Balancing Platform

WORK & LEADERSHIP EXPERIENCE

Robotics Engineer December 2022 - now
Precision Machinery Research and Development Center, Taiwan

- Four-wheeled Holonomic Autonomous Mobile Robot
  - Localization, map making, navigation based on ROS 1 Noetic, and migrated the code base to ROS 2 Humble through docker containerization.
  - Build a user interface to make waypoints navigation interactively for AMR with PyQt and RViz.
  - Improved localization with lidar-based odometry for holonomic robots, publish the package and build it to the public repository with GitHub Actions.
  - Wrote the motor driver program for a four-wheeled holonomic kinematics.
  - Integrated navigation and MySQL Database.
  - Improved navigation with docking system with AprilTag QR Code.
- Computer Vision-based Assistive program for a forklift AGV positioning
  - Transfer learning a neural network model to identify the object on top of the pallet and deploy it with TensorFlow Lite.
  - Calculate the center of gravity of the pallet and object with color segmentation to improve the Forklift AGV positioning.
  - Design a camera holder on AGV with 3D Inventor.
- Robot Arm Control with ROS
  - Control an industrial robot UR5 with ROS2 Humble Moveit2.
  - Design waypoints for the robot TCP and implement obstacle avoidance test .

Research Assistant March 2022 – July 2022 (Contract)
Autonomous and Soft Robotic Lab, National Taiwan University

- Prosthetic Leg
  - Led a team of students to collect and analyze gait movement that was later used to build a machine learning model to predict knee angle. The data were collected with 9-Axis Bluetooth IMU and trained in MATLAB.

- Configured and debugged electromechanical parts of the prosthetic leg that consists of microcontrollers, motor driver, and DC motor.
- Anti-sway Control for Crane Prototype
  - Designed and programmed microcontroller connections to the anti-sway platform through the motor driver with C++.
  - Utilized HSV thresholding and Gaussian blur filter technique from OpenCV Python library and Kalman Filter to determine the position of the load that was later used to solve the error position with the PID control method.

TRAINING AND CERTIFICATIONS

- AI-900: Azure AI Fundamentals from Microsoft
- SC-103: Shell Scripting using Bash from The Linux Foundation
- IoT Academy Certificate from Indonesian Ministry of Communication and Information Technology
- AWS Cloud Practitioner from Amazon

PUBLICATIONS

Development of Navigation System for Path Planning of Autonomous Cleaning Robot
IEEE 2021 International Automatic Control Conference (CACS)

Natural Tele-manipulation for Robot Movement based on Motion Pattern of Arm Posture
IEEE 2020 International Conference on Smart Technology and Applications (ICoSTA)

The Application of Sensorless-Based Torque Estimation Technique in Industrial Collaborative Robots
International Journal of iRobotics, 2023

SKILLS, ACTIVITIES & INTERESTS

Languages	English (TOEIC: 940) and Indonesian
Technical Skills	ROS2, ROS1, Python, C++, Arduino/Raspberry Pi, Bash, Tensorflow/Keras, Matlab, PyQt, Moveit2
Tools	Docker, GitHub, 3D Inventor, MySQL, Visual Studio Code, Jira
Research Interest	Robotics, Deep Learning, Cloud-based Technology, Digital Twin