Portfolio

Background, Research & Engineering Projects

Hanif Edma

https://hanifedma.com/portfolio_presentation

- **Seoul National University of Science and Technology (SEOULTECH)**
  M.S., Electrical & Information Engineering — GPA 4.19 / 4.50
  Seoul, South Korea • Feb 2024 – Aug 2026 (Expected) • Research Assistant

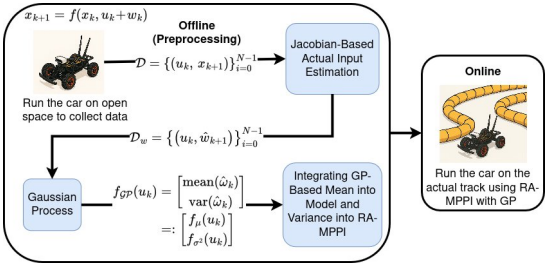
- **Universitas Indonesia**
  B.S., Electrical Engineering — GPA 3.61 / 4.00
  Depok, Indonesia • Aug 2019 – Aug 2023

Background — Technical Skills

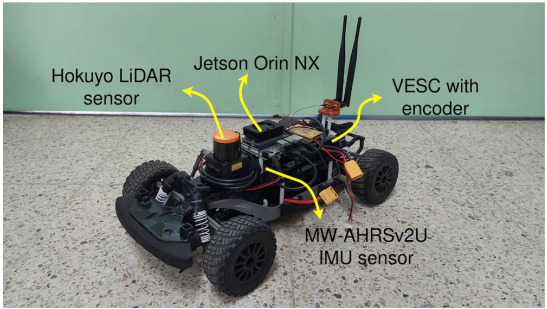
Focus: Robotics (mobile robots) • Control & Estimation • Electrical Engineering

- **Control & Estimation:** MPC / MPPI / MPCC, PID, LQR, Kalman Filter (KF/EKF), 2D SLAM, Motion Planning & Trajectory Optimization
- **Machine Learning:** Gaussian Process (GP/SGP), Neural Networks, Imitation Learning, PyTorch & TensorFlow (basic)
- **Programming & Frameworks:** ROS1 / ROS2, C/C++, Python, MATLAB/Simulink, CasADi, Flutter, HTML/CSS/JS, OpenCV (basic)
- **Tools & Platforms:** Gazebo, move_base, Linux, Git, Docker
- **Hardware & IoT:** NVIDIA Jetson, Raspberry Pi, Arduino, ESP32

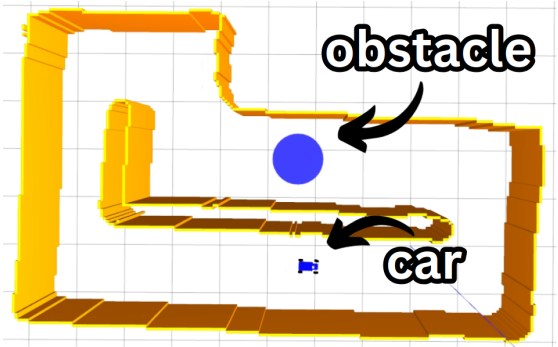
Real-world run — proposed method



Method framework



F1TENTH platform



Simulation — with obstacles

Simulation — without obstacles

Objective

Drive a robot safely despite the model–reality gap, without hand-tuning the safety level.

Outcome / Contribution

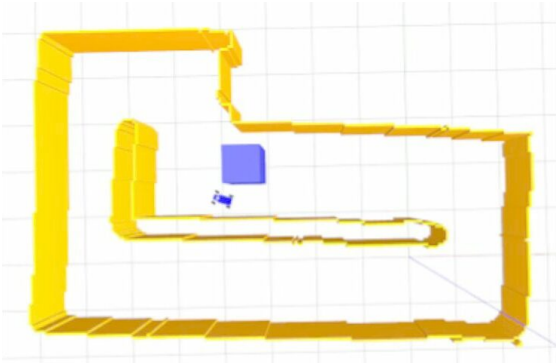
- Gaussian Process learns the model gap offline and **auto-sets the safety level** — no manual tuning.
- On F1TENTH (sim + real): finished every obstacle lap where baselines crashed, at the same speed.

Images, video & explanation: https://gp-ramppi.github.io/

Paper (IEEE Access, 1st author): https://doi.org/10.1109/ACCESS.2025.3640166

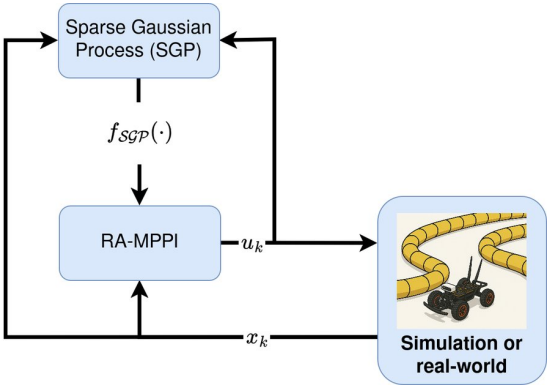
Technical skills

- Gaussian Process
- MPPI / sampling MPC
- Localization & mapping (SLAM)
- ROS1, move_base (Nav2 equivalent), Gazebo
- PyTorch, PyCUDA
- Python, C/C++
- **Hardware:** Jetson Orin, LiDAR, IMU, wheel odometry, VESC

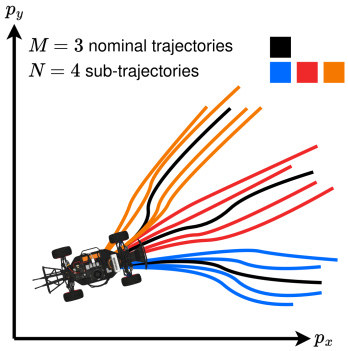


Simulation (Gazebo)

Real-world run — proposed method



Control scheme



Online sampling

Objective

Adapt to uncertainty in real time — learn the model gap **while driving**, no data collected beforehand.

Outcome / Contribution

- Sparse Gaussian Process learns the gap **online** in the background, never slowing control.
- On F1TENTH (sim, obstacles): **22 laps vs. 16** before, still real time.

Images, video & explanation: https://sgp-mppi.github.io/

1st author · Submitted to IJCAS (Springer)

Technical skills

- Sparse Gaussian Process (online learning)
- MPPI / sampling MPC
- Localization & mapping (SLAM)
- ROS1, move_base (Nav2 equivalent), Gazebo
- PyTorch, PyCUDA
- Python, C/C++
- **Hardware:** Jetson Orin, LiDAR, IMU, wheel odometry, VESC


DOCTOR TOOL
DOCTOR TOOL
DOCTOR TOOL
DIGITALIZE YOUR HEALTH

Objective

Connect medical instruments to the cloud for posyandu (community health post) measurements.

Outcome / Contribution

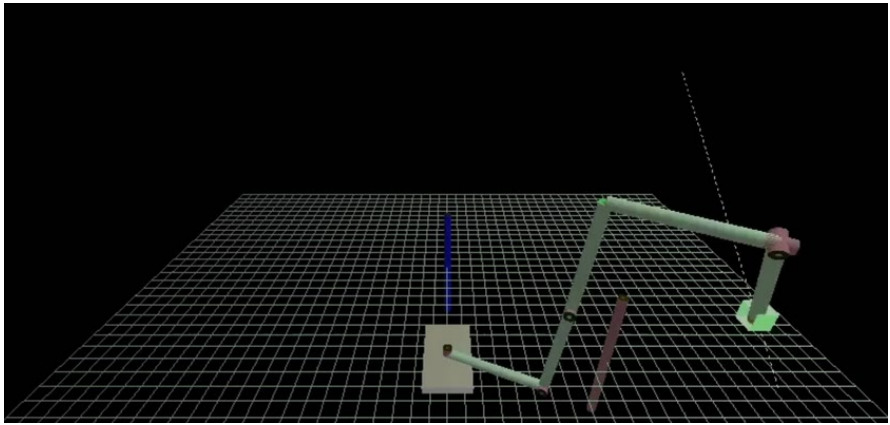
- Built an ESP32 gateway linking thermometers, oximeters, and biometric sensors.
- Connected over six categories of medical devices.

Internship at DoctorTool • Team of 2 • 2022

Technical skills

- Embedded / IoT
- RTOS (FreeRTOS)
- BLE connectivity
- Reverse engineering
- C/C++
- **Hardware:** ESP32

6-DOF Robot Manipulator Simulation (OpenGL) — Engineering Projects



6-DOF Robot Manipulator Simulation (OpenGL) — Engineering Projects

Objective

Visualize and control a 6-DOF robot arm in real time.

Outcome / Contribution

- Real-time 3D arm in C/OpenGL with forward and Jacobian-pseudoinverse IK.
- Point-to-point trajectories, joint commands streamed over serial.

Course project • Universitas Indonesia • May 2023

Source code: https://github.com/hanifedma/robot-6dof-opengl

Technical skills

- C
- OpenGL / GLUT
- Robot kinematics (FK/IK)
- MATLAB
- Robotics Toolbox (Peter Corke, MATLAB)