GALLOGLY COLLEGE OF ENGINEERING
SCHOOL OF AEROSPACE AND MECHANICAL ENGINEERING
The UNIVERSITY *of* OKLAHOMA

Integrated Housing and Electronic Packaging for a Drive-by-Wire System

MiLa
Mobility Intelligence Lab



Team



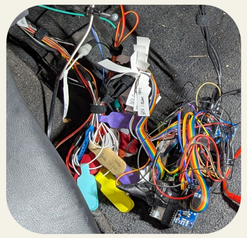
Team [Left to Right]: Katie Ochoa, Mariala Aguirre, Collin Burch, Khang Ly
Sponsor: Dr. Bin Xu
Faculty Advisor: Dr. James Baldwin

Background

- The Mobility Intelligence Lab (MiLa) is developing an affordable Drive-by-Wire (DBW) system for Level 2 autonomous vehicle research that adapts to different vehicles
- The existing system lacked a hardware layout, removability, and a practical in-vehicle autonomous mode switching method

Old External Autonomous Switch





Old Drive-by-Wire System

Objective

Improve the Drive-by-Wire system for a 2025 Nissan Leaf through:
- Compact housing
- Detachable connector integration
- Wiring organization
- Manual-to-autonomous mode transition functions

Project Constraints

Housing Design
- Space constrained PCB housing (128 mm x 150 mm)
- In range of sensor and harness wiring
- Removable, hidden installation

Electronics
- Preserve electrical compatibility



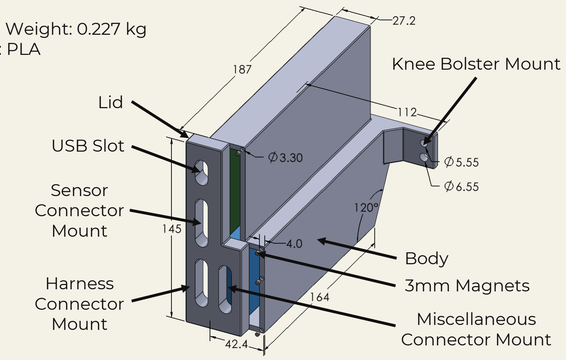


Space Allotted

3D Printed Designs

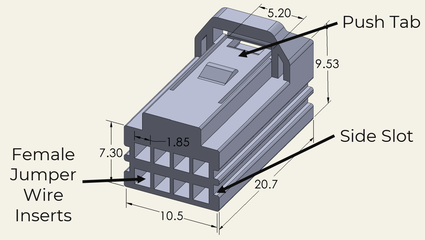
Housing

Housing Weight: 0.227 kg
Material: PLA



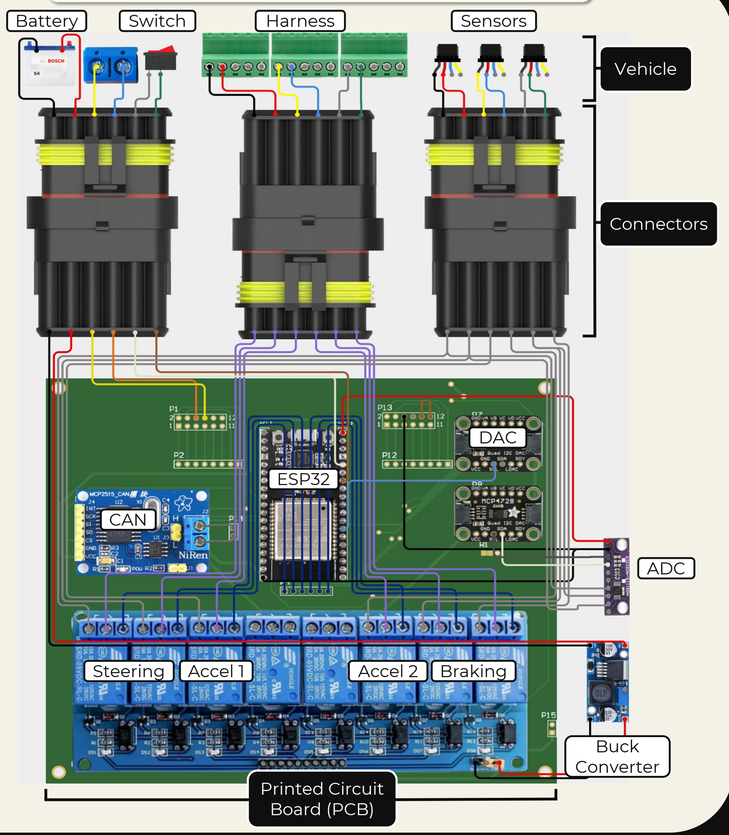
Autonomous Switch Connector

Material: PLA



All dimensions in millimeters

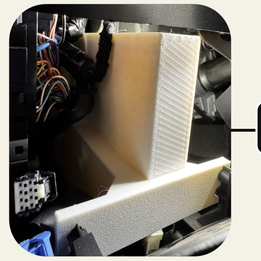
Electrical Interface



Programming

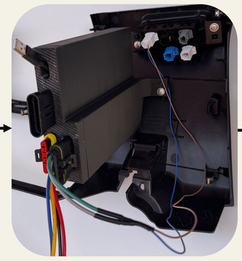
Program completed using: Arduino IDE and imported to the ESP32 microcontroller
Autonomous Mode Function: Reads CAN data → Processes controls → Outputs analog voltage signals
Autonomous Mode Control: Reads brake and steering signal → Reads switch state (On/Off) → Turn on autonomous mode until driver applies brakes or steering torque

Final Operation



- Housing inside Nissan

Housing Installation



- Behind knee bolster

Switch Installation



- Torque turns autonomous mode off

Steering Cancel



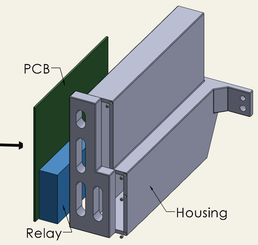
- Single press autonomous mode on/off

Brake Cancel



- Depressing pedal turns autonomous mode off

Final System



- Total weight: 0.508 kg

Codes/Standards

Mechanical:
- ASTM B258-18 – Specs for AWG electrical conductors
- ISO 128-1 – Technical product documentation
- ISO/SAE PAS 22736 – Definitions for automation systems
- ASTM ISO/ASTM52900-21 – Additive manufacturing

Electrical:
- NFPA 70 (NEC) – Wiring & component integration safety
- IEC 60364-1 – Principles of electrical installations