GitHub - https://github.com/eituranalp/ManualEVShiftSim

Manual EV Clutch Simulator

A self-directed, real-time simulator of EV clutch and engine dynamics, written in C++. Models torque transfer, RPM synchronization, and clutch slip using live gamepad input and a digital dashboard UI.

Features

- Runs at **60 FPS** with **<4ms input latency** from controller triggers (throttle/clutch)
- Fully modeled clutch system:
  - Supports **0–100% engagement**
  - Uses **10 Hz stiffness** for RPM convergence
  - Calculates load-sensitive torque dropoff
- Engine and transmission RPMs modeled independently with bidirectional syncing
- Realistic trans RPM **decay on disengagement (~3%/s)**
- Live dashboard UI with **radial RPM gauges**, **input traces**, and **lock/slip state tracking**

Tech Stack

C++17, SDL3, Dear ImGui, OpenGL3, CMake, vcpkg

To Run

Download the prebuilt zip under Releases. Runs without installation (no dependencies).
Or clone the repo, build with CMake and vcpkg.

Engineering Highlights

- Resolved inverse RPM sync issue under clutch engagement by isolating engine vs trans load paths.
- Validated torque syncing across 8+ clutch test phases and 3 engagement modes (slip, lock, disengage).
- Designed simulation-ready for future expansion: gear shifting, road load, vehicle acceleration.

Screenshot