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Abstract

Connect is an interactive installation designed for metro carriages that addresses the growing phenomenon of digital isolation in urban public transit. Motivated by research demonstrating that perceived overcrowding increases loneliness while shared sensory experience reduces it, the project transforms the metro handrail from a passive structural element into an active interface for collective interaction.

The system operates across two phases. In Phase 1, Velostat pressure sensors embedded in handrail poles detect passenger grip and transmit events via a CAN bus network to a central ceiling node, which drives a WS2813 addressable LED strip to produce individual colour trails that blend across the shared ceiling. In Phase 2, a QR code near the exit doors links to a web platform where passengers can submit or read anonymous voice messages, with an intentional delay encouraging presence during the ride.

The hardware stack is built around ESP32-C3 microcontrollers and MCP2551 CAN transceivers, selected for their low power consumption and high electromagnetic interference immunity in the metro environment. The web platform is implemented in Next.js with a Supabase backend and an automated content moderation pipeline. A functional two-node prototype was delivered within a 100 € budget constraint.

Validation confirmed a CAN bus packet delivery ratio exceeding 99.9 %, end-to-end sensor-to-LED latency below 100 ms, and a System Usability Scale score of 86.59, placing the web interface in the Excellent category. All functional, performance, safety, and user acceptance tests passed successfully.