

EE497: EMBEDDED SYSTEM APPLICATION DEVELOPMENT

FALL2025 POSTER & DEMO COMPETITION

OpenDrive: Open-Source Infotainment & Sensing Platform

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Abstract

Many cars still lack modern infotainment systems like Apple CarPlay, and aftermarket options typically cost \$500–\$600. Our project provides a low-cost alternative by building a functional CarPlay-style system for **\$120** using a Raspberry Pi, a custom touchscreen UI, and the Google Maps API. The system supports music playback and live navigation, demonstrating that essential in-car features can be delivered affordably and efficiently.

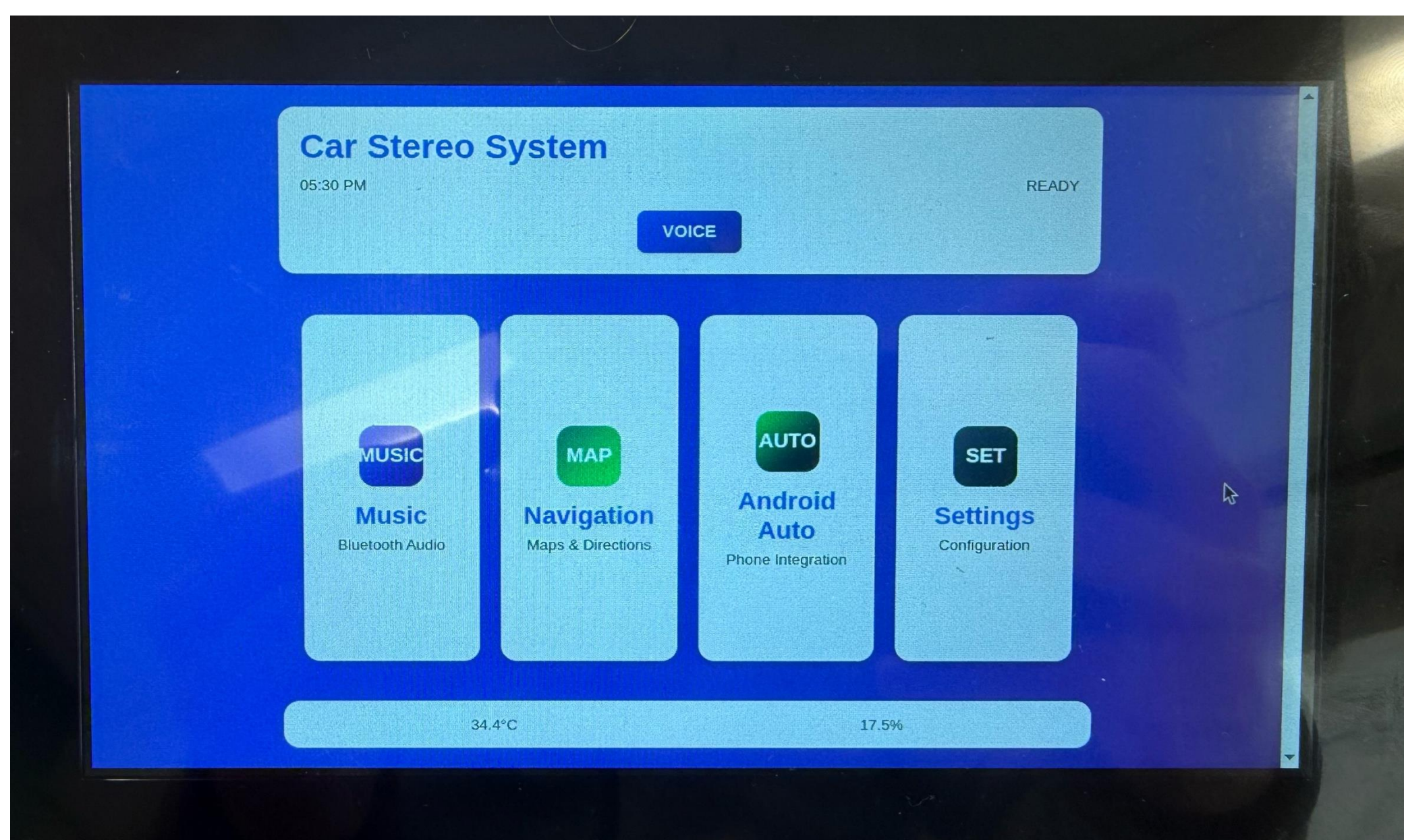


Figure 2. Home screen

Navigation Screen: Uses Google Maps API for real-time directions and location updates via Wi-Fi. (Right)

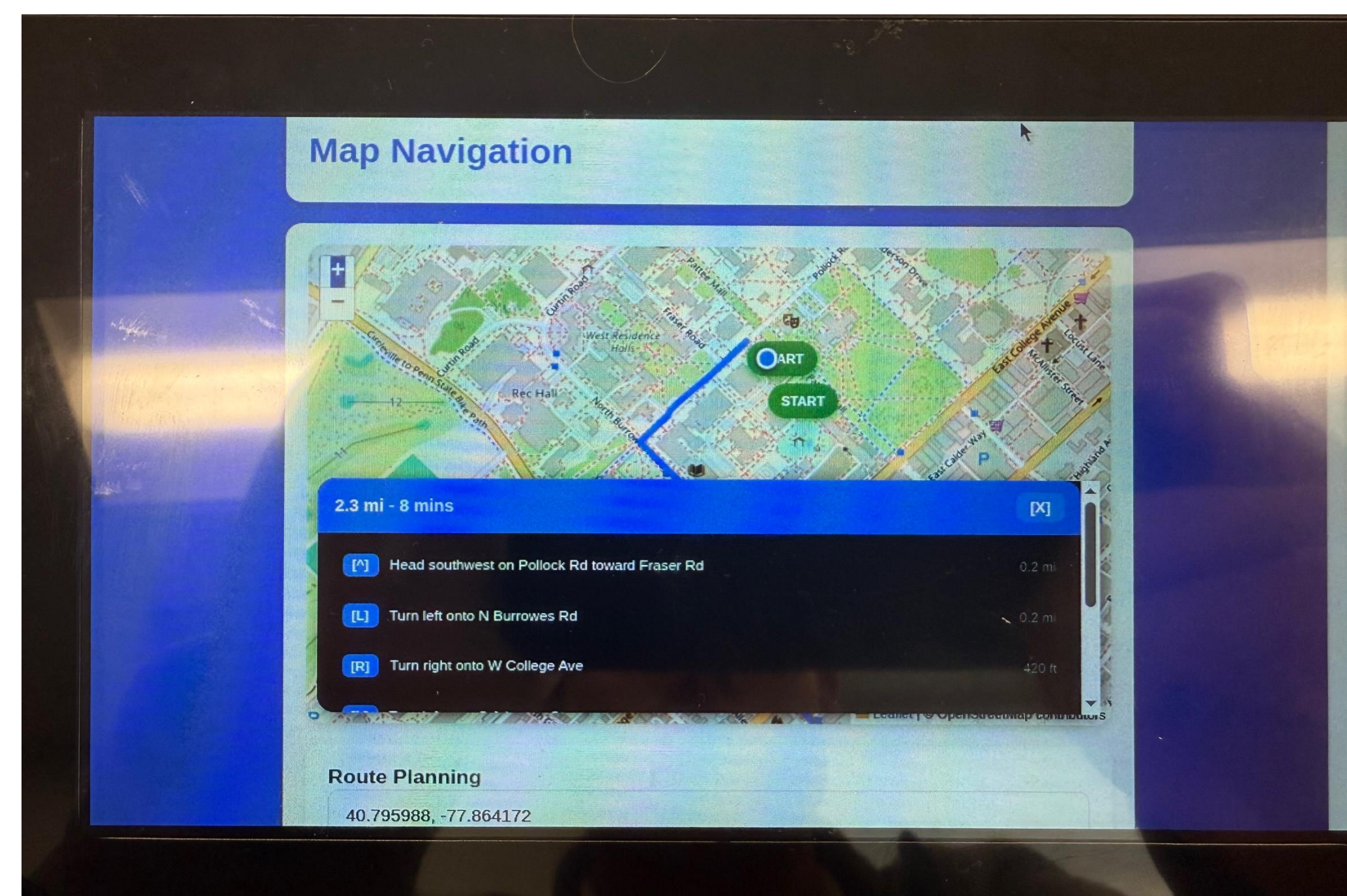


Figure 3. Navigation Menu

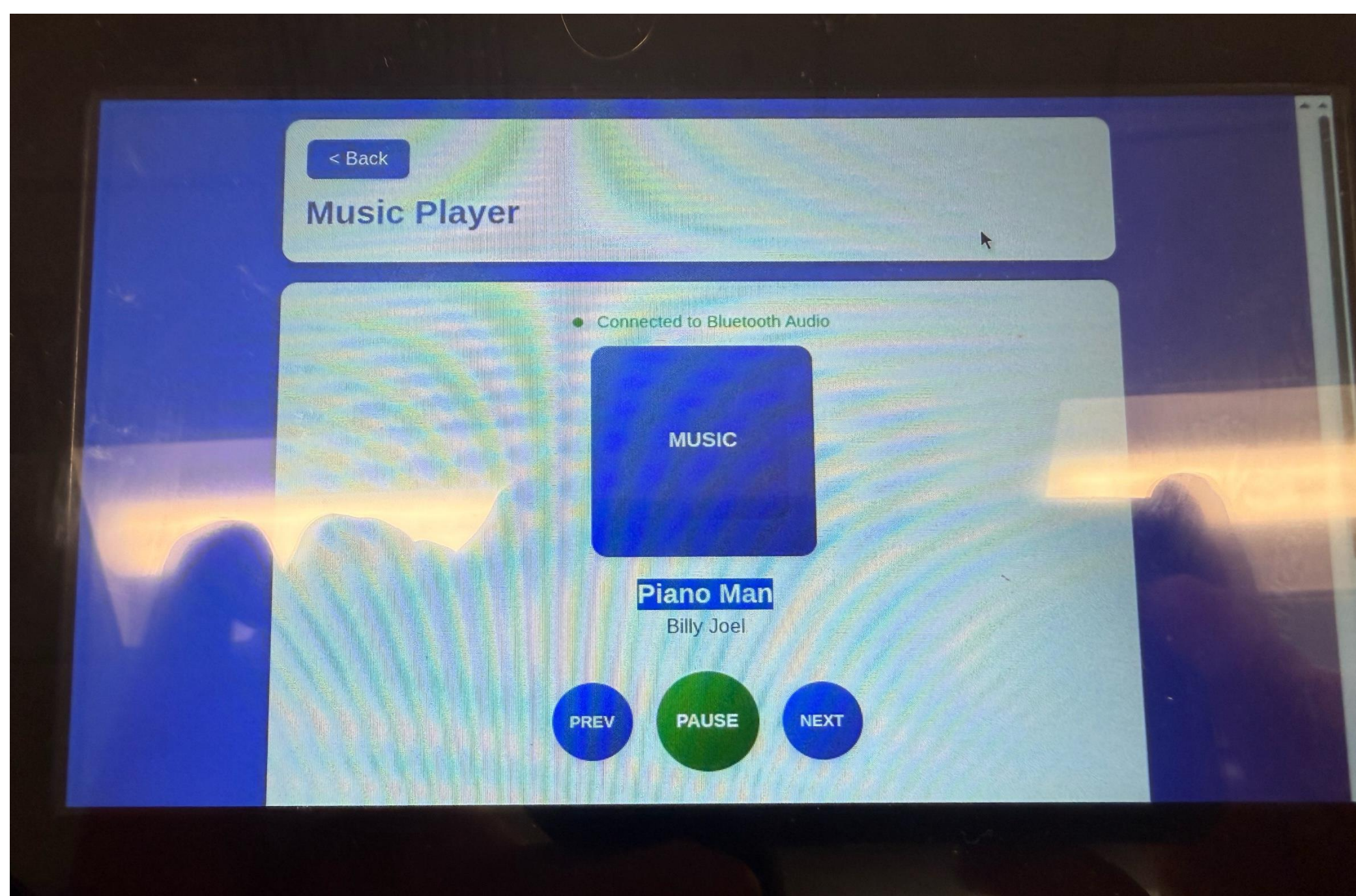


Figure 4. Music Menu

Music Screen: Allows playback control, playlist navigation, and local media browsing. (Left)

Motivation:

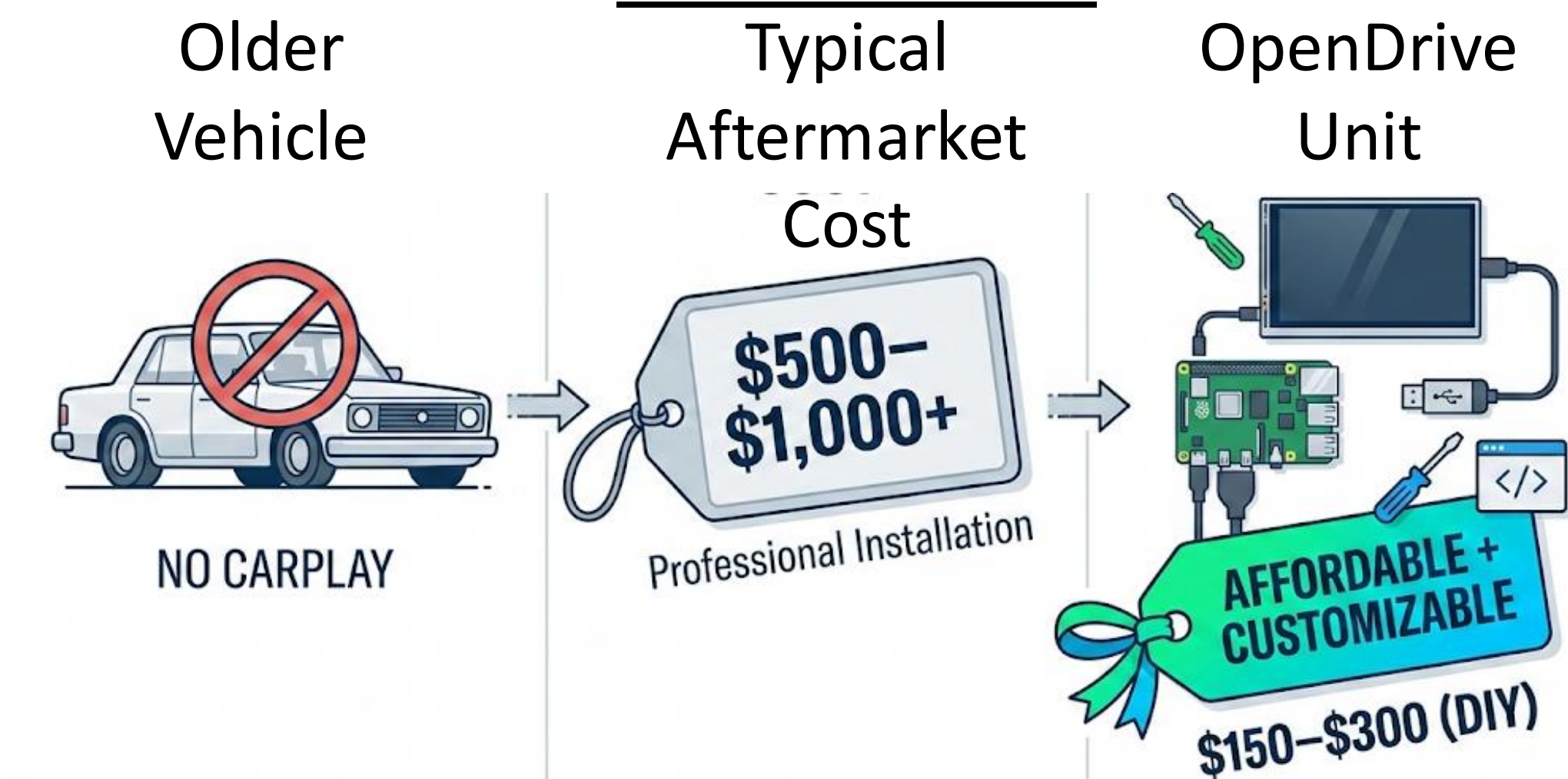


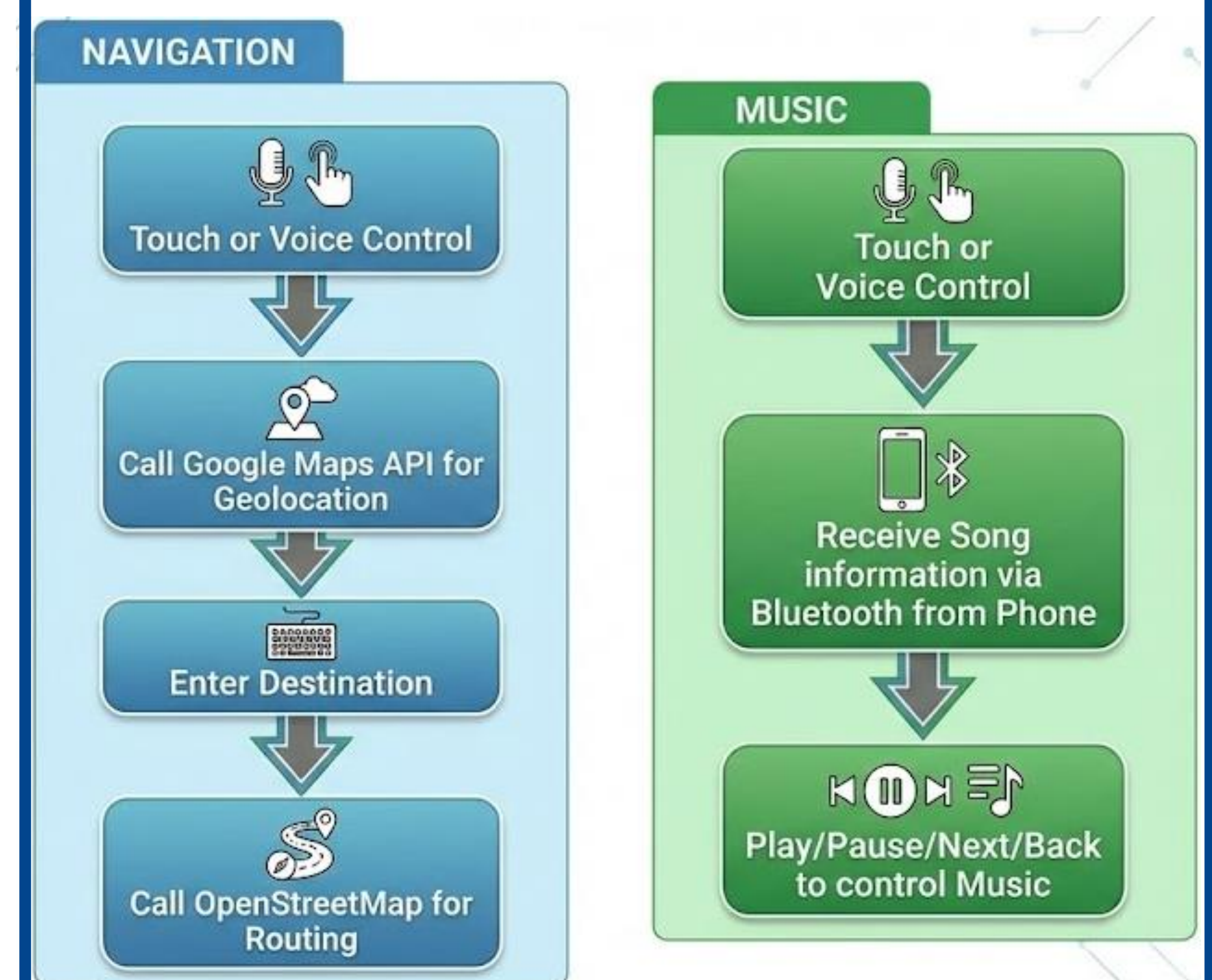
Figure 1. Motivation Graphic

Features:

The CarPlay Infotainment System consists of:

- **Raspberry Pi hardware** running the core system
- **React-based touchscreen interface** for user interactions
- **Python backend services** handling media control, navigation requests, and Wi-Fi-based location
- **Google Maps API** for accurate route rendering and real-time location
- **Wi-Fi geolocation** used to estimate the user's position when GPS hardware is unavailable

User actions—such as selecting music, starting navigation, or adjusting settings—flow from the touchscreen to the backend services, which then update the UI accordingly.



Market Survey:

About 60% of vehicles currently driven lack Apple CarPlay, representing over 150 million vehicles in the United States alone. Budget-conscious drivers and DIY hobbyists represent a strong target segment.

Feature	Our System	Aftermarket
Price	\$120	\$500-\$600
Navigation	Google Maps	Carplay-Based maps
Music	Local + Streaming Support	Carplay
Open Source	Yes	No
Installation	Simple, DIY friendly	Requires rewiring or shop Installation

Conclusion and Future Work

The CarPlay Infotainment System successfully delivers an accessible and functional infotainment experience at a fraction of typical market cost. The project demonstrates that modern in-car connectivity can be achieved without expensive proprietary hardware.

Future improvements may include:

- Integration of Bluetooth audio and hands-free calling
- Voice assistant capabilities
- Optional GPS module for even higher location accuracy
- Support for additional apps and media formats
- A refined and more compact hardware enclosure