Lightweight Navigation System

A comprehensive GPS navigation system implemented in C, featuring shortest path algorithms, GPS simulation, and real-time routing capabilities.

Project Overview

This project implements a lightweight navigation system from scratch, demonstrating fundamental concepts in:

- Graph algorithms (Dijkstra, A*)
- GPS data processing and NMEA parsing
- Real-time position tracking and route calculation
- Low-level programming in C
- Cross-platform development

Features

Core Functionality

- **Graph-based road network representation** with adjacency lists
- **Shortest path algorithms**: Dijkstra's algorithm and A* search
- **GPS data simulation** from files or real GPS devices via COM port
- **NMEA sentence parsing** (GPGGA, GPRMC formats)
- **Real-time navigation** with dynamic route updates
- **Cross-platform support** (Windows, Linux, macOS)

Advanced Features

- **Haversine distance calculation** for accurate geographic distances
- **Priority queue implementation** for efficient pathfinding
- **Automatic GPS coordinate mapping** to nearest roa