



GIS Study

Search Notes:

- Find a data source that we can use offline.
- Somewhere where we can download a data set and deploy them on our own.

Initial Proposal:

<https://www.openrailwaymap.org/>

Information relating to OpenRailwayMap:

- OpenRailwayMap is built upon the existing OpenStreetMap API.
 - Railway-specific data can be exported from OSM using these features:
 - OpenRailwayMap Export Tool:
 - Site contains an export feature than you can download map data for a specified area in different formats like GeoJSON and XML.

Licence

OpenStreetMap data is licensed under the [Open Data Commons Open Database License \(ODbL\)](#).

This area is too large to be exported as OpenStreetMap XML Data. Please zoom in or select a smaller area, or use one of the sources listed below for bulk data downloads.

If the above export fails, please consider using one of the sources listed below:

Overpass API

Download this bounding box from a mirror of the OpenStreetMap database

Planet OSM

Regularly-updated copies of the complete OpenStreetMap database

Geofabrik Downloads

Regularly-updated extracts of continents, countries, and selected cities

Other Sources

Additional sources listed on the OpenStreetMap Wiki

- - OpenStreetMap Data:
 - Download raw OSM data from [Geofabrik](#) (regional extracts of OM data.)
 - Filter this information using Osmosis or osmfilter.

- For an offline setup, you can run the map on a Raspberry Pi using tools like [OSMAnd](#) or [MapTiler](#) Server.
- It is also possible to download pre-generated map tiles from [OpenMapTiles](#).
 - These can be viewed using a GIS application like QGIS or local server.
- To view the data offline, set up a local map server using software like [OpenMapTiles](#), [TileServer GL](#), or OSRM.
 - Steps:
 - Download OSM data for desired area.
 - Setup a PostGIS database and import the OSM data using [osm2pgsql](#)

Pros of using OpenRailwayMap:

- **Railway-Specific Data:**
 - Built on top of OpenStreetMap data but prioritizes railway-specific information. Includes data like track layouts, signal placements, and other railway infrastructure. Highly suitable for railway detection system.
- **Visual Context:**
 - Map provides clear visual context specific to railways. Beneficial for understanding where obstacles or abnormalities are occurring relative to tracks.
- **Open Source (Free):**
 - Free of use and modify. No real budget constraint.
- **Integration w/ other tools:**
 - Since ORM is built using OSM, it is compatible with a large amount of GIS tools (QGIS and PostGIS). Further analysis would be easier when trying to integrate other map-tools if need be.
- **Customizability:**
 - Can establish a local ORM server and customize the data and map as seen fit. Versatile.

Cons of using OpenRailwayMap:

- **Data Completeness + Accuracy:**
 - ORM depends on community provided OSM data, which may not be 100% accurate in all regions. This could become a problem with trains and tracks that are located in remote and less-mapped areas.
- **Complex Setup:**
 - Setting up ORM for offline use or on local server can be complex and take a lot of time. Need to handle OSM data processing and manage a local tile server. Might require some familiarity with PostGIS and osm2pgsql.
- **No Native API for Integration:**
 - ORM does not provide dedicated API for interacting directly with map data or for adding markers dynamically. We would need to use the OSM API or build our own API for interacting with the map.
- **Integration w/ other tools:**

- Since ORM is built using OSM, it is compatible with a large amount of GIS tools (QGIS and PostGIS). Further analysis would be easier when trying to integrate other map-tools if need be.
- **Limited Support for Live Data:**
 - If want real-time data visualization, ORM can require some tedious additional setup.

Other Possibilities:

- **Google Maps API:**
 - **Pros:**
 - Provides support for markers, infowindows and data visualizaton.
 - High-res satellite imagery, street view and detailed map data.
 - Native support for integrating markers and handling user interactions.
 - **Cons:**
 - Can become expensive. (high API calls + user interactions)
 - Limited customization.
- **Leaflet with OSM/Custom Tiles:**
 - **Pros:**
 - Lightweight and highly customizable JavaScript library for creating interactive maps.
 - Supports custom tile layers (including OSM and ORM).
 - Easy to integrate with own data points – supports pop-ups for information display.
 - **Cons:**
 - Requires additional setup for integrating with custom or external tile servers.
 - Added development work for advanced features.
- **Mapbox:**
 - **Pros:**
 - Highly customizable maps with high performance.
 - Easy way to add data points and interact with map through API.
 - Solid support for visualizing large data sets.
 - **Cons:**
 - Pricing model is similar to that of Google Maps.
 - Limited railway-specific data.
- **QGIS with Custom Plugin:**
 - **Pros:**
 - Open-source GIS software that allows for complex spatial data analysis and visualization.
 - Use QGIS2Web to export QGIS project to a interactive web map.
 - **Cons:**
 - Desktop based and might require exporting to web compatible formats.
 - High learning curve for those not experienced with GIS.

Overview:

- **Best for Railway Infrastructure:**
 - **OpenRailwayMap:**
 - Most detailed railway information.
- **Balanced:**
 - **Leaflet with ORM Tile Layers:**
 - Flexibility to add various base map layers (can be ORM).
 - Can add our sensor data as interactive markers.
- **Simplicity:**
 - **Google Maps:**
 - Straight forward way to add data points and interactions.
 - Better for dynamic data handling.
 - Real-time updates and a polished UI.
- **Visual Customization:**
 - **Mapbox:**
 - Most modern.
 - Visually customizable with the most flexibility for styling and interaction.