Local Construction Impact Visualizer: Mapping Noise Disruption in Boston Neighborhoods

Introduction

The Local Construction Impact Visualizer is an interactive Shiny web application designed to assist Boston residents and business owners in anticipating noise disturbance from current construction activity. Building on the City of Boston's open permit database, the application visualizes and estimates construction related noise and its spatial context. The tool fills a typical urban planning and public education challenge: absence of real time, intelligible information about local construction activity. Though there are city permit databases, they contain raw data without helpful and easy to use information. This application serves to fill that niche with spatial mapping and estimated noise levels.

Use of Data

This project uses the public data set: "Approved Building Permits" from the City of Boston Open Data Portal (https://data.boston.gov/dataset/approved-building-permits). The data set contains data on permits issued, e.g., work type, location coordinates, issue/expiration dates, valuation, and descriptive fields. To keep things simple and for responsiveness of the app, the app considers only the first 1000 geolocated permits.

Data cleaning entails the removal of records that have missing coordinates and the assignment of estimated noise levels by permit type (e.g., demolition = high, utility = medium). Reported limitations include subjectivity of noise estimation and reduced accuracy in areas where permits overlap. The results do not take into account elevation.

Quality of Product

The tool was built with R's Shiny package, incorporating packages like Leaflet, ggplot2, dplyr, and tidygeocoder. It does the following:

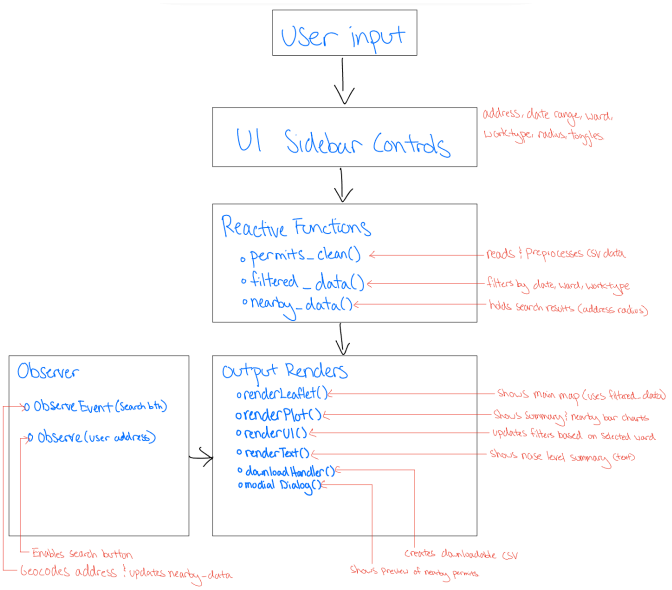
- Interactive map with toggleable heatmap and base layer (light/dark/satellite)
- Filters by work type, date range, and ward (approximate neighborhood proxy)
- Reactive sidebar input components that update automatically
- Address based search with adjustable radius to identify noise near a user specified location
- Blue radius and marker added to map based on search
- Nearby noise level analysis with summary bar chart and average dB score
- Downloadable .csv of nearby permits within the radius
- Preview report with top 10 nearby permit details via modal window
- Dynamic citywide noise bar chart updated with filters
- Nearby bar chart generated for user defined search area
- Help texts to guide proper address formatting and tool use
- Map marker popups with permit details including issue/expiration and type
- Custom geocoding system with ArcGIS and OSM as fallback for reliability

The app focuses on usability, simplicity, and responsiveness to everyday users' needs like renters, parents, or city planners.

Results

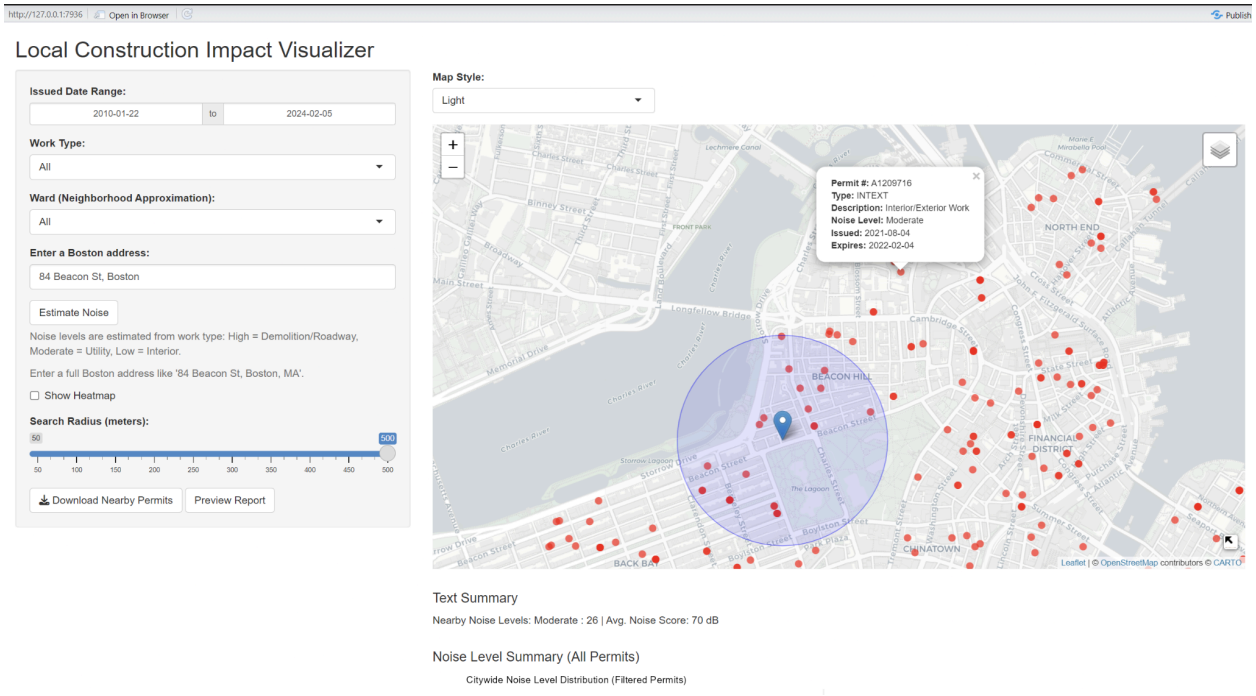
Screenshots and app interaction indicate that the app properly filters permits and displays data via plots and map markers. The noise summary via radius presents estimated noise levels and mean intensity in decibels (dB). Visualizations include:

Figure 1 – *Architecture/Function Overview Diagram*



(Illustrates how Shiny app components interact: UI, inputs, filtered data, maps, outputs)

Figure 2 – *Interactive Dashboard with Nearby Search Active*



(Map is zoomed, circle radius drawn, marker + noise result visible + map marker popup)

Figure 3. *Watch the Full App Demo Video*

[Click here to view the full application demo]

(This walkthrough highlights features such as: Address search and noise scoring, map customization (basemap, heatmap, radius), filtering by ward, date, and type, report preview and CSV download, charts updating dynamically)

All the major components are fully functional and accessible. Limitations include dependence on heuristic noise estimation and simple geocoding services.

Summary – Public Value

This application has great potential to create public value by increasing civic awareness, informing urban planning, and contributing insight into the urban soundscape. Visualization of building noise allows citizens, commuters, and urban planners to make spatially aware decisions about patterns of disruption.

For instance, a parent might use this tool to steer clear of renting in proximity to high noise areas for sensitive times such as exam weeks or baby care. Small business owners may forecast disruptions that influence consumer foot traffic. Researchers may examine correlations between noise effect and neighborhood demographics in order to inform urban equity debates.

By incorporating an easy to use filterable, searchable, downloadable interface, the app democratizes city construction data. Further down the road, the tool might be developed to incorporate actual decibel readings from environmental sensors or enable residents to report noise complaints directly into the same system, making it a real time feedback loop for city agencies.

References (APA Style)

City of Boston. (n.d.). *Approved Building Permits*. Boston Open Data Portal. https://data.boston.gov/dataset/approved-building-permits