KING'S COLLEGE LONDON

4CCS1PPA PROGRAMMING PRACTICE AND APPLICATIONS

Fourth "Air Pollution" Coursework (Mar 2025)

Project Name: Englang is My Polluted City

Student Name: Mehmet Kutay Bozkurt
Student ID: 23162628

Student Name: Anas Ahmed
Student ID: 23171444

Student Name: Matthias Loong
Student ID: 23078800

Student Name: Chelsea Feliciano
Student ID: 22042916

1 Introduction

2 Directions for Use

3 Tasks Lists and Implementation Details

3.1 Base Tasks

Welcome Panel:

Data Visualisation Panel (Map View): We have implemented a colour scheme for the entire map, where the colour of a grid area is determined by the pollution level of that area. The colour scheme is implemented as an interface `ColourScheme` with a single method `getColour()`. This allows us to have different colour schemes for the map, and a way to switch between them quite easily — improving maintainability and responsibility-driven design.

Pollution Statistics Panel:

Detailed Grid Data:

3.2 Unit Testing

Unit testing was implemented for various classes and various methods within those classes. The unit tests are implemented with JUnit. The tests were implemented to test the functionality of the methods in the classes, and to ensure that the methods are working as expected. These tests were vital in adding functionality to the codebase, as they allowed us to ensure that the new functionality did not break any existing functionality.

3.3 Challenge Tasks

More Extensive Graph Based Trends:

Interactive Map:

Adding the Entire UK in the Map:

Various Optimisations: Various optimisations were made to the codebase to vastly improve performance. LOD (Level of Detail) was implemented to decrease the number of grid areas rendered on the map, and the number of data points rendered in the graph as the user zooms out. Additionally, culling was implemented to only render grid areas that are visible on the screen.

4 Code Quality Considerations

4.1 Coupling and Responsibility-Driven Design

4.2 Cohesion

4.3 Maintainability

4.4 Acknowledgements

Various APIs and external libraries were used in this project for extended functionality:

- **Gluon Maps** (https://github.com/gluon-hq/maps) - Maps Library by Gluon (maintainer of JavaFX) that implements OpenStreetMaps

- **OSGB by DST** (https://github.com/dstl/osgb]) - Library to convert British Grid System (Easting / Northing) to Latitude and Longitude

- **GeographicLib** (https://github.com/geographiclib/geographic java) - Used for geodesic distance calculation

- **Postcodes.io** (https://postcodes.io/) - API used to get location & address data from the specified longitude and latitude on the map

- **GSON** (https://github.com/google/gson) - A library by Google to convert between Json and Java Objects

- **World Air Quality Index API** (https://aqicn.org/api/) - An API to get real time Air Quality Index Updates from the World Air Quality Index Project

5 Final Remarks