Project Proposal Draft V.1

MEASURING AIR POLLUTION

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SPONGEBOB (SECTION 3)

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ACKNOWLEDGEMENTS

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ABSTRACT

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CONTENTS

Page

CONTENTS (Cont.)

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1
INTRODUCTION

This chapter provides readers with an overview of the project's goals, scope, motivation, problem statement, and document organization. These subjects will make it clearer to the reader what we hope to accomplish and user issues, our project's objective, advantages, the scope of our work, our project strategy.

1.1 Motivation

Nowadays, air pollution is one of the big global problems that we are currently facing. Air pollution can pose various health risks to all people and living organisms. One of the serious illnesses that is linked to long-term exposure to polluted air is lung cancer. Lung cancer is an extremely serious and life-threatening illness. Statistically, lung cancer is one of the biggest leading causes of cancer-related death worldwide. Because of this, anything that poses an increased risk of developing lung cancer should be a serious public health concern. To help mitigate this issue, we developed an application that allows users to check air quality using AQI measures from many different areas. By allowing users to check air quality, users can avoid going to places that have high AQI values or prepare their equipment to help protect themselves in cases where it is unavoidable.

1.2 Problem Statement

- People may not know where to check for real-time air quality data.
- Substitute applications may be cluttered with too much information, making the experience less enjoyable.
- People may not know how to help improve air quality.

1.3 Objectives of the Project

To provide a platform for people to check real-time air quality information of specific places.

- We aim to deliver accurate, real-time data on air quality metrics like AQI value to users.

To provide a user-friendly application design

- We aim to create a user interface that simplifies complex quality data, ex., adding universal symbols that would help users understand the meaning of measures level and only including what is necessary to avoid information overload.

To provide information on how to improve air quality.

- We plan to provide a section that would provide tips and tricks on how to improve air quality, news, and information related to air pollution so that people understand how they can help improve air quality and are more aware of the air pollution problem.

1.4 Scope of the Project

We are going to create an Android mobile application. This application will provide real-time air quality information widgets of specific locations, information related to air pollution, and personalized protection based on their sensitivity level.

1.5 Expected Benefits

- AQI air quality measures information is more accessible to people.
- People can prepare appropriate protective equipment when going to various places using information from our app.
- People can have better health as they can use our app to avoid or prepare the right protection.
- People are better informed about the air pollution problem. As a result of increased understanding, it may influence some people to take small actions to help mitigate the air pollution problem.

1.6 Organization of the Document

This document consists of 7 chapters including:

1. Introduction – The first chapter introduces the reader to motivation, problem statement, objective, scope, and expected benefits to gain a general understanding of why we created this application.
2. Background – The second chapter explores existing solutions and literature to gain more background in the related fields.
3. Analysis and Design – The third chapter focuses on the design and analysis of the system application. This includes analysis and design of the overall system architecture, software design (system structure chart, process analysis and design, and data flow diagram), data model design (data dictionary, database analysis, ER diagram, relational schema, and file structure), and I/O design (interface design and transition diagram). This chapter will be a blueprint to guide how we will implement our application.
4. Implementation – This chapter explains our application implementation details, including the hardware and system environment (tools) and the technique and guide for implementation.
5. Testing and Evaluation – The fifth chapter shows unit tests, tests performed on each function, system integration test, and text scenario to ensure the application is working properly.
6. Conclusion – The sixth chapter explains the benefits and views on future works.
7. Project Milestone Progress Summary – The last chapter ends with a reflection summary on this project.

CHAPTER 2
BACKGROUND

This chapter describes a summary of what we have learned to design and develop our AQI visualizer application. There are two tools we studied in this literature review, and each is discussed separately in each paragraph.

2.1 Literature Review

As we are going to develop an application that shows air quality levels with AQI values and basic weather conditions of specific locations, we have researched application examples with similar functionalities to learn about how we should design and create our application. There are two applications that we have investigated. These are IQAir AirVisual and Apple Weather. Both applications have their strengths and weaker points that we can combine and adapt to develop our application.

The first and most popular application for visualizing air quality is IQAir AirVisual from IQAir AG. The main function of this application is to show AQI air quality, and 7-day weather forecast information. There are two ways this application displays air quality information: 1) based on location as a list and 2) on top of the map. Another interesting feature of this app is the news and ranking feed. This feature provides a list of locations ranked based on the number of AQI values, which allows us to see which location in this world has the worst air quality based on AQI measures. The news feed informs the user about global events that could affect air quality, ex., volcanic eruption, wildfire, and flooding. In addition, it also provides some tips and guidelines about how to improve air quality. There are a lot of features in this application, which can be both its strong and weak points, as having too many features may make the application more complicated and less easy to play.

The second application is Apple Weather. This application is a weather application that comes with every iPhone device. It shows many quantities related to weather conditions, such as temperature, precipitation, and 10-day weather forecast, some of which are like IQAir AirVisual. The strength of this app that we could learn from is its simple and modern user interface design. Although the app lacks an AQI air quality display feature, its beautiful and sleek-looking UI makes it a major source of inspiration for our application design.

CHAPTER 3
ANALYSIS AND DESIGN

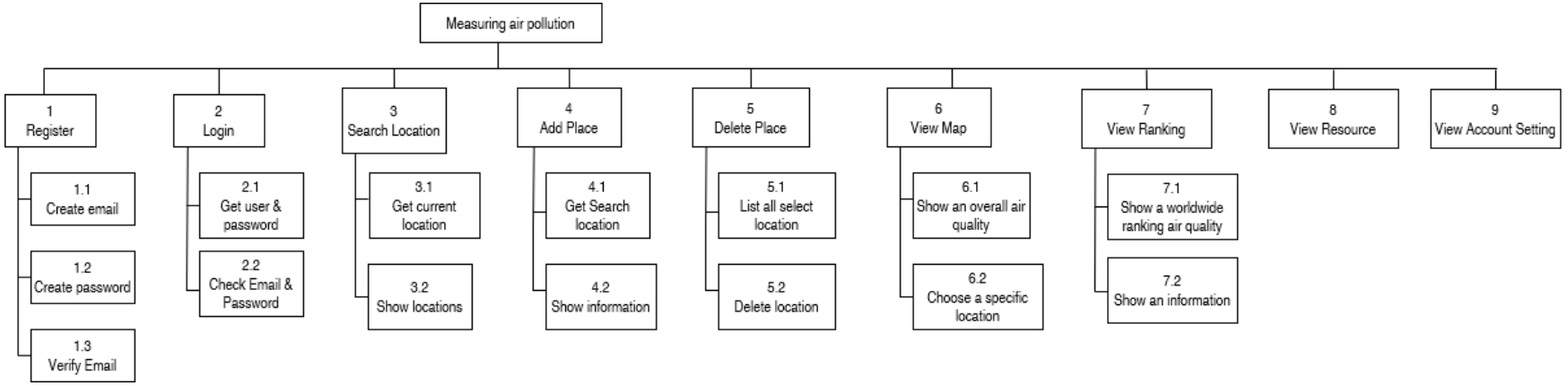
This chapter describe about analysis and design of our application. The subject will cover our system architecture overview, system structure chart, diagram, and interface design.

3.1 System Architecture Overview

The ‘Air Pollution’ application will be implemented using Flutter SDK in Dart programming languages. Flutter is a UI framework from Google that allows us to build a cross-platform native application. There are two important reasons why we use Flutter: 1) Flutter SDK tools can compile a single codebase into native machine codes in multiple platforms, and 2) Flutter makes creating reusable UI elements, such as buttons, more convenient with widgets, allowing us to have an easier time recreating UI we design in Figma. The programming language that we will use is Dart, a null-safe language that has syntax like C. As for APIs, our project will interact with air quality and map API to get air quality information and map view.

3.2 System Structure Chart

The Air Pollution app is a simple system that aims to allow users to check the weather conditions in their location or the forecast for the next day, including PM 2.5 levels, using AQI values. It has main functions: Registration, Login, Search Location, add place, Delete place, View Map, View Ranking, View Resource, and View account setting.



Project: Measuring air pollution **System:** Air Pollution	**Major Advisor:** Aj. Snit Sanghlao
Description: This system has nine main functions: Login, Register, Search location, add place, delete place, and View Map, view ranking, View resource, and View account setting.	

Figure 3.1: System Structure Chart of Air Pollution application

The detailed description of each subsystem is shown below:

1. Register – First step when you start the application.
    1.1. Create Email – User must input their email address.
    1.2. Create Password – User must input their password.
    1.3. Verify Email – Check if there is a duplicate email address in the user database.
2. Login – User must sign in before using an application.
    2.1. Get Email and Password – User must input their email and password to login their account.
    2.2. Check Email and Password – The system will check users accounts have been registered or not.
3. Search Location – Function for search location that the user wants to add.
    3.1. Get a current location – The system will track the current user's location.
        3.1.1. Ask for permission to get the user mobile's current location.
        3.1.2. Check if permission has been given.
    3.2. Show location – The system will display users' location.
4. Add place – The user can add a location they are interested in.
    4.1. Get search location – The user types the location of their interest and adds it.
    4.2. Show information – The system will display air quality information about that location.
5. Delete location – The user can remove a location that they do not want.
    5.1. List all choose location – The system shows all location that the user has been added.
    5.2. Delete location – The user removes a location where they do not want to show.
6. View Map – The system shows a world map with air quality information pin to each place.
    6.1. Show an overview of air quality – The system shows worldwide air quality.

6.2. Choose a specific location – The user chooses a location to see air quality information.

7. View ranking – The system shows a weather ranking from unhealthy to healthy.

7.1 Show ranking – The user can see weather ranking.

7.2 View information – The user sees information from each place.

8. View resource – The user sees an article about air pollution.

9. View account setting – The user can edit their account.

3.5 I/O Design

This section explains the design of the Input and Output User Interface. The section consists of two parts, the interface design and the transition diagram showing transition through the system.

3.5.1. Interface Design

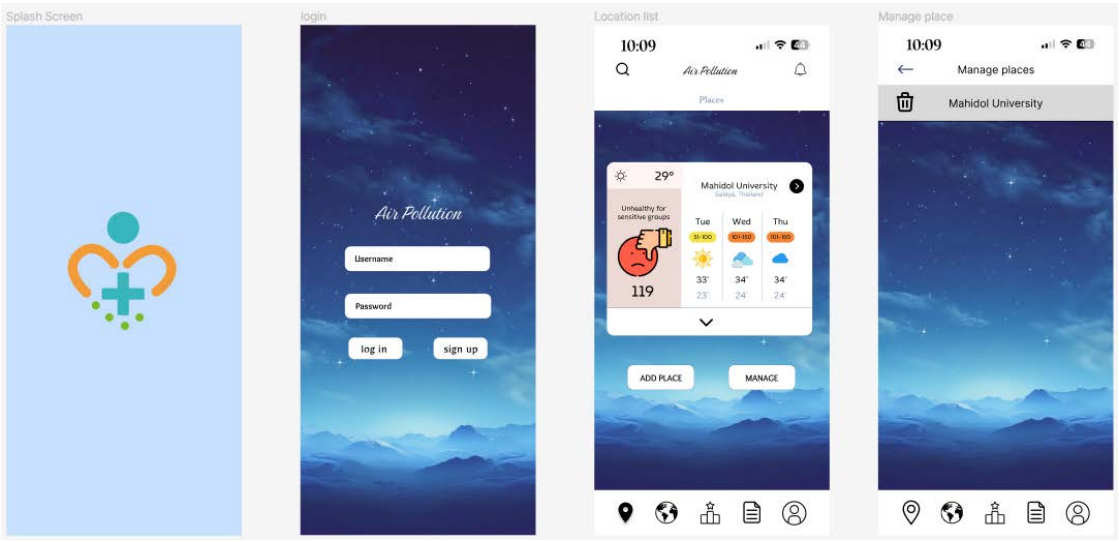


Figure 2: Splash screen, Login page, Location list page, and Manage places page.

As the reader can see, the leftmost side is the first page of the application, the Register/Login Page, where users can log in or register. When the user successfully, it will lead to the location page. It can show the overview of the place that user ever add. This page can add places and manage places.

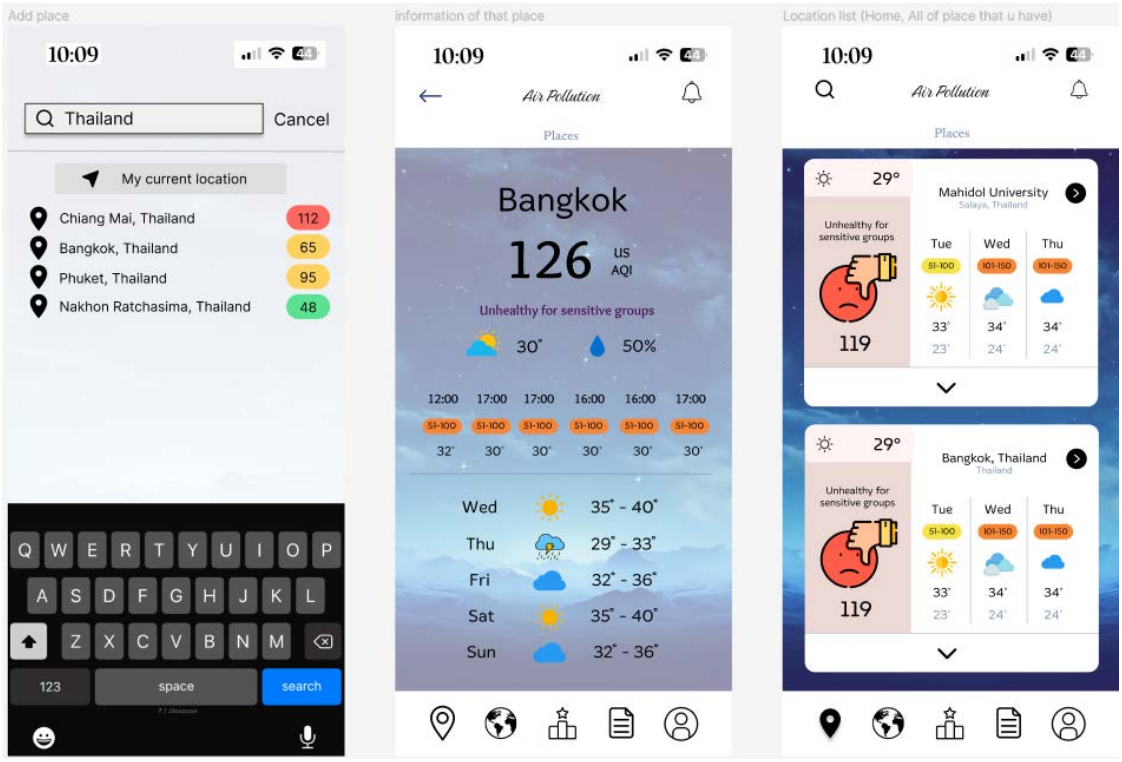


Figure 3: Search place page, AQI info page, and Location list page.

If the user clicks to add a place, it will lead to the search location page. Users can type the location that they want to check the quality of the weather and this location will show on the location page too. In addition, users can click on the location to check the whole information.

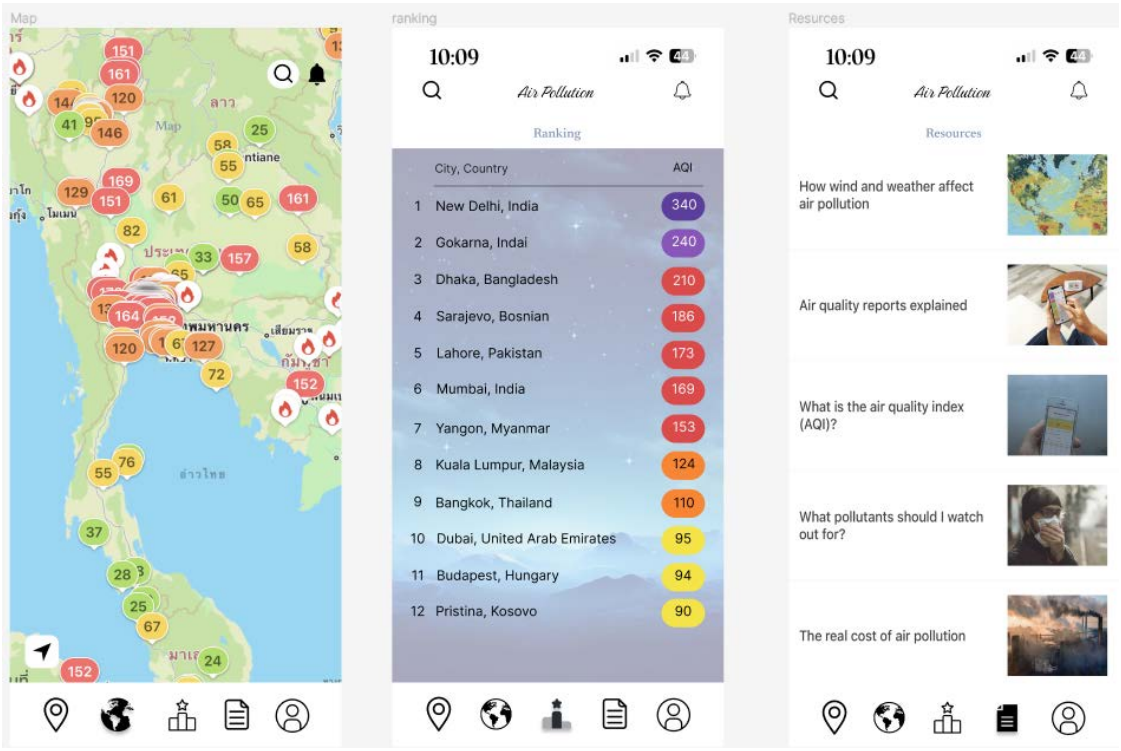


Figure 4: Map page, Ranking page, and Resource page.

The map page will show the overall quality of weather in the world. The ranking page will show the rank quality from low-quality weather to excellent-quality weather. The news page or resource page will show the news about the weather around the world.

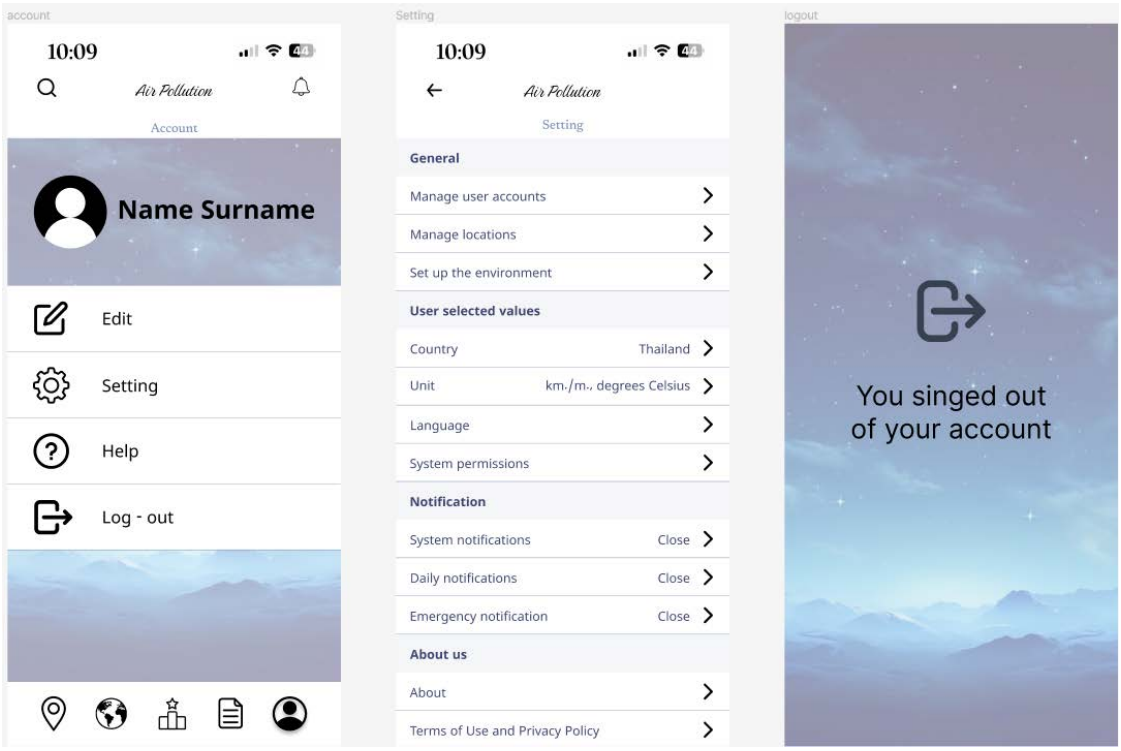


Figure 5: Account page, Setting page, and Log-out page.

The account page will show the information of the user and have the edit, setting, help, and sign-out icon. On the edit page, it can manage user accounts such as users who want to change their names. On the help page, it helps the user when they have a problem and want to communicate with us. On the setting page, it is the page that controls everything such as language, account, notification, etc. The last icon is sign-out. It must be when the user wants to log out.

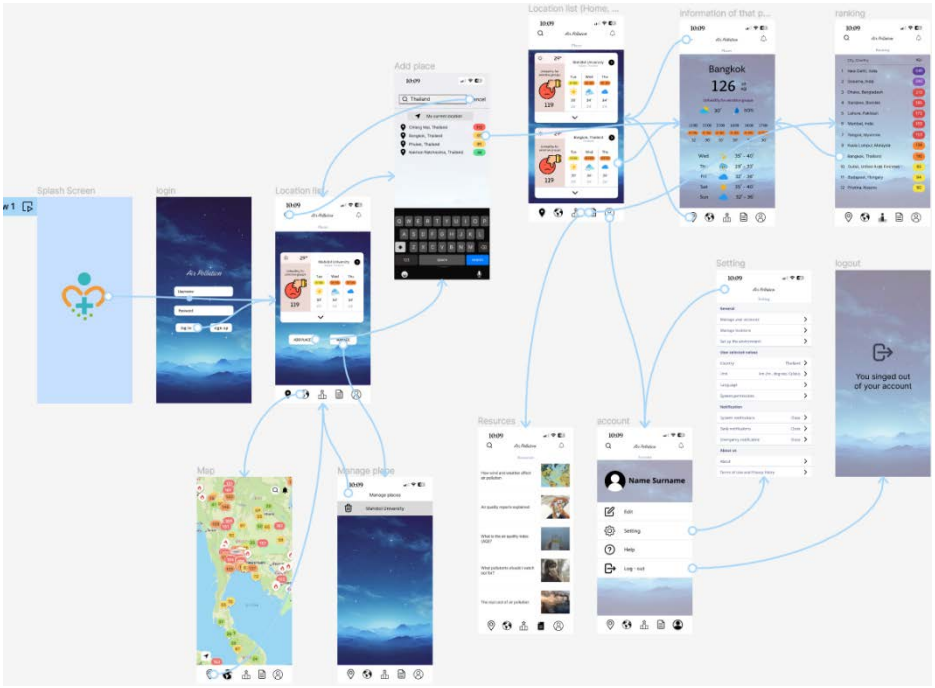
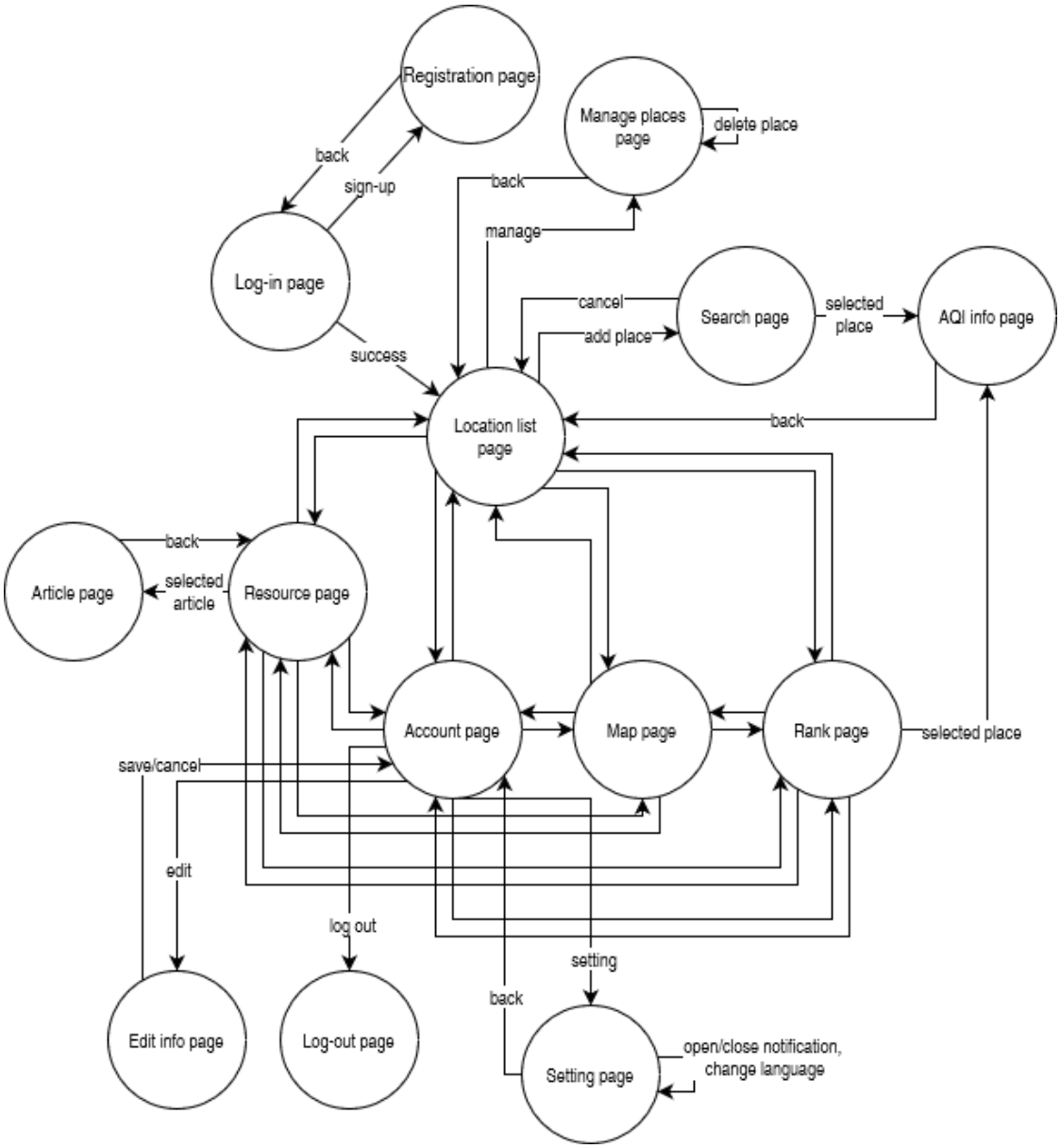


Figure 6: Showing an example action flow of Air Pollution application.

This is the overall of our interface design of the 'Air Pollution' application.

3.2.1 3.5.2. Transition Diagram

This is the transition diagram of the 'Air Pollution' application. The application starts with the login state. The user needs to log in before using the application. If the user does not have an account, then they must register to create a user account first. Once the user completely logs in, they can access the first page of the application, the location list page (a list of small widgets that display air quality info of each place) that has Add Places and Manage Places functions. After clicking on the Add Place button, it leads to the search location page. When the user searches the location, it will show a list of places that match with the search query. Once the user selects the location, the user will go to the information page of the selected place that shows air quality information and weather conditions of that location. If the user has an unwanted location widget on the location list page, the user can click on the Manage Places button to delete the location from the location list page. The application also has other features like a Map page, Ranking page, News page, and Account page. The Map page shows air quality information of each place overlay on top of the 2D world map. The ranking page shows the ranking of the cities that have the worst quality weather. The Resource page shows information about air pollution and the world’s weather. The last page is the Account page; it shows the user information and is a page where the user can edit the information, like their name. In addition, there are Setting, Help, and Sign-out icons. The Settings page allows the user to adjust application configuration in many ways, such as opening or closing notifications, language, managing accounts, etc.


Registration page
Manage places page
delete place
back
sign-up
back
manage
Log-in page
cancel
Search page
selected place
AQI info page
add place
success
Location list page
back
back
Article page
selected article
Resource page
Account page
Map page
Rank page
selected place
save/cancel
edit
log out
setting
back
Edit info page
Log-out page
Setting page
open/close notification, change language