

AIRPACT MOBILE APPLICATION

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1. Project Description and Clarification

1.1 Review of Literature

The main focus of the AIRPACT system is to provide future forecasts of predicted air quality values for a variety of pollutants including but not limited to PM_{2.5} and Ozone. The AIRPACT system's domain is restricted to the Pacific Northwest region of the United States including Washington, Idaho and Oregon. The system provides future forecasts hourly for up to 48 hours for numerous different pollutants and it displays this information through the use of several different layers in Google Maps. There are a wide variety of graphics products offered through the AIRPACT website ranging from future forecast of certain emissions across the region to charts detailing the past performance of their models compared to actual observed results at sensors. Important observations are made at numerous AIRNOW sensors places around the Pacific Northwest region. These sensors are a vital part of the AIRPACT system as it allows users to compare the predicted values made by AIRPACT against the observed values at the AIRNOW sites. This provides a user with the ability to determine how accurate the AIRPACT system has been running at that site within the past week or more. An in-depth review of the AIRPACT website provides us with the most important details regarding the AIRPACT system and which of their products should be displayed through a mobile application.

We decided to review other air quality mobile applications provided to the public to help determine what kind of features could lead to our product being better exposed and used by the public. Through a review of numerous air quality apps available on the market, we are better able to determine what additional features should be added to our application. The majority of these applications offer information that describes the color coded system the Environmental Protection Agency (EPA) uses to describe what the air quality means to a user. They use a value called the Air Quality Index (AQI) with a color coded display that allows a person to easily determine what the air quality is like at their location. The color code references to a scale used by the EPA that explains what the AQI means in terms of health implications. The most popular application currently on the market is the AIRNOW app provided by the EPA. This application has a very simplified User Interface that provides the user the air quality index for the two main pollutants of ozone and PM_{2.5} in a color coded bubble. The user can then go to the scale provided in the application to determine what the color and index actually correspond to. Reading through the reviews for this application, it appears that one feature that users would have liked was push notifications. Some users would have liked an air quality application that could send alerts to their phone when critical air quality levels are forecasted or currently being observed at their locations without having to load into the application to see.

Based on the preliminary requirements for the sensor module, we have put in research towards the schematics of the different pollutant sensors that the product will house such as Carbon Monoxide, Ozone, and Nitric Oxide, other sensors like temperature and pressure, possible communication methods for the product to send data to the server, and possible Arduino microcontrollers that would run the system and perform crucial calculations for at least the prototype stage of the system.

1.2 Client Identification and Preferences

Our clients are the members involved with the AIRPACT system in the Laboratory for Atmospheric Research at Washington State University (WSU) and at the University of Idaho. .

The AIRPACT team consists of professors Brian Lamb, Joseph Vaughan and Tom Jobson from WSU and Jennifer Hinds from the Northwest Knowledge Network at the University of Idaho. Jennifer Hinds is the web master for the AIRPACT system and is vital resource for gathering data from their database for use in a mobile application. .

They want the mobile application to have similar functionality to their website and offer a host of graphics applications and air quality data to a user. They also wish the application to be simple enough and easy to understand for the average user. The average user is considered to be a person who would use this application to quickly gather data about the air quality at a given location in the Pacific Northwest. The application will be able to allow a user to enter a location or use their current location based on their GPS location and the air quality information from the AIRPACT system will be displayed. The application should show an easy to read color coded AQI number for that location along with color coded indexes for the main pollutants. They would also like the ability for the user to see future forecast levels for several pollutants by being allowed to switch from current levels to hourly forecasts as well as forecasts for every 12 hours up to 48 hours in advance. They also want the user to be able to go to an interactive map that will provide several graphics products that are currently available on their website including hourly future forecast animations for PM2.5 and Ozone levels. The application should also automatically zoom in on the location the user is currently looking at and they would prefer that locations of nearby AIRNOW sensors appear on the map as well. The user would then be able to toggle on or off several other layers on the map. The AIRPACT team also would like the application to be lightweight enough for the user and not too cluttered. This includes not showing certain data that is available on the website to the mobile application such as meteorological data like wind forecasts. Simplifying the amount of data and charts may also be necessary to increase readability. Another feature that is preferred to have in the application is the ability for the user to toggle an animated map of their graphics either of the past like most current radars do but also the ability to display their future casts.

The hardware system would house sensors for three pollutants (CO, O3, NO) along with sensors for temperature and pressure, a transmitter to submit data through RF signals, a method of logging data and sensor diagnostics, and possibly a method for geolocating itself depending on the platform the sensor is being used with (home, car, backpack). Because of these expected platforms, it is also implied that the sensor module will need to be somewhat compact in a consumer friendly frame. It is clear that the goal of this sensor is to make a product that more accurately observes air quality than other popular cheap sensors available now while still making it easy to use and mobile enough for the average consumer, creating a useful pool of data that can be accessed by anyway through the coupled mobile app.

1.3 Stakeholder Identification and Considerations

The primary stakeholders for this application are the members of the AIRPACT team and the general public that are interested in using an air quality app. Primary consideration is for the AIRPACT team as they are the clients who are in need of this mobile application to be developed. We are responsible for creating an application with all the required features that they determine should be on there and also create an app that would get their product into as many users' hands as possible.

The other primary stakeholder for this mobile application would be the general public that would be using this product. Special consideration may be necessary for a portion of the public that would be most likely to use this product. Through research of other applications, a sizeable portion of the public that uses air quality applications are people with respiratory illnesses that need to know their air quality so they can determine if they can complete their outdoor tasks. This leads us to determine that our application at minimum should provide the

user with an easily readable scale that rates the health quality based on the levels of pollutants and possibly give more detailed description of who should be concerned at the various levels of air quality. Since we want to increase the visibility of the AIRPACT products to as many people as possible, we need to consider keeping the product easily readable and simple to use to accommodate the largest range of potential users.

Other stakeholders involved in this application include our team that is responsible for developing the mobile application and possibly businesses and government agencies that are interested in the AIRPACT system. There are agencies and businesses that are already interested in the AIRPACT system so some consideration to these stakeholders may be required as the project develops. One of these stakeholders includes the Joint Fire Science Program who submitted an RFP requesting a decision support system addressing risk from wildfire smoke.

Our team consists of Riley Dasch, Sam Fields, Manjot Brar, Christopher John and Ryan Donahoe. We want to build a successful mobile application and develop low-cost sensors for the public by meeting all of our client's requirements and making our product easily accessible by the public. We are motivated to be successful in this project as this will be very valuable to our futures as we graduate from college.