Wing Watch Project Design

Flight paths are not the most difficult thing to track. The final approach of an aircraft is the last leg of any given journey. In a normal airport under good visual conditions, the final approach will start anywhere from a half mile to two miles before the runway when the plane gets lined up. Depending on wind conditions or other external factors, sometimes the designated landing path will switch to a different approach. But even then, the plane can still be observed. It would be quite easy to draw 2 lines stretching of each runway for approximately 2 miles in each direction. But this approach clearly leaves something to be desired.

WingWatch is not an app for finding landing and takeoff paths, it is an app for finding planes. For finding them at their lowest altitude, or their most frequent landing times, WingWatch will be able to find spots that do not just coincide with flight paths, but optimize the plane spotting experience based on a multitude of variables. WingWatch uses real live flight data pulled from a network of ADS-B receivers to track data and filter it out based on plane spotting preferences. The data is tracked in a 30 $mile^2$ area around the selected airport. All flights that are departing and arriving from the airport will have their locations, timestamps, altitudes, and other variables saved into a csv file. This will then be filtered out further by restricting a height limit of between 1500 feet and 30 feet in altitude so that we can isolate planes that are flying low but have yet to land. The tracked data is then put through a cluster algorithm called DBSCAN (Density-Based Spatial Clustering of Applications). This algorithm groups data points based on their density and identified clusters in high density regions. We can adjust the variables to change the minimum size of a cluster and the value of epsilon which represents the distance threshold between two datapoints to group them in the same cluster. Given our large sample size and input parameters, we might expect anywhere from fifty to 100 clusters. This is considerably larger than the number of descent paths, but luckily because DBSCAN makes no attempt to limit clusters by a maximum value of points, most of our clusters will contain the minimum number of points and a select few clusters will contain upwards of 1000 points. When we further filter our data to only include the top few clusters, we will notice patterns. Our clusters will be long straight lines of points ranging anywhere from less than a mile to around 2 miles long. They won't be perfect of course; these lines may branch out in sections. Just because we can reliably predict that the densest clusters will correspond to the most common flight paths, does not mean we can ignore outlier data. We will need to filter our data even further. Our flight paths will need to be plotted into a formula using linear regression and points that stray too far from this line will be filtered out to give us at last our fully filtered flight path data. Each point on the map will represent a potential spot, we will search in a radius around each point and search for parks, lakes, rivers, or establishments which might provide a nice environment for plane spotting, and then save those locations to be ranked. To get a larger sample size, the data used for ranking will not be filtered quite as much. We will use the pre linear regression data and find each plane in a certain radius from any given spot and then we will use that data to rank that spot on a few different variables. We will take the average altitude to give it a "low-flying" rating and the number of data points around us will give us a

frequency rating. Once our data collection is complete, we will begin work on an app so that users can view and interact with our collected data.

The limit of this project is not defined by us, plane watching has been around for over a century and to say WingWatch has the final word on plane spotting would not be right. WingWatch is a tool for the community to use as they wish, which is why I would like to allow as much freedom to users of the app as I can. Users will be able to search for locations, favorite locations, leave ratings and reviews, and even add their own locations that they feel the app has overlooked. Users may also even be able to connect with other plane spotters, view reviews from specific accounts, and maybe even connect with them by direct message. This is still quite a distant milestone, and we face many challenges ahead. We hope to isolate spots from the filtered data by the end of November. Then we will move on to expanding the data collected to multiple airports which we hope to complete by the end of the semester. App development will take quite some time before we can release a minimum viable product and even more time before we can say we are finished, but we hope to at least have an MVP completed by the end of the second semester when the project is due.