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Writing Assignment 2

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### Eco-Friendly's Functional Specifications

The human race has rarely, in its past, faced such a difficult time as we are facing today in regards to the future of planet Earth<sup>1</sup>. People, in general, feign indifference or are unaware of their high rate of use of resources, of large amounts of waste they create, and pollution they emit. Because there are many people on the planet, each person using resources and causing pollution, when combined, there are such large quantities of pollution and waste that the earth will not be able to survive much longer. At a number of 7.125 billion inhabitants, the earth is overpopulated to such an epidemic proportion that there is a need for four planet Earths to sustain how the current population lives<sup>2</sup>.

Lakes and rivers have run dry, temperatures have risen to a historic high, and the North and South Poles are melting at an astonishing rate, leading to the rise of sea levels, to the extent that India is predicted to become submerged. If individuals would do their part little by little to spot polluting the earth, which might be the only chance we have in order to stop pollution and secure a future for our species. There is a need to create awareness for the health of the planet by showing each person how their actions contribute to climate change. Doing so will hopefully make said person mindful of how he or she is harming the planet.

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<sup>1</sup> Ahmed, Emad. "Stop Telling the Public We're Not Doomed, Says Climate Change Scientist." *CityMetric*. Centreforcities, 22 Oct. 2015. Web. 25 Oct. 2015.

<sup>2</sup> McDonald, Charlotte. "How Many Earths Do We Need? - BBC News." BBC News. BBC News, 16 June 2015. Web. 24 Oct. 2015.

Eco-Friendly is an Android application that tackles this problem. It tracks people's daily use of transportation and keeps track of how much pollution a user emits during their day's "trips". Each trip will consist of the user leaving a location they have been stopped at for at least 5 minutes, after they clear a radius of 100 feet from the location. It does this by first computing what kind of transportation the user is using during a trip. There are four modes of transportation the application considers: walking, biking, driving a car, and using public transportation (bus and subway). After the application figures out what mode of transportation the user selected, it then calculates the mass of carbon dioxide that vehicle emitted, or did not emit (in the case of walking or biking), while the user was travelling.

At the end of each day, the application will retrieve data about the user's trips throughout their day and compile them to determine if the user has decreased his or her emissions of carbon dioxide in a day. It will display how the user is doing in terms of their daily carbon dioxide emission by using graphic charts and rewarding messages like "You used the least amount of carbon today". The ultimate goal of this application is to make a user more mindful of how much he or she is actually hurting the earth, in turn hopefully making the user learn to emit less carbon dioxide in their daily trips.

The user will simply start their Eco-Friendly interaction by downloading the application onto their Android phone. The main attraction of this application will be that calculating the user's daily carbon emission will be mostly automatic. Next, the application will prompt the user to allow access to their GPS to more accurately determine where the user is and to be able to know when to a trip starts. Eco-Friendly will be using the Google Maps API. The start of a trip will be initialized automatically with a few different algorithmic specifications with the help of the Google Maps API. Firstly, the application will check (every minute) the location of the user.

It will then see, using the phone's GPS, if the user is still in the same vicinity as they have been for a long period of time, and if the user moves away from that vicinity from a radius of over 100 feet, then the application will know to start a trip. The trip will end when the user is again in a same vicinity for at least five minutes. This mirrors an actual event where someone is at home, work, studying, or not traveling. Another way the application understands to automatically start a trip and track carbon dioxide use is if the person exits a building. This will be determined using a feature of the Google Maps API, which has knowledge and extensive data on geography of buildings.

After the application understands that the user has started a trip, the next step is to determine by which mode the user is traveling, whether it is by walking, biking, taking a car, or using public transportation. Each of these methods of travel have their own way for the application to recognize which type of travel the user is using for a specific trip. Walking and biking will be the easiest forms of travel to identify. If the user is walking, just like in real life, the phone's GPS will be traveling at a very low speed (say less than 5 MPH). If the GPS recognizes this low speed, then the user must be walking to their destination. Biking, like walking, has a speed threshold faster than walking but much slower than any vehicle out on the road. The application will understand that the user is biking if the user is traveling at a speed no faster than 5-15 MPH. The more challenging part is determining automatically if the user is in a car, bus, or metro.

The Google Maps API has a feature that recognizes bus and metro routes, stops, and more. This will be the key to differentiating if the user is in a car, bus, or metro. All three of these modes of transportation share a key difference from biking or walking: each is faster. Thus, the start condition of being in a car, bus, or metro is if the user is traveling at an average speed of 15 MPH or higher. If the user is in a car then the car will not be bound to any route or bus stop. This

means it will be determined the user is in a car if their travel patterns show the user freely roaming the roads. The determination of the mode of transport being a bus is simpler than a determining it is a car. The application will deduce the user is on a bus route when the user's pattern is "stop and go", following the path of a road. The "stop and go" pattern is evident when speed accelerates before and after a Google Maps API-determined bus stop. The last mode of transportation to determine is automatically figuring out if the user takes the metro. This is more complicated than the other modes of transportation because the application will not have an internet signal or data connection between stops. The application will have to understand, with the use of Google Maps, that the user appears and disappears at a random point on the map in an urban area, waiting at each stop for a period of time. By "plotting" these points where the user is found, the application can compute similarities to the metro routes housed in the Google Maps API and determine which metro line the user has selected.

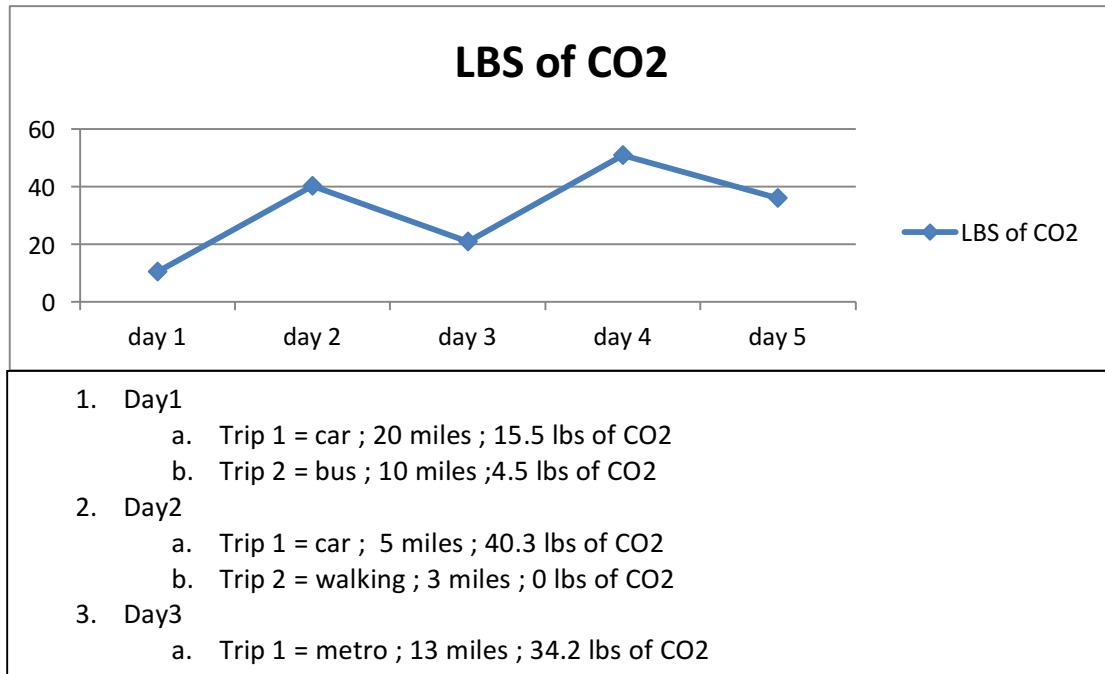
Eco-Friendly now knows when the user starts and stops a trip and their mode of transportation. The next functionality is to calculate how much carbon dioxide the user emitted during a trip. This process will be done by extracting data from a simple database with the pounds of carbon dioxide the vehicle uses in an hour, proportioning that number by the duration of the trip. If the user is on a bike or walking to their destination they will emit no carbon dioxide. If the user is in a car, the application will prompt the user to input what kind of car they are in. This is a simple prompt asking for the car's make, model, and year. When the user inputs this information, the application will go into the database to get an approximate amount of carbon dioxide the car emits.

Sharing vehicles like buses or a metro train is a little bit more problematic. Because there are multiple people in these vehicles, the user is not the only one responsible for the emissions; they

are responsible for a portion of the emissions. To make the carbon emission value more accurate, when the application understands that a user is on a bus or train it will prompt the user with the question “about how many people do you see in this vehicle?” The user will have a dropdown box to select an answer (to keep it simple for the user). The dropdown box will contain the answers 1-10, 11-20, 21-30, 40-50, and so on. After Eco-Friendly received this input it will divide the carbon dioxide emission mass of that bus or train by the number of people the user sees.

After computing the mass of carbon dioxide, the last functionality of Eco-Friendly is to gather all the data and visualize the user’s emissions during their daily travels. The application will also automatically compute the average emission mass for the day, comparing that value to past days to see if the user is polluting the earth more or less from when they first started using Eco-Friendly. There will be a section of the application that sets daily goals and prompts the user, if they have not reached these goals, with fun facts about pollution to hopefully encourage them to think twice about taking a car instead of walking. This section will show (graphically) how the user is doing from day to day, or month to month, or potentially year to year, depending on how long the user has used the application. Below you will find a simple mock-up of this

section:



Below the graph will be quantitative specifics about the user's trips, for a more detailed overview of each trip during the day.

Global pollution has become such a problem that in the near future humans will be scavenging to find simple resources like soil that can produce and water. If we do not act now then this problem can get too ahead of us. This application will hopefully make people more conscious of how much carbon dioxide they emit with each trip they take. With Eco-Friendly's easy to use, automatic algorithms the user does not need to do much to understand if they are doing their part in saving planet Earth. The application will keep track of how much carbon dioxide you emit daily with automatic computations of when a trip starts, deducing what mode of transportation you use, and more. Eco-Friendly pushes its user to better themselves for the planet and the planet's future. For simplicity purposes, this application will only have the data for DC's public transportation system