LEAF IT

NEVER MAKE AN UNINFORMED AND POLLUTING DECISION AGAIN

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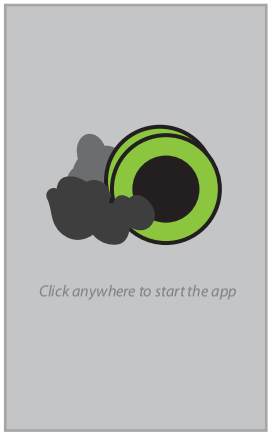
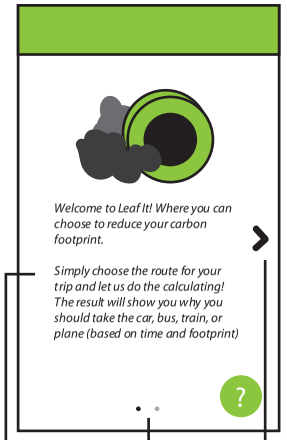
Report about the mobile app we have produced in and for the course 'Mobile Cartography'.
Featured is firstly an overview of the app, followed by a description of the app, the purpose and target group of the app, and the difficulties we have encountered, as well as the choices that were subsequently made.

Splashscreen



Splashscreen is the screen that you see before the app starts, i.e. before the first screen gets visible

Screen: 1

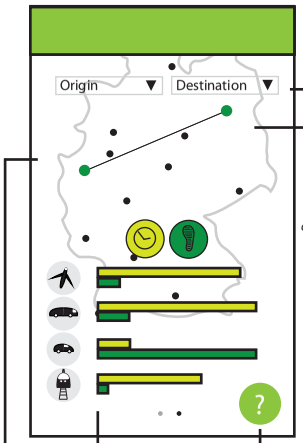


Keeping track of the page you are on, which also gives an indication how small and quick working with the app is

Information you need to understand what the app is about, i.e. information thats gets you started

Forward button, clickable after having filled in both fields

2



Fields to fill in your point of origin and your destination

Visualisation of the route that was chosen in the last screen

Preferably with a map that shows the different routes that the different ways of transportation use. However, because of restrictions for the Google API, the route has been simplified

Google Maps overview map

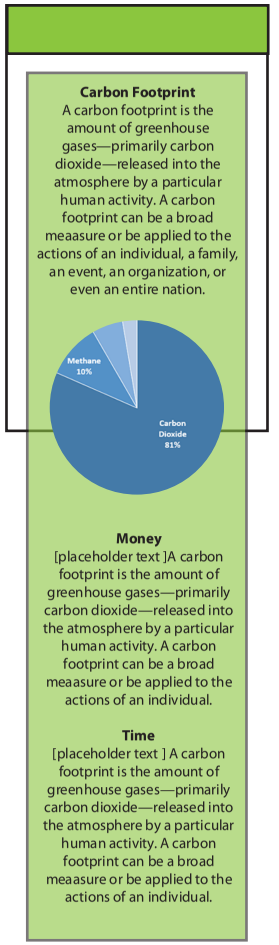
For now you can choose between four cities, but in the initial set-up it was possible to choose any city in the world

Information button, which shows you background information about our sources & used methods via a pop-up

Example of the pop-up shown here on the right >

See what mode of transport is best for you, depending on the time on the one bar, and the emission (your footprint) on the other

Pop-up example



OVERVIEW

Leaf It is an app designed to estimate and compare the carbon emission from different modes of transportation. Based on your input of origin and destination, the app will calculate the shortest distance in between, the carbon emission for traveling this distance with various transportation methods (bus, train, private vehicle, and plane), and the travel time for this distance. Our goal of creating this app is for you to have a simple tool in hand, to make an environmentally responsible decision when selecting a transportation method, with the consideration of traveling time.

DESCRIPTION

On the first page the user can see how the app looks like and what options one has. After a short explanation of the app, one can straight go into choosing the route he/she wants to know more about. After filling in the two tabs (origin and destination), the user is forwarded to the last screen, where the personalized transport options are shown. For each of the options, indicated is the time and the ecological footprint (mainly CO2). What differs this app from other transit apps is, the extension that we call 'carbon footprint'. This ecological footprint symbolizes the emission of greenhouse gases from four of the commonly-adopted transportation methods. We find it important that someone planning for a trip, not only takes into consideration the time it takes to get from origin to destination but also keeps in mind how detrimental that trip will be for the environment, thus we enabled the visual comparison of travel time and carbon footprint through implementing four bar charts. Essentially, the design is simple and straightforward — it is meant for the user to gain insights within three clicks.

TARGET GROUP

This app targets the general public who seek additional information related to traveling in order to make an eco-friendly travel decision. With a realistic routing option and simplified distance calculation, the app allows the user to fully focus on the carbon emission differences of different transportation options, thereby leaving out the routing details that you would see in a common transit app (such as Google Maps). Additionally, the app is designed with help info and additional science hidden inside the pop-ups upon request. These decisions are made so that our users, young or old, busy or leisure, and passionate or casual could receive a quick insight into carbon emission related to travel and finally make sustainable decisions within three clicks. We also hope to interest these people to further explore this topic on their own through the encouraging and personal wording of the app.

TECHNICS AND CALCULATION

The novelty of the app is highlighted through the calculation of app and travel time using independent methods outside of the routing options provided by the Google API. Carbon emission estimation is based on the Euclidean distance between the two locations the user enters, which is multiplied by a transport emission factor. The transport emission factor is different for each mode of transportation. We obtained the transport emission factor for flight, bus and trains from the United States Environmental Protection Agency (EPA)'s report on Emission Factors for Greenhouse Gas Inventories(https://www.epa.gov/sites/production/files/201512/documents/emissionfactors_nov_2015.pdf), for private vehicles from one of the University of Exeter's research projects on energy conversion (https://people.exeter.ac.uk/TWDavies/energy_conversion/Cal culation%20of%20CO2%20emissions%20from%20fuels.htm). Moreover, we defined thresholds for using different transport emission factors to increase the accuracy of estimation. For example, for trains, we used three different emission factors for inner-city and intercity trains. The average travel speed for the four modes of transportation is compiled and averaged by many different popular sources, such as Wikipedia. The average speed is adjusted based on some trials using Google Maps. To count for the differences of the inner city and intercity transits, we decided on a 40km threshold for distance, meaning if the travel distance is less than 40 km, we will use inner city speed to calculate travel time. We then use the shortest distance divided by the average speed to obtain travel time.

In order to calculate the Euclidean distance between two points, a database of cities had to be built. We decided on a database that contains four different cities; every city record contains the coordinates of the city and the city boundaries. The coordinates of the cities are used to draw a line between the origin city and the destination.

The recorded cities are Vienna, Dresden, Munich and Enschede. A function has been written to check the GPS location of the android device and compare it with the recorded city boundaries. This function helps to automatically determine if the android device is in one of these cities.

LIMITATIONS

One of the greatest limitations comes from the underlying distance calculation. Due to the limitation of technical freedom (explained below), we are only able to calculate the Euclidean distance between the two locations. This is, however, not realistic. In real life, the routes for trains can be very different from that of the buses, thus the distance of the journey will vary. On the other hand, having a static travel distance also presents an opportunity to directly compare the carbon emissions of these various methods of transportation. And let just that be the ultimate purpose to develop this app.

The already named technical freedom has indeed disappointed us. After having decided for this project, we have looked into the Google Directions API, which is used in a library (jd-alexander/Google-Directions-Android) to calculate vertices and draw polylines representing our routes based on the mode of travel. However, after implementation, we came to the conclusion that to use the Google Directions API one has to enable billing by Google, and without authorization testing the app was not possible. In the end, we chose to use simple polylines going straight from A to B to represent the routes, which are derived by the Euclidean distance between the two locations.

Limited is a word that can finally also be applied to our app as a whole. The final process of merging and combining views, functions, and a pop-up, have proven to give multiple difficulties. Solutions needed to be found, and are found. Unfortunately it has not become exactly how we wanted, but the idea is out and we hope this project can inspire other people to take this idea even further.