Bike-It

Travel Application for Bike and Transit Users

A Master's Project Proposal submitted to Santa Clara University in Fulfillment of the Requirements for the

COEN 499 - Independent Study on Mobile and Web Technologies

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by

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Table of Contents

List Of Tables and Figures

Abstract

In this project, the concepts of Mobile application development such as Android SDK, Java, REST Services and much more have been applied. This travel based application use Google Maps API, Google Directions API, Google Places API to find the best possible way to travel from one place to another using a bicycle and Public Transport. This would help daily commuters to save consider amount of time and also incline towards making healthy choices in life and also promote for green community.

Introduction

Objective:

Build a mobile application "Bike It" using Android SDK, Java and Google APIs.

Motivation:

There are numerous applications which would help for day-to-day traveling such as Google Maps, Waze Map, Bing Maps, Here Map by Nokia, and much more. But none of this application has a choice of choosing combination of travel modes like bicycling + Public, bicycling + car, running + car, safe routes based on crime and accident rates Transport. Particularly there is no application which gives you fastest route to commute by bicycling and public transport. This motivated me to develop an application which would provide the quickest route possible for bicycling and public transport.

Following are the interesting stats found during research:
● 777,000 people used Bicycle as their primary means of travel to work during 2011.
● More than 3.9mi people used to walk to their place of work in 2009.
● More than 35 mi people use public transport to commute.
● There are more than 204 mi personal vehicles in USA

Statement of the problem

Build a mobile application which can be used by people who use bike and public transport for commuting. The application would suggest best possible route option taking the biking time and public transit times under consideration.

Scope of the Application

I personally like to use the bicycle for traveling around also to commute to the job every day. The idea is, it will help me keep myself fit and also do my part for the green environment. In my early days in the USA, I used to travel 11 miles every day for my school and I used my bicycle + public transport as cycling 22 miles every day was not a viable option. It used to be 3 hours of traveling every day.

After of a couple of weeks, I realized that if I bike for little more and catch a bus and also

get down little far from my destination and bike the rest of the way to school. I can reduce my traveling time to half of what it used to be to 1 hour 30 minutes.

To come to know about this possibility I had to spend hours of time with the timetables of all the bus routes that, I would come across on my way to my school. I also tried using different apps like Google Maps and Transit but they were of no use.

I strongly believe that there are many people who are not able to afford their own car and rely on public transport and waste a considerable amount of time which would have been used rather productive.

I also believe that this application has a potential to start a new way of living which is closer to the green environment and a healthy society.

Area or Scope of Investigation

The plan is to build an application which uses Google's API and Android SDK and Java technologies to provide a customized and optimized route for the the daily commuter who prefer to use public transport and bicycle. For this purpose I have chosen to explore the following areas,

Android Studio and Android SDK

Android Studio is Android's legitimate IDE. It is predominantly worked for Android to quicken the development and help assemble the most noteworthy quality applications for each Android device.It additionally offers instruments specially custom fitted for Android designers.

The Android software development kit (SDK) incorporates an exhaustive arrangement of development tools. These incorporate a debugger, libraries, a handset emulator based on QEMU, documentation, test code, and instructional exercises.

Async Tasks

AsyncTask empowers the best possible and simple utilization of the UI thread. This class permits you to perform background operations and show results on the UI thread without manipulating main threads and/or handlers. AsyncTask is intended to be a partner class around Thread and Handler and does not constitute a nonspecific threading system.

An AsyncTask is characterized by a computing that keeps running on a background thread and whose outcome is published on the UI thread. An AsyncTAsk is characterized by 3 nonspecific sorts, called Params, Progress and Result, and 4 stages, called onPreExecute, doInBackground, onProgressUpdate and onPostExecute.

Google Maps API

The Google Maps APIs give developers several ways of embedding Google Maps into their application or retrieving data from Google Maps, and allow for either simple use or extensive customization.

Google Directions API

The Google Directions APi Returns "multi-part directions for a series of waypoints. Directions for several modes of transportation are available."

Google Distance Matrix API

Google Distance Matrix APIs are used to retrieve duration and distance values based on the recommended route between source and destination points.

Google Places API

Get information from a similar database utilized by Google Maps and Google+ Local. Places highlight more than 100 million organizations and points of interest that are refreshed as often as possible through proprietor confirmed postings and user-moderated contributions.

Google Geocoding API

The Google Maps Geocoding API is an administration that gives geocoding and reverse geocoding of locations.
Geocoding is the way toward changing over locations (like a road address) into geographic directions (like scope and longitude), which you can use to place markers on a map, or position the map.

Reverse geocoding is the way toward changing over geographic directions into a comprehensible address. The Google Maps Geocoding API's reverse geocoding service additionally gives you a chance to discover the address for a given place ID.

As a part of this Project I had to learn the usages of all these technologies in order to make the application a reality.

Hypothesis/Goals

In this project the goal is to build an application which would use Google APIs to get the information about the travel time, transits stations, and routes and use them to find the most optimal travel suggestion for travelling from one place to other.

Following are the steps that will be done in order get the optimized routes,

- Find all transit station which is in 4 km radius of the the start position
- Calculate time to travel to these stations by bicycle.
- Find all transit stations which are in 4 km radius of the destination.
- Calculate time to travel to these stations by bicycle.
- Find the travel time from all the start transit stations to the destination transit stations.
- Find best possible combination amongst these hundreds of possible routes.

Methodology

Data

The data that we are dealing in this project is the large amount of data of the Maps, For each and every route determination we have compute data by making 800 asynchronous API calls. Each call returns back a json with lot of raw data. Parsing the raw data into the meaningful form and deducing the required information which is of utmost importance is main agenda of the backend architecture.

Setup

The complete application can be visualized in the following flow diagram.
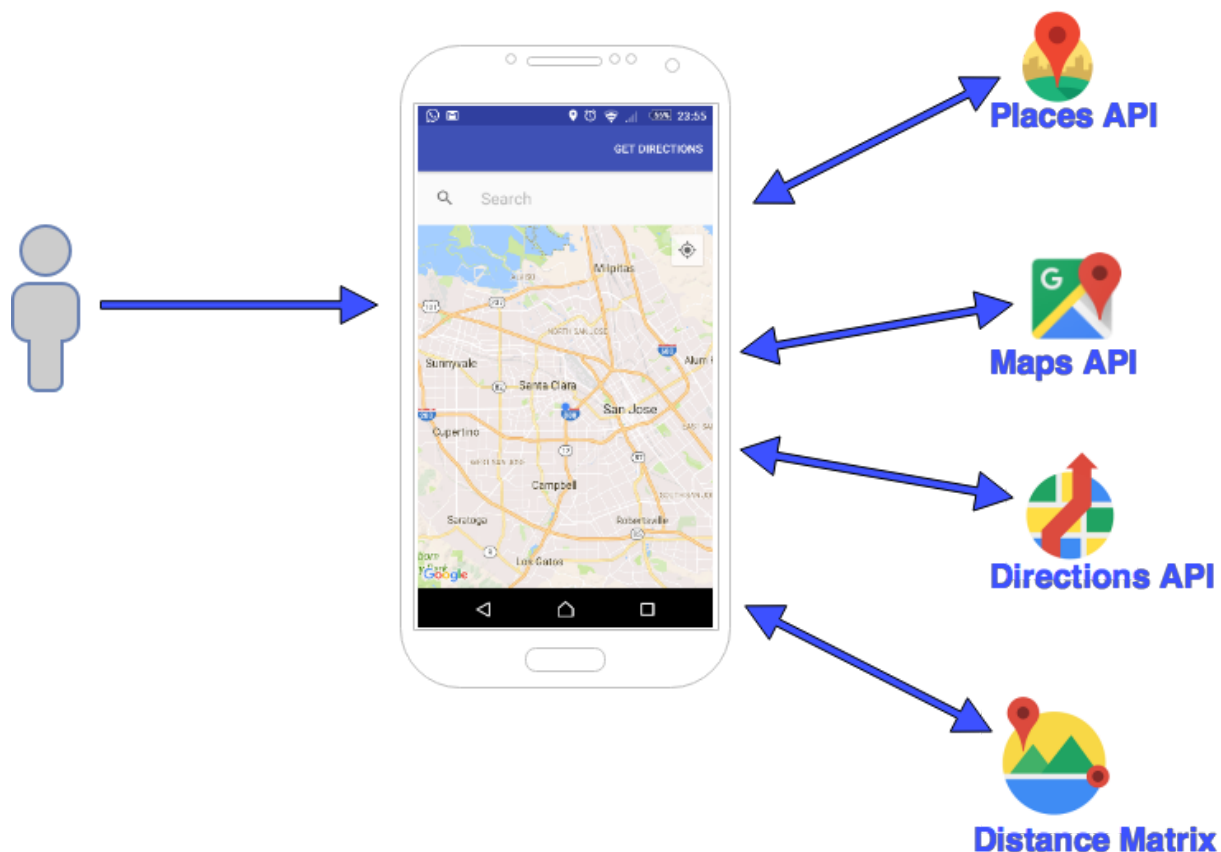

Fig 1 : Flow Diagram of the Bike - It Application

Results and Analysis

The results of the project were pretty promising the table below shows the improvement that was produced when compared to Google Maps application.

Source	Destination	Google Maps Time	Bike - it Time	Reduction in time
2147 Newhall Street	Googleplex 1600 Amphitheatre Pkwy, Mountain View, CA	1 hour 20 mins	42 mins	47.5 %
2147 Newhall Street	Pandora Radio Oakland 2101 Webster St #1650, Oakland, CA	2 hours 32 mins	99 mins	34.86%
2147 Newhall Street	Peacock Indian Cuisine & Bakery 39447 Fremont Blvd, Fremont, CA	1 hour 19 mins	48 mins	39.24%

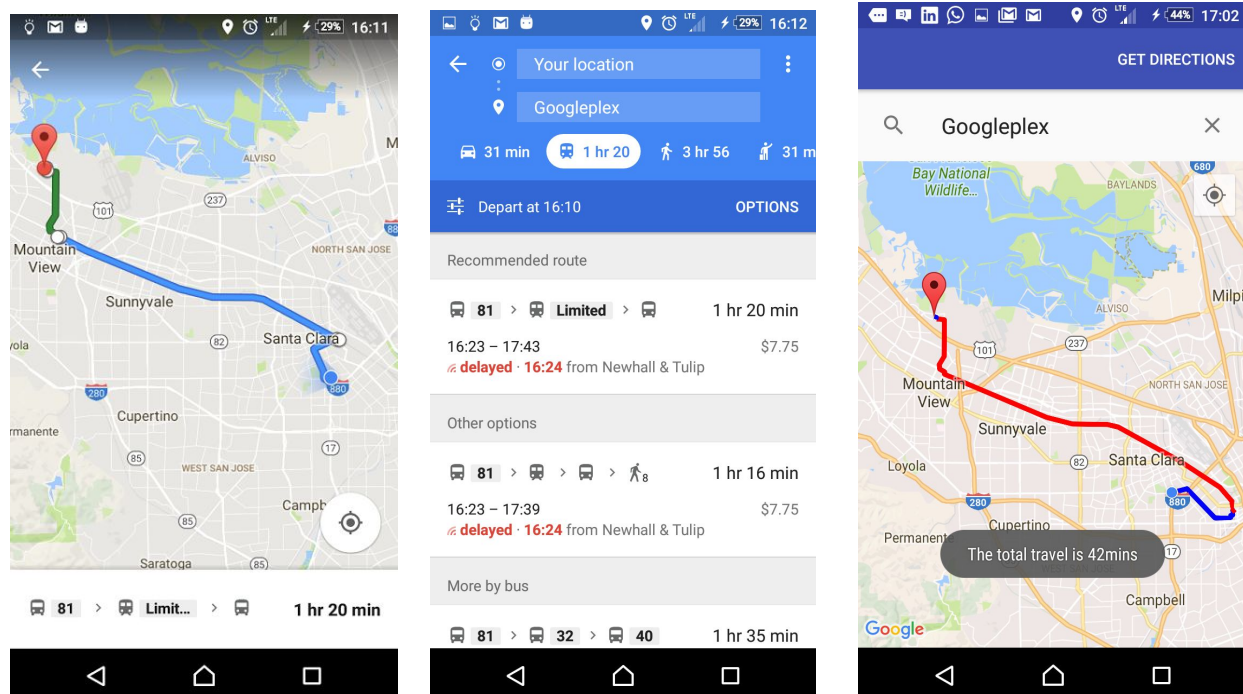Table 1: Analysis of performance of Bike - It Application

Fig 2: 2147 Newhall Street, Santa Clara, CA to GooglePlex, Mountain View, CA .
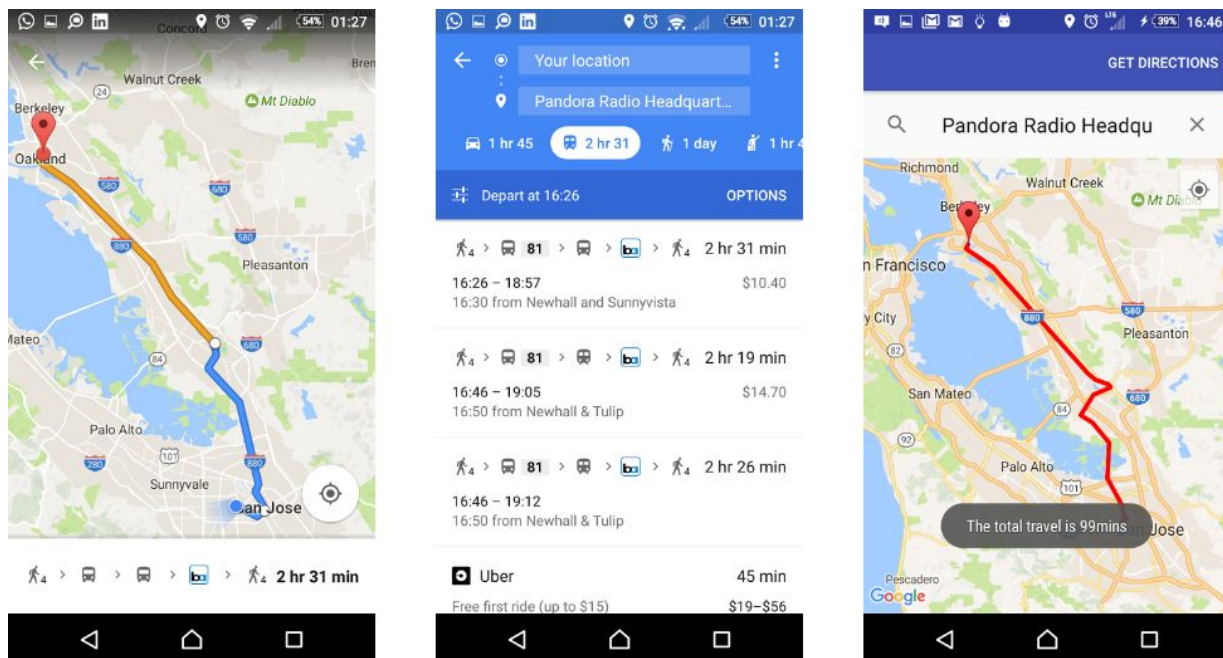Left and Center - Google Maps Suggestion; Right - Bike - It Suggestion.

Fig 3: 2147 Newhall Street, Santa Clara, CA to Pandora Radio Headquarters, Oakland, CA.
Left and Center - Google Maps Suggestion; Right - Bike - It Suggestion.

Conclusions and Recommendations

Summary and Conclusions

This project gave lot of insights on how the Google Maps API can be made used efficiently and a possible enhancement to the Google Maps application in the future. There was seen a very good improvement in terms of time saved in the range of 20 - 50 % when used bike+ public transport mode compared to walk + public transport commute.

Future Recommendations

The project can be further enhanced to make UI more interactive and make it look similar to the Google Maps Application and host it on the Play Store. Currently since there is large amount of API calls made for commuting best route there is delay in route suggestion compared to the Google stock maps application. Moving Forward would like to venture time in optimizing the computation to get results quicker.

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