Vehicle Sharing System for Android using Manual and Automated Route Tracking

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ABSTRACT

Energy is one of the biggest crises in today's crisis driven Pakistan. "Pakistan is currently facing a gas shortage of 700mmcfd"[1]*. A solution for this problem is need of hour. Gas and petrol are major sources of energy especially in a country like Pakistan with population of over 200 millions. In this paper we have tried to come up with a solution to this problem. We have developed an application which allows a user to share its vehicle thereby reducing a substantial amount of fuel consumption as well as it allows travelers to save money by sharing the fuel cost. It also helps keep environment clean and also makes people more social. Most of the people travelling in Pakistan in their private vehicles use CNG and most of the cars include one or two persons at a time. And many people use to travel from same starting point to the same destination. Many people share this route and use their own vehicle for traveling. The room available in those cars can be utilized and vehicle can be shared with other peoples saving fuel consumption of one vehicle and also reducing environmental pollution by reducing number of vehicles on road. The project allows different people who use to travel from same starting points to same destinations on regular basis, share their vehicles by automatically prompting them via a text message or an application alert hence reducing overall CNG requirements. Apart from less CNG consumption, system also offers other advantages including money saving, environment protection and increases social circle of the people by letting them find new travel partner.

General Terms

Vehicle sharing, Android, Google API, Location based services, Geo-Tagging, Reverse Geo-Tagging.

Keywords

Android, CNG Consumption, Fuel Shortage solution, Geocoding, Reverse Geo Coding.

1. INTRODUCTION

Route tracking has always been an area of interest for long. Either it's for military purpose, i-e route tracking of vehicles in order to check if the route is safe or not for the vehicle, or it can be done for the purpose of finding if vehicle is following correct route or will it reach its destination following this route or not. This thesis extends this concept a little more, it not only focuses on route tracking but it also focuses on route matching, and it simultaneously matches route of all the vehicles within a certain range. After tracking the routes it prompts all the vehicle drivers which were in certain range from a certain starting point to a certain destination that they have travelled specific distance along with other travelers and

next time whenever they want to travel on this route, they may contact these travelers and share their vehicle. The other application of this system is manual route setting, i-e user can set their journey before time and whenever another user want to go to a particular place he will find the journey through this application and if someone has already set journey of his interest the results are displayed and he can contact that person and share its vehicle. There are many route tracking applications being developed previously for android including endomondo [2] , and geoTracker [3].

Paper follows typical organization pattern where introduction of the paper is given in section 1, where as section 2 corresponds to the literature review. Section 3 includes implementation and methodology, followed by section 4 where experimental setup and obtained results are discussed and finally section 5 includes the proposed system conclusion.

2. LITERATURE REVIEW

In early 90's mobile phones were used only for the purpose of telephonic conversation or text messages at most but with the advent of new mobile technologies their functionalities are now quite extended. In order to comprehend this application, it is very important to have a little know how of android LBS (Location Based Services). LBS [4] are set of services which utilize the geographical information data of a mobile device and then accordingly provide services as programmed by the developer. It also entices cellular companies to provide value added services to their clients based on the geographical location.

LBS can be broadly categorize into three major domains [5], including public safety and emergency services where the exact location of the user can be determined , it has vital use in emergency conditions since it can be used in critical conditions to find the location of the user.

Second most important service provided by LBS is consumer services, as android, iphone and blackberry provide these services it help the user to perform multiple task related to geolocation. It includes map navigation, Marketing and advertising campaigns, as well location based reminders which can be employed to set reminder based on location.

Third important application of LBS is to search preferred location, User can search for any nearby Restaurant, a friend's home or any other location as he find convenient and the range can also be set to perform this functionality.

LBS is implanted using two different methodologies[6]

- Firstly data is processed in server and then this data is used to produce response to the clients based on the request of the client.

- Data of the mobile device based can be used and then it can be used to find location of the user.

LBS need real time position finding methods to find the location of the mobile. Accuracy of the employed method depends upon the approach that has been used in this respect. Spatial terms or text descriptions can be used to denote the locations.

Latitude-longitude-altitude can be used to represent the spatial location[5] in the coordinate system. Any location which is 0-90 degrees south or north of the equator Is called its latitude point. Whereas any point 0-180 degrees east or the west of the prime meridian, this location is Greenwich, in England. Altitude stands from the height above the see level. On the other hand a text based description is usually the location of a street which includes city pin code.

Smart phones have definitely taken the market of Nokia in the past few years, today's most famous smart phones include (Iphone, android and blackberry), These smart phones also have the ability to provide A-GPS functions with the help of which the spatial coordinates of the location can be retrieved. By using cell tower and wifi signals, Network Location Provider for android determines user location and provides information about the location in more faster, robust and using less battery power both indoors and outdoors.

Performance of standard GPS is improved by using Assisted GPS[7], which is also call A-GPS, for the devices connected to wireless based networks. AGPS is useful in two ways:

- It improves time to fix first (TTFF). Cellular networks are used by AGPS in order to gain and store information about satellites, this technique is particularly helpful because there is no requirement of downloading information through satellite.

- In case GPS signals are weak, AGPS can help in positioning of mobile devices. Tall towers can impede satellite signals of the GPS and the signals might not be able to penetrate the interior of the building. Proximity to cellular towers is used by AGPS for location calculation in case GPS signals are not strong enough.

Two API are very important for any android based location tracking applications, these two API are Google Places API and Android Location API

2.1 Google Places API

Google declared the opening and general public availability of Google Places API on May 10, 2011 at the Google I/O conference for developers in San Francisco [8].

Google Places API [8] is a set of functionalities which is used to retrieve data about the locations which are defined in this web service in the form of spatial locations or text descriptors, using HTTP requests. Response from these space specify latitude and longitude using reverse geocoding [x].There are four different types of requests which are available in Google Places API.

- **Places Search:** Based on user's definition of location, it returns an array which displays places which are near.

- **Place Details:** Return data which is more specific about a place defined by the user.

- **Place Check-ins:** It allows to find if the person has checked into a place or not.

- **Place Reports:** It allows the application user to insert new locations to the Place service, it also deletes the places which are already added by the application to the database.

Query processing in Google Places API[8] has following limitations.

- In 24 hours, users with API key can make only 1000 requests.

- Users with API console validation can make 100000 requests in a period of 24 hours. To enable billing, credit card billing is required for validation and authentication.

2.2 Android Location API

This is a set of classes which are used to retrieve the information about the location of the user in android.

Location Manager: Location services can be accessed via this class. On the basis of the user' criteria, this class provides best possible location providing facility.

Location Provider: This is an abstract super class for the location provider. This class is use to retrieve reports regarding the geographical location of the mobile device.

Location Listener: Callback methods are available in this class which are repeatedly called as the location of the device gets changed. Location manager must register the listener object.

Criteria: This class sets criteria on the basis of which suitable location provider is chosen.

2.3 Geocoding [9]

Reverse geocoding is an approach which converts geographical coordinates i-e longitudes and latitudes back into street address on the other hand forward geocoding does the exact opposite i-e it provides geographical coordinates that is latitude and longitudes into from street address. Forward geocoding utilize getLatitude() and getLongitude() methods on the other hand in reverse geocoding we employ getFromLocation() method including the geocoder variable.

3. IMPLEMENTATION METHODLOGY

This application basically consists of two major sub applications. One is the manual route tracking and matching application where user statically match their routes via database queries and the results are displayed. This way user can share their vehicle if their routes are matched. The second major sub application is automatic route matching where route of the two users is tracked automatically and then are prompted to share their vehicle. We discuss both of them.

3.1 Manual Route Sharing

3.1.1 Set Journey Module

This module includes the options for setting your journey, it includes different fields and dropdown lists to choose from several options regarding your journey.(Figure 1(a)), it contains a button to set/find journey and also a button named

"more options", which lead it to more options set/find journey screens. Figure 1(b).After the user sets the journey the record is stored in remote database on the web server using the web services, later on as we will see in the next section if someone finds the journey this data is fetched from this database.
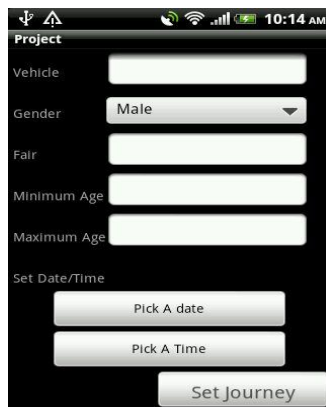

Figure 1(a): Set Journey

Figure 1(b): Set Journey (More Options)

All the different queries that can be used to set you journeys are shown here in this figure 1(a) and 1(b), these are expanded in the figure 1(c) and 1(d) as shown. Here user can choose a date from an android spinner item. Also android spinner item has been employed to show the time chooser.

Figure 1(c): Set Date
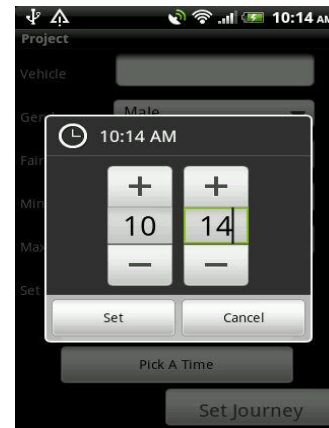
Figure 1(d): Set Time

3.1.2 Find Journey Module

Find journey module has been built using three major constraints. There are three different ways u can find journey of your interest. It includes.

- Querying the database through start point.
- Querying the database through destination point.
- Querying the database using the date of the journey.

User can also use combination of any two or all of these three queries in order to find the record which it likes to find. The main interface for querying the database is shown in figure.
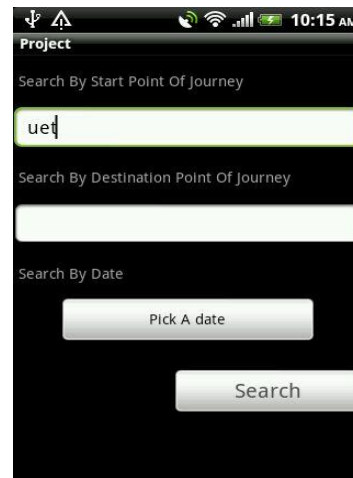

Figure 2: Find Journey

3.2 Auto Route Sharing

In contrary to static route sharing where user have to manually enter the data and other user have to manually search if their journey is matched or not and consequently if they can share their vehicle or not, auto route sharing does this automatically if the route of two or more users is matched. And then it prompts the users via notification.

Algorithmic architecture of the system is described in figure 3. Initially two variables count and match are initialized to zero. Count counts the number of time location has been matched with the updated location and match shows the number of time the current and updated location is different. Reverse geocoding is applied in order to get current location from the coordinates. Then after time t this location is matched with the updated location and count is incremented.

If current location is not matched, means the updated location is different, match is incremented and if the count is equal to three the route is added to the database. And algorithm goes to step 1. If count is not equal to three when location match is true, current location is updated with the updated location and again the location is matched with updated location after time T.
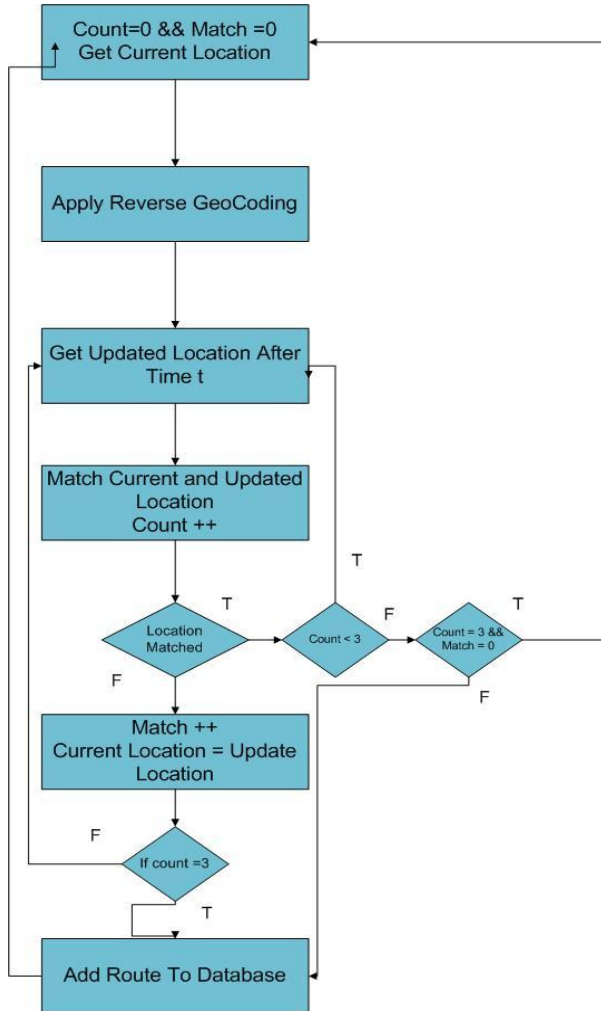

Figure 3: System Flow Chart

If the current location matches, we don't increment match and it is checked if count is less than 3, if this is the case, algorithm goes back to check after time if location is matched or not, on the other hand if count is not less than 3, algorithm check if count is equal to three and match is not equal to zero, means at least in one of three comparison current and updated location is different. Route is added in the database. If this is not the case algorithm goes back to step 1.

In the end all the route points which are in the database are matched and the users which have same starting and destination points are prompted along with the time difference between their journeys as shown in the result section.

4. EXPERIMENTAL SETUP AND RESULTS

No special hardware is required to test the system except an android based mobile device, with internet and GPS services available on it. Results from the application have been shown as follow.

4.1 Manual Route Sharing

As soon as user searches a record, a grid list of all those journeys appear who match the criteria. As shown In figure 4.

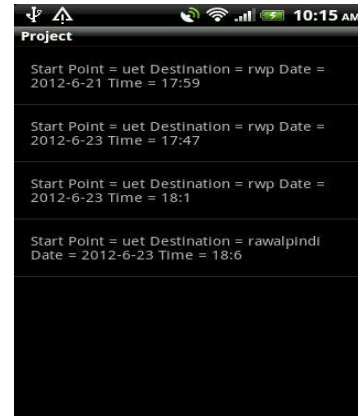

Figure 4: Matched Journeys

Clicking on one of the journeys display the profile of the person as shown in figure 5 who set this journey.
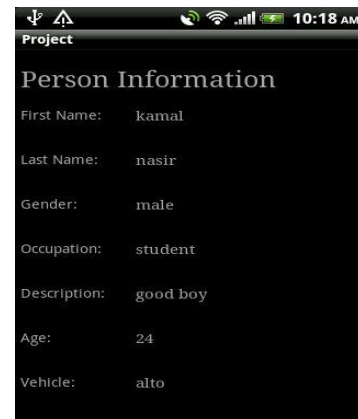

Figure 5: Person Profile

As soon as this information is displayed an entry is added to the chat application automatically and now if user wants to contact this person he can do so via this chat application. Interface of the chat application is shown in figure 6 where person who has set his journey is shown online via a green light.

Figure 6: Chat Application

4.2 Auto Route Sharing

Application has an option whether user wants that his route is matched or not, this is done via an option which is turned on or off as shown in figure 7. When this option is turned off web services running in the background stop and automatic route matching stops. Now if one wants to turn it this feature on, again he has to go to menu and click the auto route on button as shown in figure 8.
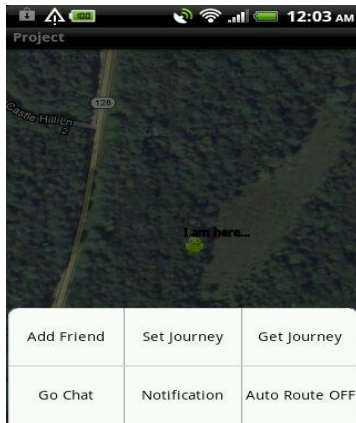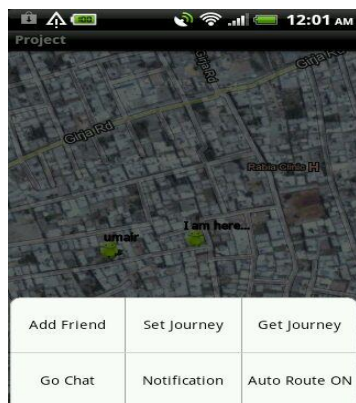

Figure 7:Autoroute Off

Figure 8:Autoroute On

And in the end, in order to view the matched route clicking on the notification button yields desired results. (Figure 9)
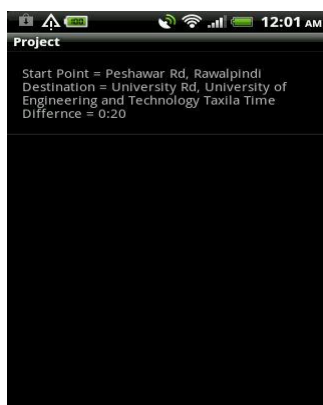

Figure 9: Matched Journeys

5. CONCLUSION

The project SOCIO-TRAVEL is solution of this prevailing problem of gas shortage. It introduces a concept of social traveling or vehicle sharing in more practical terms. The first and foremost target of the system is to provide an algorithm which allows people to share vehicle leading to less CNG consumption. Other areas of system include economic values, environment protection due to less number of vehicles and social traveling which will help find people new traveling friends. The project allows different people who use to travel from same starting points to same destinations on regular basis, share their vehicles by automatically prompting them via a text message or an application alert hence reducing overall CNG requirements. Apart from less CNG consumption, system also offers other advantages including money saving , environment protection and increases social circle of the people by letting them find new travel partner.

6. REFERENCES

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