

## Location Based offers using Android Application

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**Abstract** - As the Android market holds over 85% of the entire application market, it continues to dominate the mobile platform with 2.8 billion+ active users across the globe. Its ability to customize seamlessly, deploy much faster, improvement in scalability, and reaching out over a massive customer is what makes it the preferred platform for companies. One of the major inventions of the 21st century is the smartphones. Today, one cannot imagine his/her life without a smartphone. But, what really makes a mobile phone a smartphone is the mobile application that we use in our daily life.

In this paper, we have developed an android application with LBS (Location Based Services) in which the users will get notified if he/she is nearby a store which has live offer going on. The application continuously tracks the user's location through GPS (Global Positioning System) and if the user's location is within the 500m of the store, the application sends a notification to the user. After receiving the notification, the user can click on the notification which will redirect to the google maps and will start the route.

This application is still in its early stage and thus, lot of advancement can be done. For example, implementing Machine Learning Algorithm to study the user's shopping pattern and show them the results accordingly. The application does not specify the type of offer or the product.

**Key Words:** Android Application, Location Based Offers, Location Based Notification, Location Based Services, Firebase Database.

### 1. INTRODUCTION

People get excited when they hear the word "Offer". Our application mainly focuses on: none of the offers are left unknown or are escaped while out on a shopping trip. Mobile applications are the soul of this generation. Each and every work can be done through mobile applications. Mobile applications are user friendly and time efficient, which eventually eases out our lives. Our project aims to notify the user, especially when they are out for shopping, the live ongoing offers in their vicinity. With this, the customer or user can easily shortlist the shops with offers they liked and eventually end up saving their time by not visiting every store. The offer's notification will pop-up on the screen when

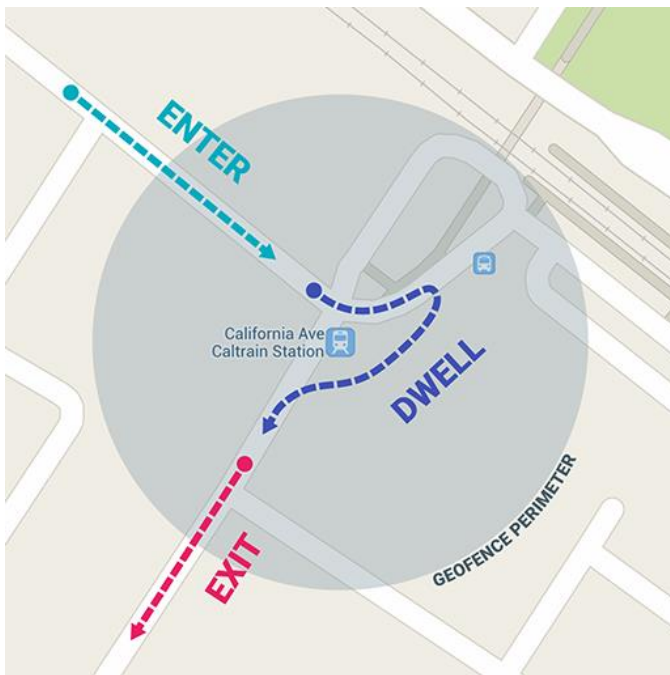
the user is nearby a particular store which has live offers going on. The content of the latter will be important information that one needs to see while looking out for offers. Example: store name, Discounts, Sale, Coupons, etc. The shopkeepers or the vendors, on the other hand will also be benefited with our application, as it will attract customers near to their stores and also advertise their live ongoing offers.

Location based applications provides services to the client or customers based on their locations. These applications developed uses your phone's GPS system, wireless access point, or infrastructure to get the user's location. Location-based services use real-time geodata from a smartphone to various services. Some services are pick up the customer from a location and drop them to a certain location or pick up groceries from a certain location and deliver it to the customers location. Near Register Shops Offer Notification-when the user enters any area, if this area shops are added in the database, then the user will notify offers of those shops. User location is continuously sent to a server (Using GPS and LBS). Admin will manage Firebase database containing shops co-ordinates. The admin can also add or remove the shop in real-time using Firebase's real-time database.

### 2. PROPOSED APPROACH

We all have passed by a shop which had its sale going on and we didn't even know, or, suppose you are out for some casual shopping and you arrive in a mall, now instead of visiting every store in the mall and checking out their offers, the application will show you every store that has live offers going on. The application uses the device's GPS service and continuously tracks the user location. And, when the user enters the geofence of 500m radius the application sends the notification to the user. A geofence is nothing but a circular area created around the location of interest (in this case the shop). There are 3 geofence transition events:

- a. Enter.
- b. Dwell.
- c. Exit.

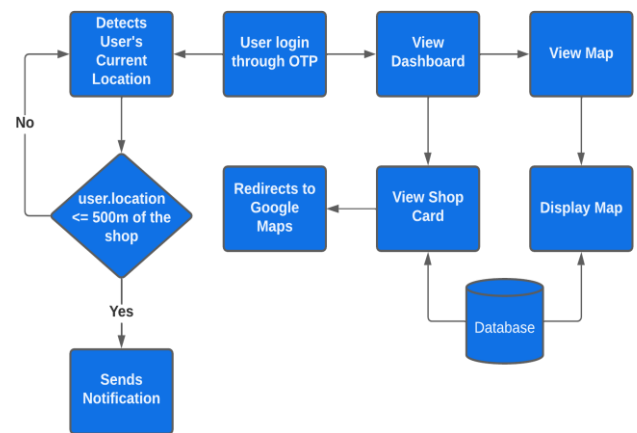


We have made use of GEOFENCE\_TRANSITION\_ENTER and GEOFENCE\_TRANSITION\_EXIT events, which notifies the user on entering and exiting the geofence. In order to make use of geofence, the application must request ACCESS\_FINE\_LOCATION and ACCESS\_BACKGROUND\_LOCATION. The application also lists all the stores with live offers in sorted order (nearest first). We have used Haversine Formula to calculate the distance with source latitude, longitude and destination latitude, longitude. Here is the python implementation of improvised Haversine's Formula for finding the distance with the given co-ordinates.

$$hav(\theta) = \sin^2\left(\frac{\theta}{2}\right) = \frac{1 - \cos \theta}{2}$$

We have used Firebase database for storing the co-ordinates of the shops in real-time database that includes latitude and longitude of the shop. The co-ordinates are stored in a tree hierarchy which consists of root, parent, and child nodes. Latitude and longitude are the child nodes of parent "shop". The admin can easily add the shop in the database by clicking the "+" button on the parent node and then entering the latitude and longitude of the shop that need to be added. Also, the admin can delete or remove the geofence around the shop by clicking on the "x" button the child node. The addition and deletion of the shop takes place in real-time.

### 3. ARCHITECTURE



Above is the architecture of the system that represents the working of the application. The user can login to the application through OTP login. As the user successfully logs in, the application starts detecting the user's current location. It also checks if the user's location is in the 500m radius of the shop. If yes, then the application sends a notification to the user that there is a live offer going on, else it again starts detecting the user's location. As the user logs in successfully, the application redirects to the dashboard activity. In the dashboard activity the user has options to view the map and see the shops with live offers as well as to navigate to the shops having a live offer. To navigate to a shop, the user needs to click on the card that has the details of the shop such as the address of the shop and its distance from the user's current location. On click, the application redirects to the google maps and starts a route to the shop's location from the user's location. The shops with live offers are stored in the Firebase real-time database with their co-ordinates (Latitude and Longitude).

### 4. METHODOLOGY

**4.1 Location Based Services (LBS):** It is an information or service, which is can be used with mobile devices and other browsers through the mobile network or Internet services and which uses information on the geographical position of the mobile device or the device. These are some methods, techniques, technologies used to locate a person or an entity.

**4.1.1 GPS:** GPS-based LBS is the simple and standard solution. Sony Ericsson's "NearME" is one such example. It helps to store the exact location. The catch here is both the end should have GPS enabled devices. GPS is based on the concept of trilateration, which is used to calculate location if one knows the distance from other, already known locations.

**4.1.2 GSM:** It is the second methodology that can be used. It works on finding the location of a mobile device with respect to its tower connected, is another way to find out the location of an object or a person. It depends on various means of multi-literation of the signal from towers serving a mobile phone. The position of the device is calculated using various techniques like time difference of arrival (TDOA) or Enhanced Observed Time Difference (E-OTD).

**4.1.3 Near LBS (NLBS):** It is another example, in which local-range technologies such as Bluetooth, WLAN, infrared and/or RFID/Near Field Communication (NFC) technologies are used to match devices to nearby services. This methodology allows a person to access information based on their surroundings, especially suitable for indoor conditions.

**4.1.4 Handset Based Technology:** It requires the same applications to be installed on both the devices. This technique determines the location by getting the cellular network of the device, cellular strength, cell number, etc. If the device's GPS is enabled, then it continuously sends significantly more precise location information to the SIM carrier.

**4.1.5 By using SIM:** In GSM and UMTS devices, it is possible to obtain raw radio measurements from the device. The measurements are serving Cell ID, round trip time and signal strength. The raw information obtained via the SIM can be different from what is available from the device. For example, it may not be possible to obtain any raw measurements from the device directly, yet still obtain measurements via the SIM.

## 5. IMPLEMENTATION

The front-end implementation includes activities such as login with OTP, which is connected to one of the firebase authentications. The firebase generates 6 digit random OTP and sends to the user entered number through SMS. On successful login, the user now sees the dashboard activity. The dashboard activity consists of a static carousel, that can be used to display any ads or sale banners. Below that we have implemented a "show map" button, this button when clicked will show all the geofences that are present in the firebase database in a map layout of android maps SDK. The user can also locate his current location on the map. Under the button, we have implemented cards which shows the details of the shop such as its geographical address, its latitude and longitude, and its distance from the user's current location. The cards are displayed in the sorted order with respect to the distance. These cards are functional, when clicked it redirects to the google map and starts a route from the user's current location to the shop's location. We have implemented the Haversine's formula to calculate the distance between the pair of two given co-ordinates(latitude & longitude). We have used Android Studio as an editor for this project and Firebase database for back-end. To connect

you android project to firebase using android studio, following are the steps to be followed:

- Open android studio and click on "Tools" in the upper left corner.
- Select "Firebase" option in the drop down menu.
- A menu will appear offering various services by firebase, select the desired service. In our case "Connect to Firebase".
- Now, create a firebase account and create a project in the firebase console.
- Fill up the necessary details it asks for. Edit the project ID if required.
- Click "Add Firebase to you android application" on the start window.
- Now, a prompt will open where to enter the package name of the application and the application will be registered with the firebase.

SHA1 certificate can also be provided to the application by following steps:

- Go to android studio project => Gradle => Root Folder => Tasks => Android => Signing Report => Copy SHA1 from console.
- Now download the google-services.json file and place it in the root directory of the android app.
- Add the following code in the PROJECT\_LEVEL build.gradle of the app.

```
buildscript {  
    dependencies {  
        classpath 'com.google.gms:google-services:4.0.0'  
    }  
}
```

- Add the following code to APP\_LEVEL build.gradle of the app.

```
dependencies {  
    compile 'com.google.firebase:firebase-core:16.0.0'  
}
```

- Now, sync the gradle by clicking on "sync now" and firebase will be successfully installed.

## 6. FEATURES OF LOCATION BASED OFFERS

### 1. Easy to detect offers

Visiting shops during festive season and deciding what to shop has always been a task for almost everyone. In this situation, the user doesn't have to visit every store and checkout their sales and offers not he/she has to visit

websites of every store. The application will notify the nearby offers to the user through notification and will help decide the user where is the sale going on.

## 2. Help vendors and shopkeepers

This application will send notification to the people which are the nearby the shop which has live offers going on, thus increasing the potential customers to visit the shop.

## 3. Machine Learning integration

The application can further be integrated with various machine learning algorithms to study the user's browsing pattern for the shops and show the results accordingly in the future.

## 4. Advertisement

Not only offers, also shopkeepers and vendors can use this application to promote their products or upcoming sale advertisement. The application will send the notification when the user passes by the shop.

## 7. RESULT

The application allows user to find and locate nearby offers and help them decide which offer will suit them best without actually visiting every store or their website. Following are the screenshots of the application showing various phases of the project.

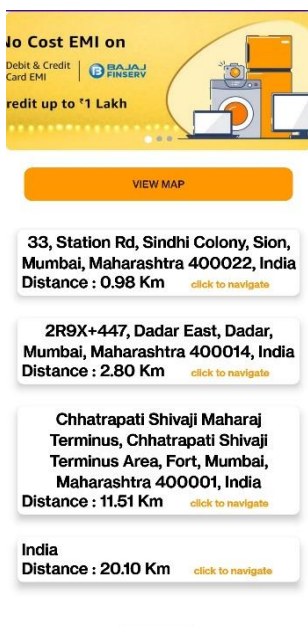


Fig 1.1

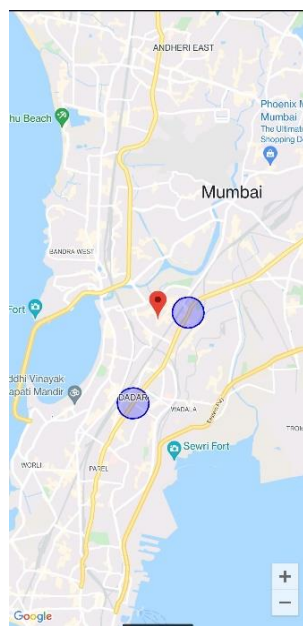


Fig 1.2

The Fig 1.1 shows the dashboard that consists of button "view map" and list of all stores having offers in sorted

manner with respect to their distance with the current user's location. The Fig 1.2 shows the map layout when view map button is clicked. The map layout contains the user's current location which is represented using the red marker and geofences of radius 500m which are represented by blue circle.

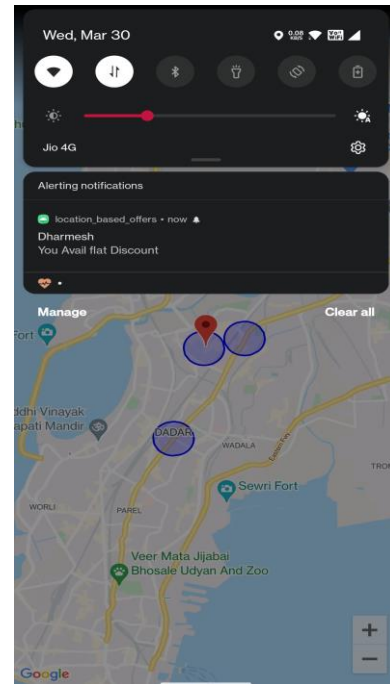


Fig 1.3

The Fig. 1.3 shows a notification saying "Avail flat discount" is received to the user when the user's current location enters the geofenced area. A similar notification saying "Thank you, visit again" is also received by the user once he exits the geofence area.

## 8. CONCLUSION

Thus, researched about various database system for android development and implemented successfully using Firebase database system. The UI of the application uses XML language and layout used are Relative, Linear, and Constraint Layout. The Back-end of the UI is coded in java programming language. For validations: error messages, Toasts, are the widgets provided by the android studio and thus implemented them successfully. The Login system is successfully able to validate the details present in the firebase database and proceed accordingly.

The registration system allows the user to create their account and store them in the database (password encrypted) and also validates if the email or the user already exists in the database or not. This module is the base of any android application and has to be implemented correctly and then proceed further.

## 9. ACKNOWLEDGEMENT

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