PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE – 411043

Department of Electronics & Telecommunication Engineering

BATCH AND ROLL NO: Q5 42441
EXPERIMENT NO.10
TITLE: Design a mobile app using Google Map and GPS to trace the location.
DATE OF PERFORMANCE:
DATE OF SUBMISSION:

Title: Design a mobile app using Google Map and GPS to trace the location.

Requirements:
1 Android studio
2.Google Play service Packages

Theory:

Introduction

In the ever-connected world of mobile applications, harnessing the power of location-based services has become essential for creating dynamic and context-aware applications. This lab focuses on designing a mobile application that integrates Google Maps and Global Positioning System (GPS) functionalities, enabling users to trace their location and visualize it on a map. The fusion of Google Maps and GPS empowers developers to craft applications that provide real-time location-based information, fostering an enriched user experience.

Objective of the Lab: The primary objective of this lab is to guide you through the process of designing a mobile application that leverages Google Maps and GPS technology. By the end of this lab, you should be adept at implementing features such as obtaining real-time location updates, displaying the user's location on a Google Map, and incorporating additional functionalities to enhance the overall location tracking experience.

Components of the Application:

1. **Google Maps Integration:**
    - The application will integrate Google Maps, allowing users to view and interact with a map interface.
    - Developers will utilize the Google Maps API to embed the map and leverage its rich features for location-based interactions.
2. **GPS Location Tracking:**
    - The application will utilize the device's GPS functionality to trace and update the user's real-time location.
    - GPS data will be used to dynamically update the user's marker on the Google Map.

Lab Prerequisites:

- Basic understanding of mobile application development concepts.
- Familiarity with the chosen development environment (e.g., Android Studio).
- Prior knowledge of programming languages such as Java (for Android)

Steps:

Step 1: Set Up Your Development Environment

- Ensure that you have Android Studio installed and configured on your machine.
- Create a new project in Android Studio.

Step 2: Obtain Google Maps API Key

- Obtain a Google Maps API key from the Google Cloud Console.
- Enable the "Maps SDK for Android" for your project.

Step 3: Add Google Maps SDK to Your Project

- Open the build.gradle file (Module: app) and add the following dependency:

  implementation 'com.google.android.gms:play-services-maps:17.0.1'

Step 4: Design the User Interface

- Open the XML layout file associated with your main activity (e.g., activity_main.xml).
- Add a SupportMapFragment or MapView element to your layout to display the Google Map.

Step 5: Implement Google Maps Integration

- Open the Java file associated with your main activity (e.g., MainActivity.java).
- Initialize the Google Map and set up its features, such as zoom controls and markers.

Step 6: Implement GPS Location Tracking

- Request permission for accessing the device's location in the AndroidManifest.xml.
- Implement a LocationListener to receive location updates.

Step 7: Test Your Application

- Run your application on an emulator or a physical device.
- Verify that the Google Map is displayed, and the user's location is updated on the map as they move.

XML Code:

activity_main.xml:

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
   xmlns:tools="http://schemas.android.com/tools"
   android:layout_width="match_parent"
   android:layout_height="match_parent"
   android:orientation="vertical"
   tools:context=".MainActivity">

   <fragment
      android:id="@+id/mapFragment"
      android:name="com.google.android.gms.maps.SupportMapFragment"
      android:layout_width="match_parent"
      android:layout_height="0dp"
      android:layout_weight="1" />

   <Button
      android:id="@+id/btnTrackLocation"
      android:layout_width="match_parent"
      android:layout_height="wrap_content"
      android:text="Track Location"
      android:background="#2196F3"
      android:textColor="@android:color/white"
      android:padding="16dp"/>
</LinearLayout>
```

google_maps_api.xml:

```
<?xml version="1.0" encoding="utf-8"?>
<resources>
   <string name="google_maps_key">My_API_Key</string>
</resources>
```

AndroidManifest.xml:

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
   package="com.example.expt10_42441">

   <uses-permission android:name="android.permission.ACCESS_FINE_LOCATION" />
   <uses-permission android:name="android.permission.INTERNET" />
   <uses-permission android:name="android.permission.ACCESS_COARSE_LOCATION" />
```

```
    <application
        android:allowBackup="true"
        android:icon="@mipmap/ic_launcher"
        android:label="@string/app_name"
        android:roundIcon="@mipmap/ic_launcher_round"
        android:supportsRtl="true"
        android:theme="@style/AppTheme">

        <meta-data
            android:name="com.google.android.geo.API_KEY"
            android:value="@string/google_maps_key" />

        <activity
            android:name=".MainActivity"
            android:exported="true">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>
</manifest>
```

Java Code:

MainActivity.java:

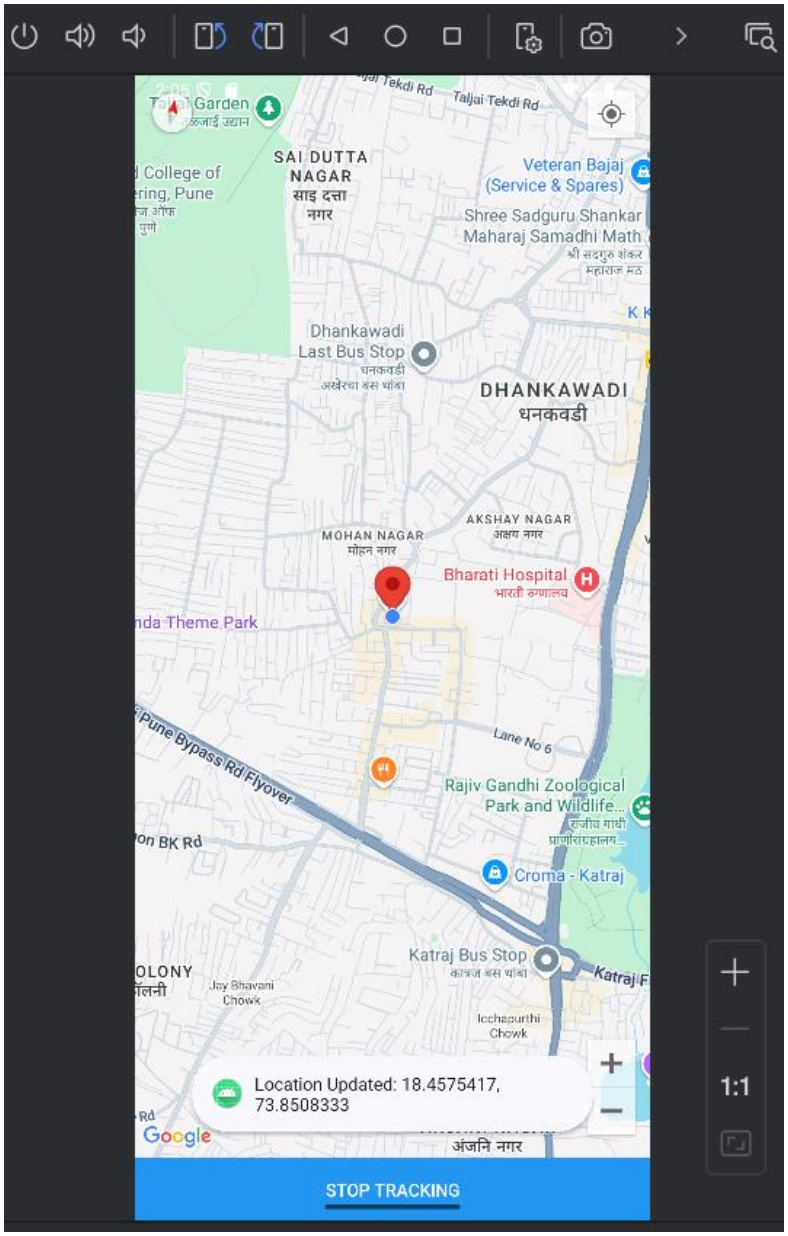
```
package com.example.expt10_42441;

import android.Manifest;
import android.content.pm.PackageManager;
import android.location.Location;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.Toast;

import androidx.annotation.NonNull;
import androidx.core.app.ActivityCompat;
import androidx.fragment.app.FragmentActivity;

import com.google.android.gms.location.FusedLocationProviderClient;
import com.google.android.gms.location.LocationCallback;
import com.google.android.gms.location.LocationRequest;
import com.google.android.gms.location.LocationResult;
import com.google.android.gms.location.LocationServices;
import com.google.android.gms.maps.CameraUpdateFactory;
import com.google.android.gms.maps.GoogleMap;
import com.google.android.gms.maps.OnMapReadyCallback;
```

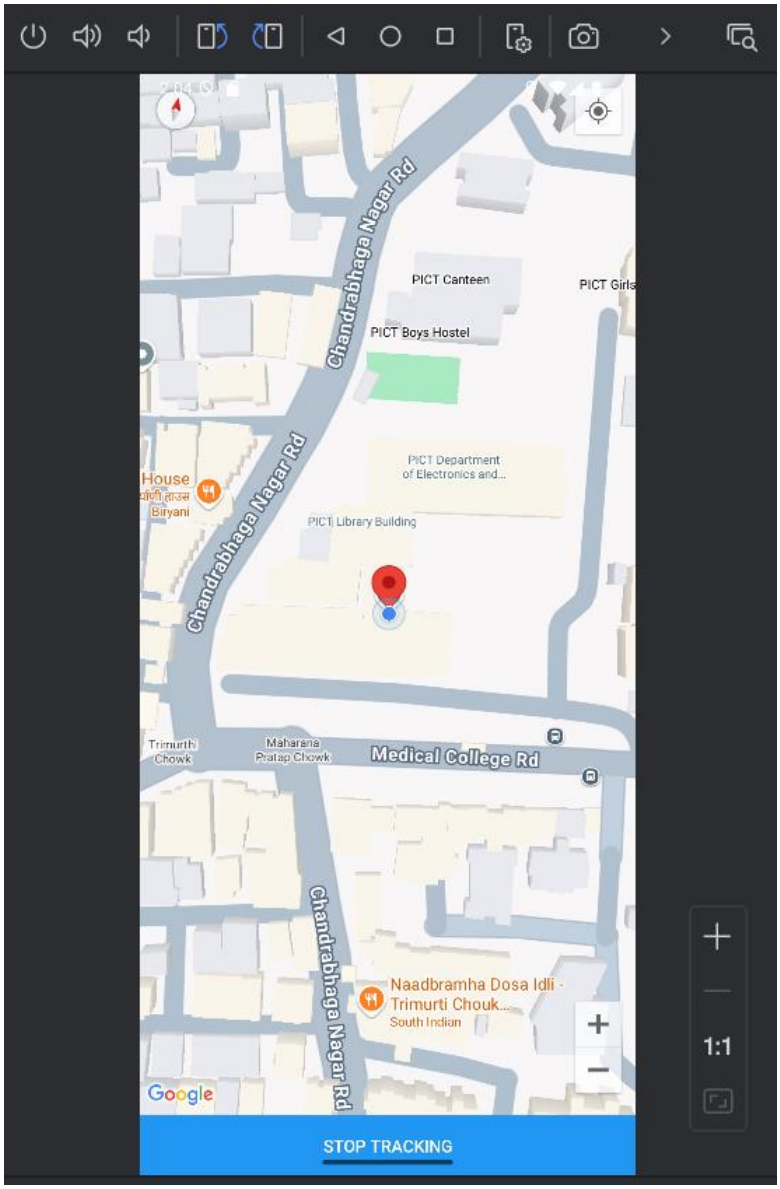
```
import com.google.android.gms.maps.SupportMapFragment;
import com.google.android.gms.maps.model.LatLng;
import com.google.android.gms.maps.model.MarkerOptions;

public class MainActivity extends FragmentActivity implements OnMapReadyCallback {
    private static final int LOCATION_PERMISSION_REQUEST_CODE = 1;
    private GoogleMap mMap;
    private FusedLocationProviderClient mFusedLocationClient;
    private LocationRequest mLocationRequest;
    private LocationCallback mLocationCallback;
    private Button btnTrackLocation;
    private boolean isTracking = false;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        // Initialize Location Services
        mFusedLocationClient = LocationServices.getFusedLocationProviderClient(this);

        // Initialize Map Fragment
        SupportMapFragment mapFragment = (SupportMapFragment) getSupportFragmentManager()
                .findFragmentById(R.id.mapFragment);
        mapFragment.getMapAsync(this);

        // Track Location Button
        btnTrackLocation = findViewById(R.id.btnTrackLocation);
        btnTrackLocation.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                toggleLocationTracking();
            }
        });

        createLocationRequest();
        createLocationCallback();
    }

    private void createLocationRequest() {
        mLocationRequest = LocationRequest.create()
                .setInterval(100000)
                .setFastestInterval(50000)
                .setPriority(LocationRequest.PRIORITY_HIGH_ACCURACY);
    }
```

```
private void createLocationCallback() {
   mLocationCallback = new LocationCallback() {
      @Override
      public void onLocationResult(LocationResult locationResult) {
         if (locationResult == null) {
            return;
         }
         for (Location location : locationResult.getLocations()) {
            updateMapLocation(location);
         }
      }
   };
}

private void toggleLocationTracking() {
   if (checkLocationPermission()) {
      if (!isTracking) {
         startLocationUpdates();
         btnTrackLocation.setText("Stop Tracking");
         isTracking = true;
      } else {
         stopLocationUpdates();
         btnTrackLocation.setText("Track Location");
         isTracking = false;
      }
   }
}

private void startLocationUpdates() {
   try {
      mFusedLocationClient.requestLocationUpdates(mLocationRequest,
            mLocationCallback, null);
   } catch (SecurityException e) {
      e.printStackTrace();
   }
}

private void stopLocationUpdates() {
   mFusedLocationClient.removeLocationUpdates(mLocationCallback);
}

private boolean checkLocationPermission() {
   if (ActivityCompat.checkSelfPermission(this,
         Manifest.permission.ACCESS_FINE_LOCATION)
         != PackageManager.PERMISSION_GRANTED) {

      ActivityCompat.requestPermissions(this,
            new String[]{Manifest.permission.ACCESS_FINE_LOCATION},
            LOCATION_PERMISSION_REQUEST_CODE);
      return false;
   }
   return true;
}
```

```
@Override
public void onMapReady(GoogleMap googleMap) {
    mMap = googleMap;

    if (checkLocationPermission()) {
        mMap.setMyLocationEnabled(true);
    }

    mMap.getUiSettings().setZoomControlsEnabled(true);
}

private void updateMapLocation(Location location) {
    LatLng currentLocation = new LatLng(location.getLatitude(), location.getLongitude());

    mMap.clear();  // Clear previous markers
    mMap.addMarker(new MarkerOptions()
            .position(currentLocation)
            .title("Your Current Location"));

    mMap.moveCamera(CameraUpdateFactory.newLatLngZoom(currentLocation, 15));

    Toast.makeText(this,
            "Location Updated: " + location.getLatitude() + ", "
                    + location.getLongitude(),
            Toast.LENGTH_SHORT).show();
}

@Override
public void onRequestPermissionsResult(int requestCode,
                                       @NonNull String[] permissions, @NonNull int[] grantResults) {
    super.onRequestPermissionsResult(requestCode, permissions, grantResults);

    if (requestCode == LOCATION_PERMISSION_REQUEST_CODE) {
        if (grantResults.length > 0 &&
                grantResults[0] == PackageManager.PERMISSION_GRANTED) {

            if (checkLocationPermission()) {
                mMap.setMyLocationEnabled(true);
            }
        } else {
            Toast.makeText(this,
                    "Location permission denied",
                    Toast.LENGTH_SHORT).show();
        }
    }
}
```

Output:


Taljai Tekdi Rd
SAI DUTTA NAGAR
साइ दत्ता नगर
Veteran Bajaj (Service & Spares)
Shree Sadguru Shankar Maharaj Samadhi Math
Dhankawadi Last Bus Stop
DHANKAWADI
धनकवडी
MOHAN NAGAR
AKSHAY NAGAR
Bharati Hospital
Pune Bypass Rd Flyover
Lane No 6
Rajiv Gandhi Zoological Park and Wildlife...
Croma - Katraj
Katraj Bus Stop
Joy Bhavani Chowk
Icchapurthi Chowk
Location Updated: 18.4575417, 73.8508333
Google
अंजनि नगर
STOP TRACKING
1:1


Chandrabhaga Nagar Rd
PICT Canteen
PICT Girls
PICT Boys Hostel
PICT Department of Electronics and...
House
Biryani
PICT Library Building
Trimurti Chowk
Maharana Pratap Chowk
Medical College Rd
Naadbramha Dosa Idli - Trimurti Chouk...
South Indian
Google
1:1
STOP TRACKING

Conclusion:

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