**Q.1) Write a Program to draw a route between two locations.**

**Code:**

**MapActivity.java:**

package com.example.myapplication;

import android.Manifest;

import android.content.pm.PackageManager;

import android.graphics.Color;

import android.location.Location;

import android.os.AsyncTask;

import android.os.Build;

import android.os.Bundle;

import android.util.Log;

import android.widget.Toast;

import androidx.core.app.ActivityCompat;

import androidx.core.content.ContextCompat;

import androidx.fragment.app.FragmentActivity;

import com.google.android.gms.common.ConnectionResult;

import com.google.android.gms.common.api.GoogleApiClient;

import com.google.android.gms.location.LocationListener;

import com.google.android.gms.location.LocationRequest;

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.BitmapDescriptorFactory;

import com.google.android.gms.maps.model.LatLng;

import com.google.android.gms.maps.model.Marker;

import com.google.android.gms.maps.model.MarkerOptions;

import com.google.android.gms.maps.model.PolylineOptions;

import org.json.JSONObject;

import java.io.BufferedReader;

import java.io.IOException;

import java.io.InputStream;

import java.io.InputStreamReader;

import java.net.HttpURLConnection;

import java.net.URL;

import java.util.ArrayList;

import java.util.HashMap;

import java.util.List;

public class MapsActivity extends FragmentActivity implements OnMapReadyCallback,

GoogleApiClient.ConnectionCallbacks,

GoogleApiClient.OnConnectionFailedListener,

LocationListener {

private GoogleMap mMap;

ArrayList<LatLng> MarkerPoints;

GoogleApiClient mGoogleApiClient;

Location mLastLocation;

Marker mCurrLocationMarker;

LocationRequest mLocationRequest;

@Override

protected void onCreate(Bundle savedInstanceState) {

super.onCreate(savedInstanceState);

setContentView(R.layout.activity\_maps);

if (android.os.Build.VERSION.SDK\_INT >= Build.VERSION\_CODES.M) {

checkLocationPermission();

}

// Initializing

MarkerPoints = new ArrayList<>();

// Obtain the SupportMapFragment and get notified when the map is ready to be used.

SupportMapFragment mapFragment = (SupportMapFragment) getSupportFragmentManager()

.findFragmentById(R.id.map);

mapFragment.getMapAsync(this);

}

/\*\*

\* Manipulates the map once available.

\* This callback is triggered when the map is ready to be used.

\* This is where we can add markers or lines, add listeners or move the camera. In this case,

\* we just add a marker near Sydney, Australia.

\* If Google Play services is not installed on the device, the user will be prompted to install

\* it inside **the SupportMapFragment.** This method will only be triggered once the user has

\* installed Google Play services and returned to the app.

\*/

@Override

public void onMapReady(GoogleMap googleMap) {

mMap = googleMap;

**//Initialize Google Play Services**

if (android.os.Build.VERSION.SDK\_INT >= Build.VERSION\_CODES.M) {

if (ContextCompat.checkSelfPermission(this,

Manifest.permission.ACCESS\_FINE\_LOCATION)

== PackageManager.PERMISSION\_GRANTED) {

buildGoogleApiClient();

mMap.setMyLocationEnabled(true);

}

}

else {

buildGoogleApiClient();

mMap.setMyLocationEnabled(true);

}

**// Setting onclick event listener for the map**

mMap.setOnMapClickListener(new GoogleMap.OnMapClickListener() {

@Override

public void onMapClick(LatLng point) {

// Already two locations

if (MarkerPoints.size() > 1) {

MarkerPoints.clear();

mMap.clear();

}

// Adding new item to the ArrayList

MarkerPoints.add(point);

**// Creating MarkerOptions**

MarkerOptions options = new MarkerOptions();

// Setting the position of the marker

options.position(point);

**/\*\***

**\* For the start location, the color of marker is GREEN and**

**\* for the end location, the color of marker is RED.**

**\*/**

if (MarkerPoints.size() == 1) {

options.icon(BitmapDescriptorFactory.defaultMarker(BitmapDescriptorFactory.HUE\_GREEN));

} else if (MarkerPoints.size() == 2) {

options.icon(BitmapDescriptorFactory.defaultMarker(BitmapDescriptorFactory.HUE\_RED));

}

**// Add new marker to the Google Map Android API** V2

mMap.addMarker(options);

// Checks, whether start and end locations are captured

if (MarkerPoints.size() >= 2) {

LatLng origin = MarkerPoints.get(0);

LatLng dest = MarkerPoints.get(1);

**// Getting URL to the Google Directions API**

String url = getUrl(origin, dest);

Log.d("onMapClick", url.toString());

FetchUrl FetchUrl = new FetchUrl();

// Start downloading json data from Google Directions API

FetchUrl.execute(url);

//move map camera

mMap.moveCamera(CameraUpdateFactory.newLatLng(origin));

mMap.animateCamera(CameraUpdateFactory.zoomTo(11));

}

}

});

}

private String getUrl(LatLng origin, LatLng dest) {

// Origin of route

String str\_origin = "origin=" + origin.latitude + "," + origin.longitude;

// Destination of route

String str\_dest = "destination=" + dest.latitude + "," + dest.longitude;

// Sensor enabled

String sensor = "sensor=false";

// Building the parameters to the web service

String parameters = str\_origin + "&" + str\_dest + "&" + sensor;

// Output format

String output = "json";

// Building the url to the web service

String url = "https://maps.googleapis.com/maps/api/directions/" + output + "?" + parameters;

return url;

}

/\*\*

\* A method to download json data from url

\*/

private String downloadUrl(String strUrl) throws IOException {

String data = "";

InputStream iStream = null;

HttpURLConnection urlConnection = null;

try {

URL url = new URL(strUrl);

// Creating an http connection to communicate with url

urlConnection = (HttpURLConnection) url.openConnection();

// Connecting to url

urlConnection.connect();

// Reading data from url

iStream = urlConnection.getInputStream();

BufferedReader br = new BufferedReader(new InputStreamReader(iStream));

StringBuffer sb = new StringBuffer();

String line = "";

while ((line = br.readLine()) != null) {

sb.append(line);

}

data = sb.toString();

Log.d("downloadUrl", data.toString());

br.close();

} catch (Exception e) {

Log.d("Exception", e.toString());

} finally {

iStream.close();

urlConnection.disconnect();

}

return data;

}

// Fetches data from url passed

private class FetchUrl extends AsyncTask<String, Void, String> {

@Override

protected String doInBackground(String... url) {

// For storing data from web service

String data = "";

try {

// Fetching the data from web service

data = downloadUrl(url[0]);

Log.d("Background Task data", data.toString());

} catch (Exception e) {

Log.d("Background Task", e.toString());

}

return data;

}

@Override

protected void onPostExecute(String result) {

super.onPostExecute(result);

ParserTask parserTask = new ParserTask();

// Invokes the thread for parsing the JSON data

parserTask.execute(result);

}

}

/\*\*

\* A class to parse the Google Places in JSON format

\*/

private class ParserTask extends AsyncTask<String, Integer, List<List<HashMap<String, String>>>> {

// Parsing the data in non-ui thread

@Override

protected List<List<HashMap<String, String>>> doInBackground(String... jsonData) {

JSONObject jObject;

List<List<HashMap<String, String>>> routes = null;

try {

jObject = new JSONObject(jsonData[0]);

Log.d("ParserTask",jsonData[0].toString());

DataParser parser = new DataParser();

Log.d("ParserTask", parser.toString());

// Starts parsing data

routes = parser.parse(jObject);

Log.d("ParserTask","Executing routes");

Log.d("ParserTask",routes.toString());

} catch (Exception e) {

Log.d("ParserTask",e.toString());

e.printStackTrace();

}

return routes;

}

// Executes in UI thread, after the parsing process

@Override

protected void onPostExecute(List<List<HashMap<String, String>>> result) {

ArrayList<LatLng> points;

PolylineOptions lineOptions = null;

// Traversing through all the routes

for (int i = 0; i < result.size(); i++) {

points = new ArrayList<>();

lineOptions = new PolylineOptions();

// Fetching i-th route

List<HashMap<String, String>> path = result.get(i);

// Fetching all the points in i-th route

for (int j = 0; j < path.size(); j++) {

HashMap<String, String> point = path.get(j);

double lat = Double.parseDouble(point.get("lat"));

double lng = Double.parseDouble(point.get("lng"));

LatLng position = new LatLng(lat, lng);

points.add(position);

}

// Adding all the points in the route to LineOptions

lineOptions.addAll(points);

lineOptions.width(10);

lineOptions.color(Color.RED);

Log.d("onPostExecute","onPostExecute lineoptions decoded");

}

// Drawing polyline in the Google Map for the i-th route

if(lineOptions != null) {

mMap.addPolyline(lineOptions);

}

else {

Log.d("onPostExecute","without Polylines drawn");

}

}

}

protected synchronized void buildGoogleApiClient() {

mGoogleApiClient = new GoogleApiClient.Builder(this)

.addConnectionCallbacks(this)

.addOnConnectionFailedListener(this)

.addApi(LocationServices.API)

.build();

mGoogleApiClient.connect();

}

@Override

public void onConnected(Bundle bundle) {

mLocationRequest = new LocationRequest();

mLocationRequest.setInterval(1000);

mLocationRequest.setFastestInterval(1000);

mLocationRequest.setPriority(LocationRequest.PRIORITY\_BALANCED\_POWER\_ACCURACY);

if (ContextCompat.checkSelfPermission(this,

Manifest.permission.ACCESS\_FINE\_LOCATION)

== PackageManager.PERMISSION\_GRANTED) {

LocationServices.FusedLocationApi.requestLocationUpdates(mGoogleApiClient, mLocationRequest, this);

}

}

@Override

public void onConnectionSuspended(int i) {

}

@Override

public void onLocationChanged(Location location) {

mLastLocation = location;

if (mCurrLocationMarker != null) {

mCurrLocationMarker.remove();

}

//Place current location marker

LatLng latLng = new LatLng(location.getLatitude(), location.getLongitude());

MarkerOptions markerOptions = new MarkerOptions();

markerOptions.position(latLng);

markerOptions.title("Current Position");

markerOptions.icon(BitmapDescriptorFactory.defaultMarker(BitmapDescriptorFactory.HUE\_MAGENTA));

mCurrLocationMarker = mMap.addMarker(markerOptions);

//move map camera

mMap.moveCamera(CameraUpdateFactory.newLatLng(latLng));

mMap.animateCamera(CameraUpdateFactory.zoomTo(11));

//stop location updates

if (mGoogleApiClient != null) {

LocationServices.FusedLocationApi.removeLocationUpdates(mGoogleApiClient, this);

}

}

@Override

public void onConnectionFailed(ConnectionResult connectionResult) {

}

public static final int MY\_PERMISSIONS\_REQUEST\_LOCATION = 99;

public boolean checkLocationPermission(){

if (ContextCompat.checkSelfPermission(this,

Manifest.permission.ACCESS\_FINE\_LOCATION)

!= PackageManager.PERMISSION\_GRANTED) {

// Asking user if explanation is needed

if (ActivityCompat.shouldShowRequestPermissionRationale(this,

Manifest.permission.ACCESS\_FINE\_LOCATION)) {

// Show an explanation to the user \*asynchronously\* -- don't block

// this thread waiting for the user's response! After the user

// sees the explanation, try again to request the permission.

//Prompt the user once explanation has been shown

ActivityCompat.requestPermissions(this,

new String[]{Manifest.permission.ACCESS\_FINE\_LOCATION},

MY\_PERMISSIONS\_REQUEST\_LOCATION);

} else {

// No explanation needed, we can request the permission.

ActivityCompat.requestPermissions(this,

new String[]{Manifest.permission.ACCESS\_FINE\_LOCATION},

MY\_PERMISSIONS\_REQUEST\_LOCATION);

}

return false;

} else {

return true;

}

}

@Override

public void onRequestPermissionsResult(int requestCode,

String permissions[], int[] grantResults) {

switch (requestCode) {

case MY\_PERMISSIONS\_REQUEST\_LOCATION: {

// If request is cancelled, the result arrays are empty.

if (grantResults.length > 0

&& grantResults[0] == PackageManager.PERMISSION\_GRANTED) {

// permission was granted. Do the

// contacts-related task you need to do.

if (ContextCompat.checkSelfPermission(this,

Manifest.permission.ACCESS\_FINE\_LOCATION)

== PackageManager.PERMISSION\_GRANTED) {

if (mGoogleApiClient == null) {

buildGoogleApiClient();

}

mMap.setMyLocationEnabled(true);

}

} else {

// Permission denied, Disable the functionality that depends on this permission.

Toast.makeText(this, "permission denied", Toast.LENGTH\_LONG).show();

}

return;

}

// other 'case' lines to check for other permissions this app might request.

// You can add here other case statements according to your requirement.

}

}

}

**DataParser.java:**

package com.example.myapplication;

import com.google.android.gms.maps.model.LatLng;

import org.json.JSONArray;

import org.json.JSONException;

import org.json.JSONObject;

import java.util.ArrayList;

import java.util.HashMap;

import java.util.List;

public class DataParser {

/\*\* Receives a JSONObject and returns a list of lists containing latitude and longitude \*/

public List<List<HashMap<String,String>>> parse(JSONObject jObject){

List<List<HashMap<String, String>>> routes = new ArrayList<>() ;

JSONArray jRoutes;

JSONArray jLegs;

JSONArray jSteps;

try {

jRoutes = jObject.getJSONArray("routes");

/\*\* Traversing all routes \*/

for(int i=0;i<jRoutes.length();i++){

jLegs = ( (JSONObject)jRoutes.get(i)).getJSONArray("legs");

List path = new ArrayList<>();

/\*\* Traversing all legs \*/

for(int j=0;j<jLegs.length();j++){

jSteps = ( (JSONObject)jLegs.get(j)).getJSONArray("steps");

/\*\* Traversing all steps \*/

for(int k=0;k<jSteps.length();k++){

String polyline = "";

polyline = (String)((JSONObject)((JSONObject)jSteps.get(k)).get("polyline")).get("points");

List<LatLng> list = decodePoly(polyline);

/\*\* Traversing all points \*/

for(int l=0;l<list.size();l++){

HashMap<String, String> hm = new HashMap<>();

hm.put("lat", Double.toString((list.get(l)).latitude) );

hm.put("lng", Double.toString((list.get(l)).longitude) );

path.add(hm);

}

}

routes.add(path);

}

}

} catch (JSONException e) {

e.printStackTrace();

}catch (Exception e){

}

return routes;

}

/\*\*

\* Method to decode polyline points

\* Courtesy : http://jeffreysambells.com/2010/05/27/decoding-polylines-from-google-maps-direction-api-with-java

\* \*/

private List<LatLng> decodePoly(String encoded) {

List<LatLng> poly = new ArrayList<>();

int index = 0, len = encoded.length();

int lat = 0, lng = 0;

while (index < len) {

int b, shift = 0, result = 0;

do {

b = encoded.charAt(index++) - 63;

result |= (b & 0x1f) << shift;

shift += 5;

} while (b >= 0x20);

int dlat = ((result & 1) != 0 ? ~(result >> 1) : (result >> 1));

lat += dlat;

shift = 0;

result = 0;

do {

b = encoded.charAt(index++) - 63;

result |= (b & 0x1f) << shift;

shift += 5;

} while (b >= 0x20);

int dlng = ((result & 1) != 0 ? ~(result >> 1) : (result >> 1));

lng += dlng;

LatLng p = new LatLng((((double) lat / 1E5)),

(((double) lng / 1E5)));

poly.add(p);}

return poly;

}}

**XML:**

<?xml version="1.0" encoding="utf-8"?>

<fragment xmlns:android="http://schemas.android.com/apk/res/android"

xmlns:map="http://schemas.android.com/apk/res-auto"

xmlns:tools="http://schemas.android.com/tools"

android:id="@+id/map"

android:name="com.google.android.gms.maps.SupportMapFragment"

android:layout\_width="match\_parent"

android:layout\_height="match\_parent"

tools:context=".MapsActivity" />

**AndroidManifest:**

<?xml version="1.0" encoding="utf-8"?>

<manifest xmlns:android="http://schemas.android.com/apk/res/android"

package="com.example.myapplication">

<uses-permission android:name="com.javapapers.currentlocationinmap.permission.MAPS\_RECEIVE" />

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

<uses-permission android:name="android.permission.WRITE\_EXTERNAL\_STORAGE" />

<uses-permission android:name="com.google.android.providers.gsf.permission.READ\_GSERVICES" />

<uses-permission android:name="android.permission.ACCESS\_COARSE\_LOCATION" />

<uses-permission android:name="android.permission.ACCESS\_FINE\_LOCATION" />

<uses-permission android:name="android.permission.ACCESS\_NETWORK\_STATE" />

<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">

<!--

The API key for Google Maps-based APIs is defined as a string resource.

(See the file "res/values/google\_maps\_api.xml").

Note that the API key is linked to the encryption key used to sign the APK.

You need a different API key for each encryption key, including the release key that is used to

sign the APK for publishing.

You can define the keys for the debug and release targets in src/debug/ and src/release/.

-->

<meta-data

android:name="com.google.android.geo.API\_KEY"

android:value="@string/google\_maps\_key" />

<activity

android:name=".MapsActivity"

android:label="@string/title\_activity\_maps">

<intent-filter>

<action android:name="android.intent.action.MAIN" />

<category android:name="android.intent.category.LAUNCHER" />

</intent-filter>

</activity>

</application>

</manifest>

**Output:**



