

**REPUBLIC OF TURKEY  
FIRAT UNIVERSITY  
THE INSTITUTE OF NATURAL AND APPLIED  
SCIENCE**



**DYNAMIC DATA COLLECTION ON DIGITAL MAPS  
USING ANDROID SMARTPHONE**

**Master Thesis  
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**October - 2017**

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**October -2017**

## **DECLARATION**

I declare that this thesis entitled “DYNAMIC DATA COLLECTION ON DIGITAL MAPS USING ANDROID SMARTPHONE” is the result of my own research except for quoted texts and ideas as cited in the references. The thesis has not been accepted for any degree and it is not concurrently submitted in the candidature of any other institution.

**Shirwan Rashid ABDALRAHMAN**

**Elazığ/TURKEY - 2017**



## **DEDICATION**

To the family of Shirwan Rashid Abdulrahman with all my appreciation to all those who have supported me from the beginning of my study until its end.



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**Shirwan Rashid ABDALRAHMAN**

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## ABSTRACT

Smartphone is the term given to the present day mobile phones that utilize tasteful working frameworks and bigger interactive touch display screens, which are used as an interface for the user to run versatile applications. On the off chance that no declaration is made by the producers on the typical meaning of the cell phone, some of them view the cell phone as a phone that offers the upsides of browsing the Internet, synchronizing electronic mails, reading and editing MS Office documents, as well as having a full “QWERTY” console. However, generally, the most commonly referred to nowadays is the cellphone that deals with one of the accompanying working frameworks such as Windows, Symbian or its subordinates, Linux or its subsidiaries and Blackberry. These cannot be categorized as one-of-a-kind from laptops, private computers or any other system in history, they rather can be all smart devices that consist of a two-part complimentary to each other, namely the hardware, the physical section that is visible to touch, and the software which is the programmatic operator section of the system (operating system), which runs the hardware in order to do the required job. The explosive growing statistics onto smartphone stations have quite a few outlooks of value for service companies and operators, such as teaching consumer knowledge, mobile units selling, and useful resource allocation, etc.

The earlier studies on smartphones are incomplete in general measures for more applications which are needed for the daily activities. In this study, a dynamic information inquiry’s device is offered to find out the machine records onto a series of analysis. The realization of the statistics series is done for a good measure using a live method. Therefore, the analysis motive is also designed to adapt to the dynamic additions of data. Also, this method can be typically extended with different modules; these system interfaces can be incorporated using data resources on Digital Maps.

In this thesis, we have collected information from digital maps using mobile devices android based smart equipment. For this purpose, Google maps are used. A map of a selected region has been used to identify places with vital prescriptions (hospitals, schools, shopping mall, restaurants, etc.). This data is presented in the tables as statistical data.

**Keywords:** Smartphone, Digital Map, Mobile Data, Android Operating Systems, Database, GPS Sensor

## ÖZET

### AKILLI TELEFON KULLANARAK SAYISAL HARİTALAR ÜZERİNDEN DİNAMİK VERİ TOPLAMA

Akıllı telefonlar, günümüzde eğlenceli çalışma ortamı sağlayan ve kullanıcıya çok yönlü uygulamaları çalıştırmak için bir arayüz olarak kullanılan daha büyük etkileşimli dokunmatik ekranı olan mobil telefonlara verilen terimdir. Cep telefonlarının geleneksel anlamı konusunda üretici firmaların her hangi bir açıklama yapmamasına binaen, bazıları cep telefonunu internete göz atma imkânı tanıyan, elektronik postaları senkronize eden ve MS Office belgelerini açan ve tam bir “QWERTY” klavye konsollu telefon olarak görüyor. Bununla birlikte, günümüzde cep telefonuna eşlik eden en yaygın olarak kullanılan Windows, Symbian ve alt türevleri, Linux ve alt türevleri, Blackberry işletim sistemleri ile de ilgilenilir. Akıllı telefonlar, dizüstü bilgisayarlar, özel bilgisayarlar veya tarihteki başka herhangi bir sistemin bir türü olarak sınıflandırılmazlar. Bunlar daha ziyade, birbirlerine tamamlayan fiziksel parçaların tümü olan donanım ile donanımın işlerliği için gerekli olan yazılım gibi iki bileşen içeren akıllı cihazlardır. Akıllı telefon istasyonları üzerine giderek büyüyen istatistikler, hizmet sunan şirketler ve operatörler için oldukça önemli sonuçları içerirler; tüketici eğilim bilgisi, mobil üniteleri satanlar ve faydalı kaynakların paylaşımı vb.

Akıllı telefonlarla ilgili önceki çalışmalar, günlük etkinlikler için ihtiyaç duyulan daha fazla uygulama için sayısal bazda tamamlanmamıştır. Bu çalışmada, dinamik bilgi sorgulama hizmetine yönelik olarak, makina kayıt dizilerinin analizi ile ortaya çıkarılması önerilmektedir. İstatistiksel serilerin anlamlandırılması, tasarlanan dinamik bir filtreleme yöntemi kullanılarak yapılır. Bu şekilde yapılacak analizin bir diğer amacı da, verilerin dinamik ilavelerine uyum sağlayacak biçimde tasarımın yapılmasıdır. Ayrıca, önerilen bu yöntem modüller ile genişletilebilir; bu sistemlerin arayüzleri sayısal haritalar üzerindeki veri kaynakları kullanılarak birleştirilebilir.

Bu tez çalışmasında, android tabanlı mobil akıllı ekipmanlar kullanarak sayısal haritalardan bilgi derlenmiştir. Bunun için Google haritalar kullanılmıştır. Seçilen bir bölgenin haritasından yaşamsal öneme sahip yerlerin (hastane, okul, alışveriş merkezi, lokanta, v.b.) tespiti yapılmıştır. Bu veriler istatistiki olarak tablolarda sunulmuştur.

**Anahtar Kelimeler:** Akıllı Telefonlar, Sayısal Harita, Mobil Veri, Android İşletim Sistemi, Veritabanı, GPS alıcısı.

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## **SYMBOLS AND ABBREVIATIONS**

|             |                                                |
|-------------|------------------------------------------------|
| <b>API</b>  | : Application Program Interface                |
| <b>AVD</b>  | : Android Virtual Device                       |
| <b>CDMA</b> | : Code Division Multiple Access                |
| <b>CSS</b>  | : Cascading Style Sheets                       |
| <b>DNS</b>  | : Domain Name System                           |
| <b>DOS</b>  | : Disk Operating System                        |
| <b>DTW</b>  | : Dynamic Time Warping                         |
| <b>FDMA</b> | : Frequency Division Multiple Access           |
| <b>GGSN</b> | : Gateway GPRS Support Node                    |
| <b>GPRS</b> | : General Packet Radio Service                 |
| <b>GPS</b>  | : Global Positioning System                    |
| <b>HTML</b> | : Hypertext Markup Language                    |
| <b>IDE</b>  | : Integrated Development Environment           |
| <b>IMSI</b> | : International Mobile Subscriber Identity     |
| <b>IOS</b>  | : Internet Operating System                    |
| <b>ISP</b>  | : Internet Service Provider                    |
| <b>MSc</b>  | : Master of Science                            |
| <b>OBD</b>  | : Outbound Dialing                             |
| <b>PDA</b>  | : Personal Digital Assistant                   |
| <b>PEAP</b> | : Protected Extensible Authentication Protocol |
| <b>PSTN</b> | : Public Switched Telephone Network            |
| <b>SDK</b>  | : Software Development Kit                     |
| <b>SGSN</b> | : Serving GPRS Support Node                    |
| <b>SQL</b>  | : Structured Query Language                    |
| <b>UML</b>  | : Unified Modeling Language                    |
| <b>XML</b>  | : Extensible Markup Language                   |

## **1. INTRODUCTION**

Data collection of the smartphone means collecting information about applications' installed on smartphones. Simply, one can imagine the data produced by OS, GUI, measurement, GPS, ScanCam, and so on. Some advanced models of smartphones have been gaining more and more reputation in recent years, especially for the collection of movement-travel data. This is reflected in the development of daily necessary applications to solve practical problems, for instance, fixing sensors such as GPS and thermometer on the smartphones. The new phone is very intelligent and capable of capturing raw data suitable for knowing a person's daily action rhythms and existing benefits of extra collection procedures [1]. For more clarity, compared to the old-style transportable file records, smartphones offer a correct information about the trips and location, and the most difficult of under-reporting of short trips. One benefit of smartphones is that individuals have a tendency to carry them almost in all places they go. Moreover, their operational processes are more likely to quickly consume the battery energy [2].

Data groups are collected to their attendants, including users' Internet present, set up applications, etc. The technologies of the smartphone are providing a number of approval systems, the process is the respectable sample to display that they create use of data investigation and collection of more information about this collection. A lot of exploring mostly gets to the data onto several ISPs or similar organizations. The datasets cannot hold the sample of new information, as an outcome that develops restriction to do a complete exploration. As the number they hold is correct, they cannot make a query dynamically. Smartphones are becoming a great mobile phone for communications and universal computing; even in growing countries which are slowly upgrading the previous generations of phones. The smartphones are mostly nice-looking and smart for the users. They help to get information about many things because of their rate active leading and answering the easy way [3].

### **1.1. Related Work**

Many researchers proposed several definitions of the system architecture of smartphone in the literature, among these definitions is one provided by Fuchao Zhou

(2011). The author proposed a system in order to identify opinion leaders based on user blood station and common data obtained from smartphones analysis. Here, the author proposed a model that adopts two main stages in the identification of the opinion leaders. Bloodstain age estimation based on recent studies on the blood spot to determine the period elapsed for the deposition of bloodstains, which can provide timely information benefited from the official investigation. This project used, at its beginning, smartphones' cameras for collecting a low-cost lighting framework as a device to retain the age of the blood spots. Blood stains on various substrates were filmed using a smartphone camera, then, this process was compared using two smartphones (Samsung Galaxy S Plus and Apple iPhone 4), which basically leads to a health testing ability at home [10].

The work conducted by Gert-Jan Steeneveld and Berthold K. P. Horn (2013) developed the concept of smartphone thermometer. Here, an everyday software program to follow the temperature hints in the user's cell phone was developed. The application was able to show the temperature subsequent on a mobile smartphone. With an appropriate design and predominant accuracy, that's remained the default technique to check the temperature instantly. However, it's very indispensable to make certain that the used smartphone has a temperature sensor. Besides, this machine software can exceptionally show the temperature available on the Internet, similar to what is offered by the local weather App. The smartphones are generally having the ability to connect to GPS for measuring the temperature in a specified area [11].

The system of smartphone's architecture is explained by Mayank Goel (2012). The architecture cares about creating sensing applications that differ from three main extents: communication station, mobile configuration and data format [21]. Another definition of the useful source of Vana Kalogeraki (2012) described it as "the structure entails of two series of software utility mechanisms strolling on wise phones and a map decrease server, this is the use of a series the contract giving out at the sensor"[23], [25].

There are many programs for smartphones which have been defined with the aid researchers' usage; for instance, M. Narmatha and S. Venkata KrishnaKumar (2016) defined them as a "study on Android operating system and its versions changeable for procedure". The transportation accumulates data onto accelerometer and device computerized experiments, Wi-Fi, GPS and digital cam available in different machines with cell phone sensors that are saved from most people. Viewing those trails needs networking and minimum energy, utilized in a non-intrusive method. The (testbed) hires a

mild –weight sandbox to the most amount of storage and community resources used inside the device. To defend closing consumer’s gadgets from horrible attackers, the sandbox constructions are powerfully isolated from any other computing device at the equator [26].

## **1.2. The Aim of the Study**

Smartphones are the principal share of the computing structure. There is a motivation to familiarize cellular units to encourage devices traditionally deliberate for standard PCs or customized hardware. Greater data information series of smartphones define intended at lowering enhancement partitions of sensor-based cellular applications. This is most beneficial in sponsoring efforts; as extraordinarily technical resources are fairly scarce in many shares of the developing world. Three dimensions of variability in common detecting applications are recognized, specifically: verbal exchange channel, records series style, and machine configuration. The purpose of this thesis is to show more data about smartphone applications. In addition, developing an application feature that can be used while traveling for locating vital nearby neighborhoods.

## **1.3. Thesis Organization**

**Chapter one:** Introduction about data collection of smartphones, Google Maps and some other applications used in smartphones which are vital in our life.

**Chapter two:** Background and the purpose of data collection of the smartphone. Also, the application of Android Google Maps and its other necessary developing environments, such as Android Studio program, Cam-scanner, Android Bluetooth and Range-Finger. In addition, elaborating the steps calculation and distance measurement with estimating driving behavior by smartphone.

**Chapter three:** System architecture and Crowdsourcing data collection, visualization diagram and estimating the drivers of the smartphone. In addition, location and maps with other important parts related to Android Studio which are explained in details.

**Chapter four:** The design optimization and the obtained results from the developed system with the map view, this is explained in the following points:

1. The first step is to start the process and get the IDE set up for the Android Development.
  - Eclipse or Android Studio the one which includes JavaScript and HTML programmer capabilities.
  - If uncertain, get the Android SDK package deal: For the details see Google developments on the Web of (Android SDK, API 17).
2. Enabling or disabling the region layer. While permitted, after creating a new key built certificate fingerprint and submitted credentials, create from an option in the Google developer console. These steps should enable the activity of Google Maps Android API. The following steps are used for featuring an easy Google Maps API, including (KML) layers, on the website. Lots of other utilities may be brought to make the map more dynamic. See the resources section for some beneficial links.
  - A. Sign up for an API key from Google community.
  - B. Insert layer key.
  - C. Write the declaration variables.
  - D. List the functions.
  - E. Set up a desk with a checkbox for toggling layer on/off.
  - F. Fill in codes by JavaScript and HTML.
3. Zooming the camera and the camera will reposition the digital cam in retaining with the instructions described in the update. The flow is instantaneous, and a subsequent digital position will replicate the new function. The digital camera update from the manufacturing facility should be checked for a set of updates.
4. Shapes set of map tiles types that have to be displayed (e.g. Google Maps, Map, Type, and Satellite). The allowable values are:
  - **Normal:** Basic map with roads and normal view (up, down, left and right).
  - **Satellite:** Satellite view with roads by details and very clear views.

**Chapter five:** The conclusions and future research directions.

## **2. BACKGROUND**

### **2.1. Introduction**

This chapter considers the data collection of smartphones and Google Maps for a better understanding and further enhancement of its application. However, the detailed methods, techniques, approaches, and data used differ from most of the research work related to the topical information. The first smartphone is the IBM Simon; it was planned and implemented in 1992. The phone was displayed as a product model in the same year at Comdex, the computer manufacturer, which was held in Las Vegas, Nevada trade show. It was released to the public in 1993 and sold by BellSouth. In addition, to being a mobile phone, it also included a calculator, calendar, world clock, notepad, address book, e-mail client, and the capability for sending and receiving faxes and many games. This version had no corporal buttons, as a replacement for customers, a touch display was used to identify the phone numbers. Also, the text was input with a keypad on the monitor or screen. By today's standards, Simon will be a low-end product to some extent; it lacks a camera and the capability to set up third-party applications. However, its appointment raised high time advantage [2].

In the past, old style sensors were working in an excellent extra easy and effortless way. Later, when the software grew up over the duration of the previous few years, the knowledge of mobiles and their related software has become relatively limited. Though, current new mobiles have created and added a number of constructions of a full-fledged supercomputer. This consists of excessive quickness of central processing devices and image processing unit, incredible house for storing, high-determination screens and cameras and flexible communication hardware. The new mobile's OS chains the point of the laptop computer's OS yet with different features, such as Wi-Fi, mobile data (cellular) capability, contact displays, Bluetooth and world positioning system with mobile navigation, video camera, voice recorder, and song participation and conversation. The operating structures of the sensor have to be produced in a situation that suits these features [5].

JavaScript embedded systems' design (mobile device is one of them) targets strategies ranging from industrial control to phone products (especially phone features).

Here, one of the key factors is Java "Micro-version" which is formerly known as JavaScript version Micro 2. Java "issuing Microsystem" is designed by Sun Microsystems and it is now a branch of Oracle Corporation. It replaced the old style with a similar technology. Java was originally developed under the name of the process of Java community as a system (JC R-68). Different versions of Java "version micro" has been developed to (JC RSS) Inc. Sun Corporation provides a reference operating specification but does not intend to provide a free operating environment for Java. The Micro version is widely used for mobile phones instead of relying on third parties [4]. Throughout this development, the arrangement of the mobile operating system has gone from simply too complex to something in-between. This is the main motivation behind the development process, which is naturally supporting the technical developments in hardware and software as well as Internet services [4].

Android OS is developed as an Android operating system for mobile phones by the Open Telephone Association which belongs to Google. It enabled Google's distribution of Android in November 2007 where most of the core Android systems were launched under the open source license. However, this has created a fantastic extent of software for the Android cell phones such as searching applications, Google Music, Google Play Services, Play Store and so on. In 2011, Android-based smartphones had the biggest set up on any other sensor working system. Particularly since 2013, Android's systems, as well as selling, are more than Windows-based phones, Mac OS, and iOS. Since 2013, it has had a Google Play Store that has more than one million Android issued applications and more than 50 billion downloaded applications [3].

## **2.2. Analysis of Digital Maps Data Collection**

The analysis of Google Maps data collection using Android Studio is a relatively new research field. Google Maps location search itself is a new research discipline. So, there are some background terms and topics that are very important to be recognized. It is essential to comprehend the basic concept of HTML, SDK and Android Studio for a better understanding of the practical work. As the discussion goes on, it will be seen that there are many things in common between cameras, zooming, the point of starting and locating. However, map applications area is a very specific research field that is mainly concentrated on Google Maps [22]. GPS equipment is generally utilized in technological knowledge and

has now ended up relatively low-fee. Therefore, almost every person can own a private GPS receiver. Once statistics are carried out, categorized as positive, the following goal is to visualize the records. After the collected data has been dealt with, a preliminary picturing is automatically produced conferring to the sorted facts. Anyway, customers all have private favorites and might choose to make a model on the automatically made imagining. A GPS enabled smartphone finds the location using a mathematical principle known as “trilateration”. TV satellites that orbit the earth have an atomic clock that ceaselessly broadcasts radio signals at the accurate time. The GPS gadget is a constellation machine with 29 recorded satellites. It takes 24 TV satellites for a PC to grant an international insurance. For giving the right location anywhere on the earth, the device needs to calculate well and find at least four most visible satellites. Here, at least four satellites must be seen due to the fact that the GPS receiver requires four satellites to be capable to decide its very own location. It’s a kind of a trick to furnish an explanation for the three-D space. The approximate characteristic can be discovered via three satellites. On the other hand, to beautify the accuracy and get specific better files, four or more satellites should be used. The smartphone’s GPS application may discover the vicinity with the aid of a calculation made based on some known distances from every satellite. This continues till it secures a signal from three or more satellites. The smartphone’s GPS application requests to have a look at the excessive-frequency. This is referring to small energy radio signals established by three or more satellites; then the application computes the distances between the satellites and the smartphone. Figuring out the location comes next, where specialized GPS packages can provide the exact location records about the merchandising and the pace of a tour. Map matching is sensible in GIS and its associate’s equipment list of purchaser or truck places in the avenue community of an ordinal map. The connection of a map-matching challenge turns into multifaceted scenario while the raw path travels the same multi-lanes street network elements. This makes people have a hassle finding out on the right street section [13].

### **2.3. Android Studio**

Android Studio is one of the leading research fields in computer engineering science. Android Studio and Eclipse are the two maintained combined development settings for Android development, and only one is needed to trail along with the samples of this study.

There are a few other tools that should be very suitable now and in the future work with Android system. While it is impossible to use all these tools until an application has been completed, it will be useful to know about them when the need arises.

Some of the advantages of Android Studio development are listed below:

1. A large user base.
2. The expansion of OS is not really enforced.
3. The familiarity of Java programming over C programming to most developers.
4. The fragmentation of the devices/OS.
5. The monetization-wise iOS apps that rule the charts [30].

### 2.3.1. Android with Application Program Interface

- **Integrated Development Environment:** It is mainly related to C and C++ programming languages. Same like IDEs, it offers the programmer a normal and unified tool to run, link, compile and debug or repair programs. It also offers to support the controlling of program files in “projects”, including all the elements needed to output the final running program. From the point of simplicity, the default installation options should be used on the home computer. For Windows 8, it is suggested to install any C++ programming capabilities or package with bundled TDM compiler available [31].

- **Software Development Kit:** When a discussion is made about this part, usually the need arises for recognizing simple tools crucial for it. The essential tool of SDK used for Android may additionally be coming from inside the software of Android Studio environment. That has been meant; however, it could be said that being requested in this case dictates that it is going to be appropriate to request those tools from command rapidly, or the Window station components. In order for operating systems to discover the manner of the used equipment and work on the carried outside of the choice, it will be very necessary to enable them to characterize the machine’s path within the environment variable section. The path variable of Android Studio needs to be organized; this consists of the following path phases:

(Where *< path \_ to \_ android \_ s d k \_ installation >* signifies that the file system site from which Android SDK has set up):

*<path \_ to \_ android \_ s d k \_ installation>/ s d k /tools*

*<path \_ to \_ android \_ s d k \_ installation > / s d k / platform-tools*

The venue for the SDK on any Android characteristic may also be unique via the use of initiation of the SDK directory and it should be devoted to the SDK Path. Before beginning with Android development, the principal step is to put in a great evolution effort. Fit assessment environments consist of Android SDKs, Android Studio, protected appeal environment IDE and JDK. This segment of Android SDK, should be enclosed thru the crucial tiers to set up these bundles on Linux, Mac OS X, and Windows. The successful installation of Android SDK is needed to different software program structures, which may be no longer a part of the Android SDK: Java Development Kit or Eclipse IDE. Android SDK contains all the tools needed for developing Android apps from the command line. In addition, different tools that assist in locating, diagnosing and simplifying the problems do exist in SDK. Whether Eclipse or Android Studio is being used, SDK Android comes pre-configured and similar to other IDEs as shown in Figure 2.1.

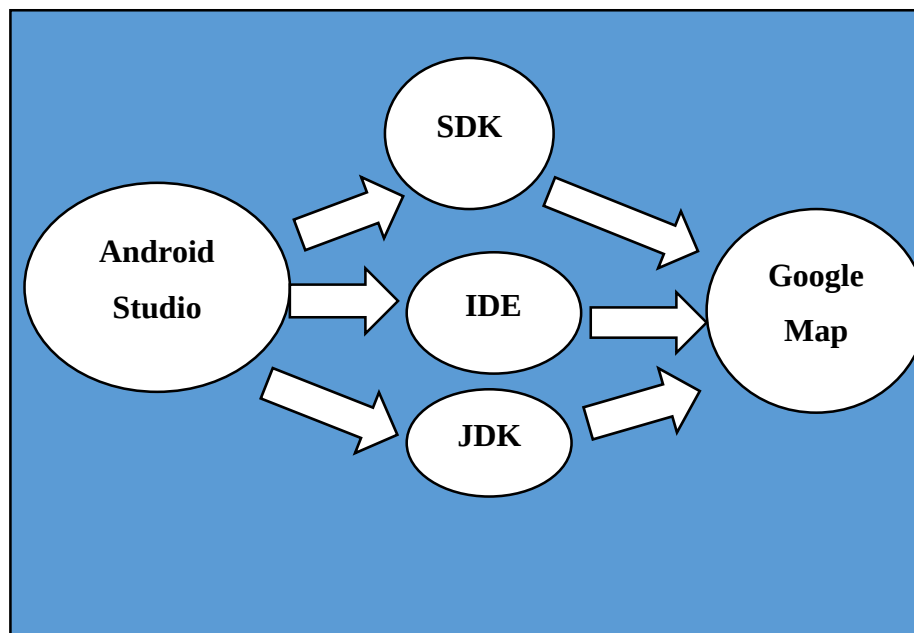


**Figure 2.1.** Google Maps overlap fields.

### 2.3.2 Global Positioning System

The meaning of GPS is a collection of about 30 spaced satellites that orbit the earth and make it possible for people with ground receivers to locate their geographic positions. The location exactness is anywhere from 10 to 100 meters for most of the tools. The accuracy can be located to within one meter with special military-approved tools. GPS tools are usually used in science and have now become suitably low-charge so that nearly anyone can own a GPS receiver. Once data is applied, categorized and certain, the next goal is to visualize the data. After data handling, an initial picturing is automatically produced conferring to the collection of the data source location. Anyway, clients have their own favorites and may need to make a variation on the automatically made imagining [6]. The GPS enables the smartphone to find the position using a mathematical principle called trilateration. The satellites that orbit the earth have an atomic clock and incessantly broadcast radio signals of the time as data. The GPS system is a constellation system with 29 recorded satellites. It takes 24 satellites to provide a global coverage, which is used for providing the right values anywhere on earth. Any device needs to calculate well and find at least four satellites most visible to determine the coordinates of the location. At least four satellites are visible because the GPS receiver needs four satellites in order to determine the location [13]. Smartphones and tablets with amusing Graphical User Interface (GUI) are becoming progressively full-option. Hundreds of thousands of smartphones and their associated specialized applications (apps) already exist on the smartphone. The difficulty of smartphone apps lies regularly in the user border, especially with data handling or substitution for any backend constituent. A similar situation happens for the applications using some software as a modern design service, where the quiet side module contains most of the operating border code for the application. The analysis of some applications mostly involves UI testing [3].

The Android cell phone platform components can be elaborated in the following points:

- *Application framework*: Android elements available on the access layer of the machine. Typically, technical APIs are used here as core applications. Modern smartphones are designed to permit exterior builders to write packages for these devices [5].

- *Libraries:* They consist of crew or listing of C and C++ programs libraries. These libraries processes are risky to grow or build a smartphone software set (Android application). They comprise functional software of media libraries, organizing of C libraries process, superficial manager, 3D libraries, SQLite and so on.
- *Android Runtime:* Android-based smartphones expand a group of core libraries which carry most of the performance in the core libraries of Java. The Android virtual machine is regarded as Dalvik VM built or dependable on the Linux kernel for some functional process.
- *Linux kernel:* Android-based smartphones rely upon Linux for the responsibilities of the core device operations such as security, memory management, procedure administration and others.

The development and environment of iPhone Operating System (iOS) increase the level of excellence in user interfaces. They offer designs and suggestions with great chances to deliver a winning and unique user skills. These common design ideas should be studied before starting any coding to improve the usability and applicability of the developed apps. To through light on more approvals for great interface design, the following are some examples:

- The mediator and interface building structure
- The snow leopard with Mac
- The SDK for iPhone
- The typical type of (C-Objective)
- The hardware and software
- The Web Kit [3].

View controllers are the basis of the internal template of the application. Each application has a point of view and at least one controller, most applications have several controllers. Each unit of opinion control manages the part of the user interface of the application, as well as the interactions between that interface and basic data. Also, it facilitates the display controller's transition between different parts of the interface of the user [3]. The server-based helps pages for using it; prior beginning to integrate the iOS app with Google login components, the needed X code project must be downloaded and configured. The following steps describe how to integrate Google login in the application features [3]:

- The Web pages provide the Safari browser for searching.
- The Safari browser is built on the Web kit open standard.
- Server-based help pages that support HTML, CSS and more detailed of the resource item. In addition, the server help pages allow the dynamic update of help contents outside of the application code [6].

## **2.4. Cam Scanner**

Cam scanner is using the basic idea of camera architecture, camera2 APIs, Play Store filters and demo summary techniques. Although the security of scanning through the smartphone matters, it is very difficult to beat the cam scanner's security. This scanner includes the application for all free basics, plus a lot of the applications. The smartphone's camera is used for scanning printed documents and business cards, receipts and even the words and graphics on a white plate. Upon the completion of the examination, the cam scanner analyzes the image content to regulate everything automatically. This means, all scans are saved as business cards in one folder and they can be sent online at the same time into the other side. As an added bonus, the application also allows the creation of scanning photos taken previously. More importantly, the quality of the scan is an excellent, though the mileage may be different from the normal phone camera [7].

## **2.5. Android Bluetooth Application**

Bluetooth is very important in order to control home lighting; four lights are explained in the GUI. First, click the "Open Bluetooth" button to switch on the Bluetooth connector while the application is successive. Click on the "Search Lights" button to find the same lights with Bluetooth devices, four devices at most, the lights automatically flash on or off according to the Bluetooth response received from the lights. To control the allocated light, choose either "ON" or "OFF", the phone then shows its command to the lights through a Bluetooth communiqué. As a final point, the user can click "Exit" button to station all running threads and exit the application [8].

The Android phone needs to be assigned to the server in order to perform the application; the Bluetooth units and a server-side mechanism are applied to control the lighting. Then, the server opens a server plug, sends and takes delivery of commands

through the established connection. The Bluetooth socket class is used for the server to accept the commands when an arriving connection is recognized. The Bluetooth host system is successful for communicating with up to 7 Bluetooth modules at the same time thru a single link. The server socket snoops for an incoming connection request for the users, and when a request is accepted, a Bluetooth socket object is formed.

The following steps are to set up a server socket and accept a connection:

- The call listens using RF com with service record (String, UUID) to get a Bluetooth server socket.
- The call accepts to start listening to connection requests.
- The call terminates to end the program [8].

## **2.6. Blood Testing Application**

For health purposes, retrieving information from the database to seize the higher definition for fitness desires simply like measuring blood pressure, exercising goal, blood glucose level, and weight is highly recommended. The goal of health elegance consists of two constructions to run the database. The system's delete all is used to clear the intention table of the documented health states that consist of five fields: exercising goal, blood strain intention, glucose level target, blood pressure target, weight target, and one key value for the ID. These aims are greater-defined with the resources of the operator's health care team, which are constructed at the user's contemporary fitness situations and saved in an SQLite database. They are used in the regulation of engine aspect to affirm the identification of the contemporary data inside the range of the goal.

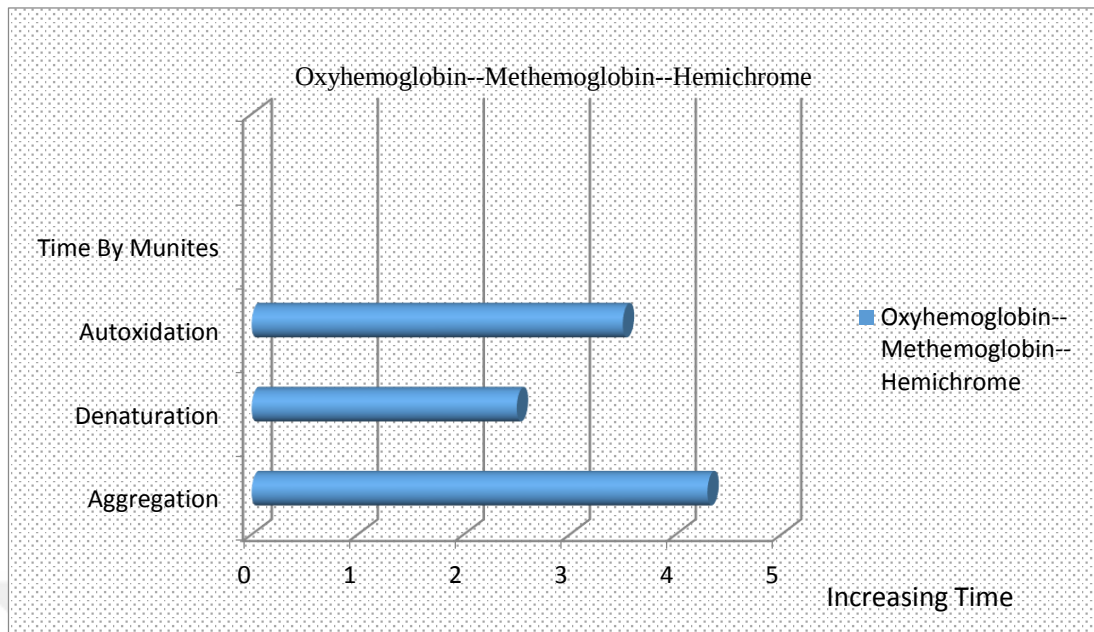


**Figure 2.2.** Blood test over the collection.

**Table 2.1.** A health goal Table.

| A health goal of      |                                       |
|-----------------------|---------------------------------------|
| <b>ID</b>             | ID integer primary key auto increment |
| <b>Blood pressure</b> | Integer                               |
| <b>Glucose level</b>  | Integer                               |
| <b>Weight</b>         | Integer                               |
| <b>Exercise</b>       | Text                                  |

For instance, with the resource of evaluating the go with the flowing blood glucose test results with blood glucose scoring, the user will be aware of if the circulation is in normal range level. A digital camera that can be adjusted to seize electromagnetic wavelengths and their usability in calculating approximately the present day blood age [10] as shown in Figure 2.2 and elaborated in Table 2.1.

## 2.7. Range Finder

A laser rangefinder is a rangefinder which is used for a laser Sunbeam to modify the space of an object. The maximum sharing of laser rangefinders operates at the time of flight with the aid of moving a laser pulse of a mild ray from a source, and calculating the time taken by the pulse to be imitated off the board and returned to the source sender.

Owing to the excessive quickness of light, this method isn't appropriate for excessive exactness sub-millimeter measurements; everywhere triangulation and different strategies are on the occasion used. The researchers visualize that the phone with a cheaper made in infrared lasers may be snapped into personal motors, consisting of wheelchairs or golfing carts, to assist rendering them to independent. The version of the device can also be constructed into small independent robots, such as the drones transport packages deal proposed by Amazon. The wide deployment of this scenario in unpredictable environments would limit the use of costly laser rangefinders [34].

## **2.8. GPS Time Calculation**

Based on the influence pattern of worldwide function devices, the GPS is finding the location with an accuracy of  $\pm 500$  feet. GPS is a wonderful device, but it's not all the time perfected. GPS controls the role by way of calculating time, the signal takes to discover the Smartphone, as it travels at a continuous speed. But in some occasions, the signals slow down while they enter diverse bulks of the atmosphere. The radio signal comes throughout the block, or can even bind off payable to solid edifices/gadgets like large buildings or rock surfaces, prior reaching the receiver. There is probably a mild time version of the clock with its very own GPS enabled device, yet isn't accurate if the distance is imaginary and to be corrected in accordance with the atomic timers in satellites. The correctness of GPS additionally clings on upon the variety of satellites. Smartphones can connect with lesser satellites available, but it would raise the callous possible state of affairs. The place of the satellite additionally influences the trilateration accuracy. Terminated the past years, examiners have set up a few systems for collecting vehicular records onto (sub) built-up levels. Old –fashion structures using Avenue –installed sensors consisting of cameras systems, Bluetooth scanners, microwave sensors, etc. These equipment facts are approximately the kind and wide variety of vehicles passing thru an area, their speed, travels time, so on. Anyway, such styles are complex and consist of high installation fees. For instance, a telephone wishes to connect to automobile-purpose, there should be a complex base station on board in an effort to acquire signals from the tool. In some manner, engineers should be having precisely the GPS antenna and set up tools into the system. These troubles have caused incomplete network holding. Generally, standard administrations have collected new wireless communication channels precisely designed

for the truck's consumer. This has enabled new technologies such that vehicle-cause systems. These may also depend upon board devices to report truck archives at as soon as to some other trucks or to a core server. With refined onboard computing devices hooked up in motors, examiners are capable to gather data to screen traffic word to propagate the emergency message, traffic injuries, speak analytic statistics, and so forth. However, the factor of this strategy is the availability of onboard devices. It's in all likelihood that any such ahead thinking generation is only reachable to a biased subgroup of the truck. The manner of organizing a trial of the test-mattress and amassing records is approximately supplying all data onto a truck device at the last of a user's sensor, which is elaborated in the following sub-sections.

### **2.8.1. Wi-Fi Onboard Diagnostics**

The sensor must download a check-mattress utility for its units in the same vicinity. Since monitoring information is intended to be included, also the board companies of sensor owners' representatives of truck owners should be included. These holders should add their Wi-Fi onboard diagnostics gadgets into their vehicles. The onboard diagnostics unit has two ports. It should be placed under the navigation wheel, then the users should be connecting their cellular phones to some other devices, which also turns on the identical time as a Wi-Fi access thing. This is done to remind that onboard diagnostics structures in most vehicles are auto on the road. Then, a sturdy substructure should have been obtained that does no longer desire higher inserting in the location of the machine [19].

Considered a library for the sandbox that gives a border to communicate with an in-truck outbound dialing tool, which moreover turns as a Wi-Fi get entry factor, referred to as the element outbound dialing conversation Library (OBDLib). In this sample operation, the trail code can link to the outbound dialing device, same to connect to a Wi-Fi hotspot and collect truck data onto this device through the OBDLib interface. The OBDLib agrees to vehicle data collection. A planned store for the sandbox that offers an interface to communicate with an in-vehicle OBD sensor, which also turns as a Wi-Fi access point. This examination is formatting a crowdsourcing, primarily based measurement programs. Those are used by smartphones as document statistics monitor to the far-flung server for the machine information collection. The software works in the experience of smartphones, pulling together cellular data onto the user practice under their permission [16].

### 2.8.2. Cellular Network Software

The software examines the cellular network pace in an active way and collects individuals' archives about a passive behavior. The lively component is caused by means of users' active movements, at the same time as the passive action is taking place, precipitated by the usage of numerous situations. The two elements of information accumulated from terminals are exported to the regional actively provoke activities of the system report information. The passive aspect runs inner the heritage to transmit facts regularly, which is likewise precipitated through various situations of terminals. When a community of terminals change occurs, the utility website traffic is below a certain threshold level or some other activities take place, the software data will be transmitted [20]. Servers frequently ask the user if he wants to free up a location for the ways off aspect. The lively component listens to the user while making an attempt out the requirement and decides whether or not and now not it will probably be processed. When the requirement is effectively completed, the measurement outcomes and associated records can be recorded and uploaded to the server. Thus, it would be most effective while the customers are working on it.

The proposed device objectives are the users who desire to exercise through walking. The device is realized as a utility for smartphones with a triaxial rushing up sensor and GPS. The machine entails a shared database and a server on the cloud, considering that the cell phone is wide-spread through customers. The shared database shops on foot data measured through the acceleration and GPS gadgets of the phone. At this stage, the walking information consists of acceleration largeness, slope, taking walks velocity, oxygen acceptance, and place on foot routes. The shared database also collects heart pulses and physical street assessed through the device. The taking walks records in the shared database are categorized into several units built on personal profiles. Every person is supported at some stage in taking walks over the smartphone application [17]. Now, the process is given step by step below:

In the starting point, take the value of the sample number for the walking steps that create the waveform the variable "y" as the current sample number of walking steps.

- To calculate the threshold value "d", there are two systems to define a threshold. One way is by the amount of test gravity data with a fixed threshold, and the

other method is over the actual data collection time. For real-time data collection, compute “ $d$ ” with  $n$  number of samples and store its data sets.

- Get significance data  $[y]$  and next gravity data  $[y+1]$ .
- Compare  $[y + 1]$  data with  $[y]$  data.
- If  $[y + 1]$  data and  $[y]$  data are not equal, then compare  $[y]$  data with the threshold “ $d$ ” value.
- If  $[y]$  data  $>$  “ $d$ ”, then one step count.
- Compare  $[y + 1]$  data with “ $d$ ”. If  $[y]$  data  $<$  “ $d$ ”.
- If  $[y+1]$  data  $>$  “ $d$ ”, then one step count, otherwise rise sample number and calculate with gravity for this sample number.
- When  $[y]$  data =  $[y + 1]$ , then replace the current gravity with  $[y + 1]$  data and rise the value of sample number.
- Continue this process until the total walking steps are considered [17].

## 2.9. Walking Steps Calculating and Distance Measurement

As described in the previous sub-section, the emotion charge alterations happen based on the change of walking slope and pace. At the primary path for measuring acceleration information while strolling on treadmills, taking walks at special speeds and with special slopes lead to distinct acceleration largeness. In the calculation, coronary heart carefully pertains to oxygen popularity. This is due to the fact that coronary heart size change through exercise (increase or decreases) to deliver necessary oxygen quantities, depending on the exercise intensity. The fundamental aspect is that displaying the information of the physical weight may be estimated through the heat level. At that point, the requirements of the primary thoughts for predicting coronary heart level similarity with a phone should be simplified. Additionally, the proposed gadget is outlined which makes users maintain the right tempo of strolling. Smartphones are regularly well-appointed with rushing up sensors. The powerful key of acceleration gadgets is to get the measure of the cellular telephone and this mobile obtains three elements. They are the stepping up mechanisms that are one by one identical to the stepping up of the control gadget X, Y, Z axes minus the mechanisms of gravity acceleration inside the matching axis [18].

## **2.10. Qualitative Smart Phone Applications**

The examinees state that their sensors have made them more creative within the factory by making them greater systematized, yet some of them aren't relying on applications. It seems that the advantages of the phone's applications outweigh the negatives of researchers. The limitations may additionally have resulted to triumph over them. Upon studying the topics stated by researchers, it has become clear that studies, places of work and institutes do require an adaptation to the increasing use of smartphones. The researchers rated themselves as greater productive because they are proudly owning a smartphone, indicating that administrative center participation attention of the area-relevant applications is required. Strengthening accelerated security in the workroom, along with limiting being capable of laboratories thru card-only get admission to or personal lockable drawers or cabinets do encourage an access control using a smartphone. In addition, the increasing focus on expert fitness and protection rules concerning secure regions for private belongings should allow researchers to carry their smartphones into the workroom more often. Waterproof covered casing for smartphones attachment would allow researchers to apply their telephones and observe empirical situations. Moreover, providing data and information on a way to manage and control settings of smartphones to limit calls, emails, and social networking sites activities may additionally reduce distractions in the workroom. Wireless net hyperlinks permit access to components of the residence or homes. This applies to basements wherein broadband networks providers are not to be found. Mainly in which smartphone contracts or a plan isn't wrapped via employers, examiners can be reluctant to access the net for work pursuits. Besides, an intranet network of the workforce to get right of entry to useful connections along with reference publications, journals and calculators relevant to their region of research and staff contacts may be useful for all cell phone examiners [35].

## **2.11. Estimating Driving Behavior by a Sensor**

Estimating driving behavior by a sensor is the other theory and stage of system drawing, which is the other factor considered for time calculation. The first stage in this plan is the information obsession and preprocessing of the statistics with the useful resource of a smoothing clear out. Second, observe the stop factor endpoint and display the

algorithm to appreciate the temporal range of the signal looking for predominant activities. Once the activities are detected, the sign is temporally scaled to pick out the event inside the chosen element of the sign using DTW. The important purposes at the back of DTW are to triumph over specific temporal extents of the equal activities all thru particular drivers. After this early step, the Bayesian classifier is carried out to classify hazardous of secure riding dependency. The collection of data related to these steps is elaborated in the following sections. In order to become aware of the latest occasion, the set of policies continually obtains statistics onto the gyroscope, magnetometer, and accelerometer. Conjecture so the hazardous of things to do comes about when there are acute or surprising maneuvers, no longer impervious left or applicable turns, lane leavings, and sudden braking or accelerate. These matters to do can be additionally closing consequences of an opportunity threat of driver and passengers. The reason of these shunts can be associated with drivers' present temper/overall performance, alongside with inattention, drowsiness, aggressive driving and drunk-state driving [36].

### **3. SYSTEM ARCHITECTURE OF DATA COLLECTION**

#### **3.1. Introduction**

Different from former work in the system evolves and data analysis, the suggestion is to have a system fulfills the needs of data collection and dynamic data analysis. Google is planning to dominate the mobile communications sector, thanks to the Android operating system (open source), which will be presented to users and giants of communications, around the world, as an information platform capable of melting experience and an Internet multimedia portfolio of mobile phones. Unlike current mobile management software, Android is an open-source platform, meaning that any programmer, designer or wireless operator can change its content without consulting anyone. In addition, and to lure programmers and independent software designers and urge them to produce applications specific to "Android", Google has chosen the operating system "Linux" where any professional is able to use the code and modify it if needed. To date, 34 companies (together founded a coalition called OHA) have agreed to respond to Google's offer.

#### **3.2. Overview**

To evaluate the technical work of large sensor information and to facilitate the development and management of models, this study suggests a dynamic data assessment tool. The sensor information can be accumulated to the collective outsourcing servers; finding the servers of a new cell may be in addition to the Android program setup. Sensor information may be scanned using the walk-in method in the hardtop's pre-evaluation models, even as it is pulled to the nearby servers. Evaluation results can be put into an awesome web-based structure, making them suitable for review. In a concrete implementation, there is much effort to complete the desired dynamic analysis. As the phone facts collected using the road capacity of the machine dimension every daily update, it is required that the local database synchronizes record of companies with the remote side of the actual side to provide maximum current day statistics for the evaluation model. Also, it allows superior models later to be more convenient. Evaluation effects from HDFs can be assessed to off-server routes and provided in special tactics. Based on the above technique, each element is ready for a percentage of the work and collaborates with others.

The dynamic assessment system usually involves three elements: visualization information, vital fact assessment and a series of group outsourcing records. Each part consists of several sub-components. It is prepared by using the record flow method as a baseline in the task context [46].

### 3.3. Crowdsourcing Data Collection

Search outsourced mass projects using the smartphone also displays information and writes information to a remote server to collect sensor data. The sensors provide valuable information when investigating users' needs and behavioral patterns.

- **The method of data collection:** This refers to the frequency of network sensor tests in a robust manner and collects operational data in a negative way. The active element here is the consequences of the dynamic actions of users, while, the negative element of heritage walking driven by many circumstances. Two parts of records compiled from stations to local servers are often exported, as a good way to get rid the remote side effect. The element that listens actively to the consumer's verification is considered necessary and whether it is likely to be controlled. When the request is completed efficiently, the measurement results and associated facts will be reported and uploaded to the server. The passive part works to transmit statistics often, which is also due to the use of many station conditions. When a network of exchange stations or visitors to the application occurs under some threshold values or some different occasions are obvious, the utility statistics can be transferred.

- **Datasets:** The datasets mostly consist of the active and passive parts according to the technique of data collection system. The data built of two parts is illustrated in Tables 3.1 and 3.2.

In Table 3.1, the ping reflects the data connection between the person and the server. The signal strength and frequency of the network can be used for human's good society. The base station address can be placed via the cell's ID. The rest of the facts are often irrelevant to users' geographic location. In Table 3.2, the package name is uniquely described. The used network can determine the type of customer and the type of sensor in the details along with GPRS, UMTS, EDGE, LTE, and so on.

**Table 3.1.** Data structure of active part

| Record Type                  | Illustration                                  |
|------------------------------|-----------------------------------------------|
| <b>Ave/max_downloadspeed</b> | Average/max download speed                    |
| <b>Ave/max_uploadspeed</b>   | Average/max upload speed                      |
| <b>Gps_lat/gps_ lon</b>      | Latitude/longitude of gps position            |
| <b>Network type</b>          | Network type                                  |
| <b>Operator_ name</b>        | Name of operator                              |
| <b>Ping</b>                  | Time delay of ping                            |
| <b>Rssi</b>                  | Received signal strength indicator            |
| <b>Wifi_ bss_ ID</b>         | Physical address of wi-fi station             |
| <b>Cell_ ID</b>              | Cell ID                                       |
| <b>City</b>                  | City of terminals                             |
| <b>Imei</b>                  | International Mobile Equipment Identity(IMEI) |

**Table 3.2.** Data structure of package parts

| Record Type                     | Illustration                            |
|---------------------------------|-----------------------------------------|
| <b>Package/app_name</b>         | Package and app name                    |
| <b>Upload /download traffic</b> | Upload /download traffic                |
| <b>Start/end _time</b>          | Start/end time of current record        |
| <b>Network type</b>             | Network type                            |
| <b>User ID</b>                  | User id of application                  |
| <b>Cell_ID</b>                  | Cell ID                                 |
| <b>Wifi_ bss_ ID</b>            | Physical address of Wi-Fi station       |
| <b>Date</b>                     | Date of this record                     |
| <b>Imei</b>                     | International Mobile Equipment Identity |

### 3.3.1. Dynamic Data Analysis

To enable a good data examination and good dynamic feature, Hadoop has been used for conducting the evaluation. Hadoop is a flow scheme for handling important information about groups, which is accumulated primarily from (Hadoop Distributed File System) and map reduce. Mapridus is a version of the programming designed to manipulate information units on a very good scale with a custom climate algorithm on the array [45], which is a systematic analysis method. In the record store of Hadoop, the cell provides a green device for large record stores and get admission. It can complete the replacement facts from the local surroundings of HDFS. The Hadoop cluster deployed on this part is amassed of one grasp and five slaves. Established on this Hadoop cluster, programming with map reduce makes it easy to monitor huge scale corporate statistics. With a user-friendly programming interface furnished through Hadoop, it's a powerful tendency to use Java to create fashion information that both assesses static and dynamic statistics. To provide a dynamic analysis, the simplest addition is a part of the facts that need to be analyzed periodically. This sector of information can be lifted to immediate consequences. The reduction map gives a complete of design companies to do recording evaluation, this reduces the problem of operations: limit and map. In particular, the map filters and converts input data, while less the effort is being given to the compilation process. The key to making the facts are being looked at is to solve the problem in the above two sub-problems. Built in the above structure, data model and analysis can be divided into the following steps:

- 1) Data input: Sensor statistics are pulled down from the face away to the original servers in real-time through the use of Python scripts. When the information is synchronized with a local database with a distant face, the HDFS would be often introduced into the cell.
- 2) Data pruning: Typically, it refers to the information processed using the most integrated demo including many submenus of tables stored in HDFS. So, the unique menus need to eliminate the buffer. Besides, unusable records protect some misinformation or unacceptable information to be filtered for the facts of the trim method.
- 3) Mapping: In this stage, the task of maintaining the tune of the block determines the keys of the report to access the raw data and create the value list of the keys.

With the integration method, average files may be produced, prepared in the form of a list of keys (values).

- 4) Reducing: A new couple of master values are produced to assess the objectives by passing the value list. It is flexible to customize the drop function, consisting of elimination, combination, count, duplicate, and so on. Finally, the resulted report is run in a similar way.
- 5) Data output: Final result files are transferred from HDFS to the original database using Shell scripts. It can be saved uniformly within the local server [51].

### **3.3.2. Data Visualization**

The website is hooked up in some distance server to ensure that the maximum number of users may access to it. The evaluation of collected outputs is achieved from a dynamic stage and fixed components. Fixed partial statistics are suitable for the transfer. Additionally, dynamic side strategies can also provide each modified output for the generated elements.

### **3.4. Data Analysis**

A preliminary look at today's information scale is created. This tool typically analyzes the cell facts about the consumers' usage and visitors' applications. In contrast to various new mobile phone programs that are involved in the upward trend of statistics, cluster evaluation is used to consider the process and vigilance as given in Table 3.3.

#### **3.4.1. Primary Analysis about Table**

The information collected in this system has been taken for approximately 5 months. The details of information statistics are shown in Table 3.3. Everyday rises by a hundred thousand records. In Table 3.3, the operator is distributed over 100 cities, including a group of consumer companies. The community types cover a number of sensor networks show the total number of visitors and the size of the file's outstanding range of information groups.

**Table 3.3.** The scale of data sets.

| Category      | Passive part         | Active part |
|---------------|----------------------|-------------|
| Users         | 5563                 |             |
| Provinces     | 35 (310 cities)      |             |
| Running time  | 173 days             |             |
| Network type  | Wi-Fi, 2G, 3G and 4G |             |
| Applications  | 6792                 | ---         |
| Total traffic | 1983.35 GB           | ---         |
| Records       | 42880641             | 33685       |

### 3.4.2. User Usage Design

The user usage pattern is examined to produce user's behavior from the outlook of the network and its traffic.

#### ***Daily network usage:***

Workers' distribution of monthly community traffic is analyzed as shown in Figure 3.1. The traffic value is divided into seven periods ranging from 0.1 MB to 1000 GB. It may be quite obvious that the equivalent number of operators distributed in 1000 MB levels is very good. There are some site visitors within the range of 1 to 100 GB. When it comes to Wi-Fi, the maximum distance is distributed within a very small period value. These statistics are precious to the network user. Figure 3.1 shows user distribution of monthly mobile network traffic.

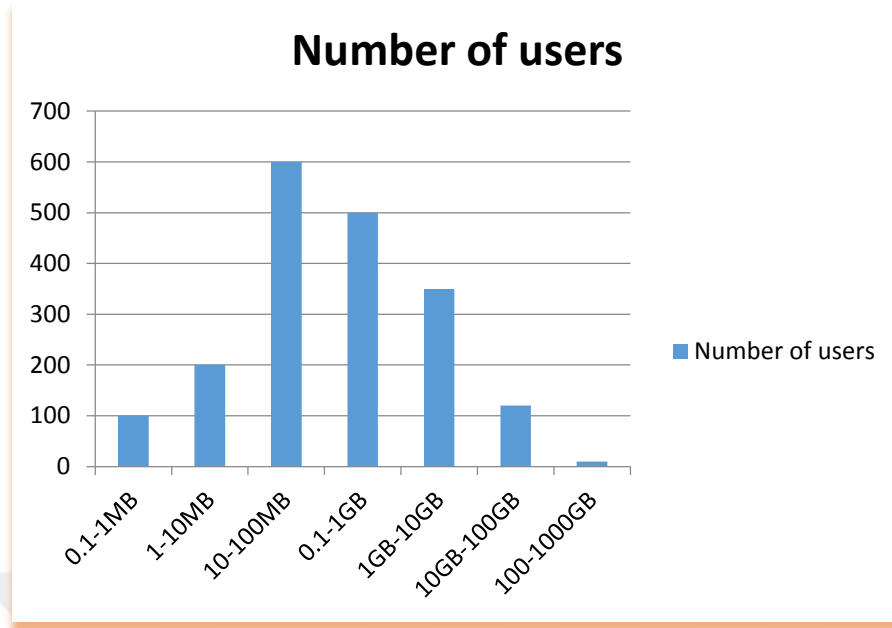


**Figure 3.1.** User distribution of monthly mobile network traffic

### 3.5. Diagram and Estimating Driving of Smartphone

In this part, a way is provided to apprehend the driver's behavior for the use of new devices or cell phones. The purpose of inspecting the sensory statistics received using a brand new smartphone is to lay out a vehicle on a freelance machine. This freelance machine does no longer need automobile installed cellular measuring flip values and gasoline consumption. The sensory information used in this work carries the magnetometer, gyroscope, and accelerometer. Using these devices, the role, acceleration, speed, deviation and deceleration of sensory can be found. In addition, they can assist in obtaining the angle facts and the assessment of safe mobility using statistically collected driver behavior. In a unique case of its kind, this work makes use of any external devices, resulting in a price-effective, simplified and fun tool for the consumer [36].

#### 3.5.1. Endpoint Detection

In order to select the dominant event, our algorithm constantly gets the facts of the magnetometer, gyroscope, and acceleration. The fluctuations occurred while there are sharp or unexpected maneuvers, sudden braking or acceleration, leaving the lane, and

unsafe or proper turns are estimated. These activities can also lead to final results related to the potential risks for the driving force, tourists, and pedestrians. The reason for those physical activities can be related to the current drivers' mood/behavior consisting of inattention, drowsiness, competitive use while riding and driving under the influence of alcohol. The index that relates to these events is expected to use the endpoint detection algorithm [48].

The algorithm works by arranging the samples using windowing system. For every window, the power of examples lying within is estimated by equation (3.1).

$$E = (S[K] - \mu) / \sigma \quad k = 1, 2 \dots m \quad (3.1)$$

Where E is the electricity for one window, S[k] is the statistics placed in every window,  $\mu$  is the mean cost or the value of the information for the window,  $\sigma$  is the everyday perversion of the information and m is the window size. The threshold for the evaluation problem is targeted empirically from the located power fashion in the training information. The power marks beyond the sill variety are removed. This procedure provides us with the sign component so one can be managed for a potential event.

### 3.5.2. Dynamic Time and Warping Algorithm

Once the start and other factors are detected from the possible probability, the machine includes the differences between the instructions and takes a look at the final result intervals using the DTW algorithm. In order to estimate the most desirable trend, DTW returns the values as given in Table 3.4.

To make the pictorial impersonation less difficult, the speed has been divided on 10. Therefore, 6 km, in this case, refers to 60 km in Table 3.4. The left column signifies the records from the template end result ordered in a top-down direction. Also, the bottom line indicates the test-driving records from left to right.

|                              |              |
|------------------------------|--------------|
| Template event data (x)..... | a.06260033   |
| Test data (y).....           | a.062600321  |
| The difference (x-y).....    | a.06-44-6030 |

**Table 3.4.** Sample of data to find the optimal path using DTW

| Template  |   |   |    |    |    |   |   |    |    |    |
|-----------|---|---|----|----|----|---|---|----|----|----|
| 3         | 3 | 3 | -3 | 1  | -3 | 3 | 3 | 0  | 1  | 2  |
| 3         | 3 | 3 | -3 | 1  | -3 | 0 | 0 | 0  | 1  | 2  |
| 0         | 0 | 0 | -6 | -2 | -6 | 0 | 0 | -3 | -2 | -1 |
| 0         | 0 | 0 | -6 | -2 | -6 | 6 | 6 | -3 | -2 | -1 |
| 6         | 6 | 6 | 0  | 4  | 0  | 2 | 2 | 3  | 4  | 5  |
| 2         | 2 | 2 | -4 | 0  | -4 | 6 | 6 | -1 | 0  | 1  |
| 6         | 6 | 6 | 0  | 4  | 0  | 0 | 0 | 3  | 4  | 5  |
| 0         | 0 | 0 | -6 | -2 | -6 | 3 | 3 | -3 | -2 | -1 |
| Test Data | 0 | 0 | 6  | 2  | 6  | 0 | 0 | 3  | 2  | 1  |

In Table 3.4, the computing distances for contiguous elements within the matrix created to estimate the least path are given. The optimal sill for the distance between the current and the candidate neighbor is empirically determined and it is ultimately set to 0.05. In DTW algorithm, two input vectors  $\{X = x_1, x_2, \dots, x_m\}$  and  $\{Y = Y_1, Y_2, \dots, Y_m\}$  represent the training and examination of data. The DTW algorithm begins by calculating the Euclidean distance between X and Y vectors in order to compute the optimal resemblance between them, as given in equation 3.2.

$$D(i, j) = (2)|x_i - y_j| \quad (3.2)$$

The optimal graph path between these temporally ordered templates is found, hence, the distance for each element in D matrix of  $m \times n$  size is calculated. Minimum path to neighbor element is saved in the matrix  $M_p$  and given by equation 3.3.

$$M_p = \sum_{i=1}^n \sum_{j=1}^m = \min([D(i-1, j), D(i, j-1), D(i-1, j-1)]) \quad (3.3)$$

### 3.5.3. Classification of Algorithm Behavior

The statistical classification set of regulations used in this work is deploying Bayesian inference. We expect the lifestyles of two directions associated with tightly closed and risky using behavior. A mathematical expression for the proposed class is given by equation 3.4; where the class here is directly related to the observations for driving events.

$$P(r_1|s) = \frac{P(r_1)P(\frac{s}{r_1})}{P(s)} = \frac{P(r_1)P(\frac{s}{r_1})}{P(r_1)P(\frac{s}{r_1}) + \dots + P(r_n)P(\frac{s}{r_n})} \quad (3.4)$$

Given the prior probabilities of these two classes for driving events, the system output can be obtained by comparing the posterior probabilities as provided in equations 3.5.a and 3.5.b [49]

$$P(r_1|s) > P(r_2|s) \rightarrow \text{Driving at risk} \quad (3.5.a)$$

$$P(r_1|s) \leq P(r_2|s) \rightarrow \text{Driving safe} \quad (3.5.b)$$

## 3.6. Location and Mapping

### 3.6.1. Google Map Accelerometer Gyroscope Sensor

In this layout, an accessible tool for Android is used. The word that presents smartphones usually displays sensory statistics, and this application is not a particular iPhone's one. There are a few devices have acceleration and gyroscope information and used in this look at the stage. In the surroundings, the acceleration device information provides the total acceleration to be implemented to the vehicle inside (X, Y, Z) the aircraft. The accelerometer information also provides position information and car frequency. On the other hand, gyroscope measurements provide accurate records on lane departure and educational events. Android allows us to integrate Google Maps into our benefits and show the user any nearby area on the map if needed. The user can view many

distinct routes on the map, and so on. The user can also customize the map according to the desired choice [50].

### **3.6.2. The Toolkit**

This part provides an explanation on how to install the Android Software Development Kit (SDK) and completes the associated software program the user possibly need. By the very last, the user will be able to run an easy “Hello World” application on an emulator. Mac OS, Windows and Linux systems can ever be used for Android utility improvement. The software program will be loaded and it will provide the equipment in SDK. This will enable the developer or programmer to sources of a sample code. Throughout this thesis, and in particular, in this element, the communication about the instructions available on various websites for downloading and updating the needed Android environment has been made. The quality useful resource to discover facts and to get connected to the desired package is the Android developer’s website [33].

The concentration here is guided towards managing the user thru setup, with info as a way to recognize how the components of Android and its developer equipment collectively interact. In the same time, the rationale of all components and their possible replacement. The detailed explanation and updates are usually posted on the modern website of the Android developer.

### **3.6.3. Android SDK Installation and Basic Requirements**

Well completed installation of the Android SDK calls for other software program structures that aren't a part of the Android SDK: Eclipse Incorporated Development Environment (IDE) and Java Development Kit (JDK). These two structures aren't furnished as a part of the Android SDK because they are likely to be used for the purpose of outdoor of the Android software program growth. They also may formerly be set up for the gadget and redundant setup on the system can motive version clashes. The Android SDK is convenient with a range of latest releases of Eclipse IDE and JDK. Downloading the contemporary releases of them is commonly the right selection. The proper necessities are listed on the system necessities’ web page of Android developers [53].

If Eclipse is used, then the application can be run from the options. A project activity file should be opened where the application can be started from the toolbar [53]. Eclipse is chosen as the IDE wrapped in this thesis due to the fact that Eclipse assists the most important quantity of Android SDK equipment and other different plug-ins. In addition, Eclipse is the maximum broadly used Java IDE, but Intel j IDEA is a good replacement of many Java coders as shown as in Figure 3.2.

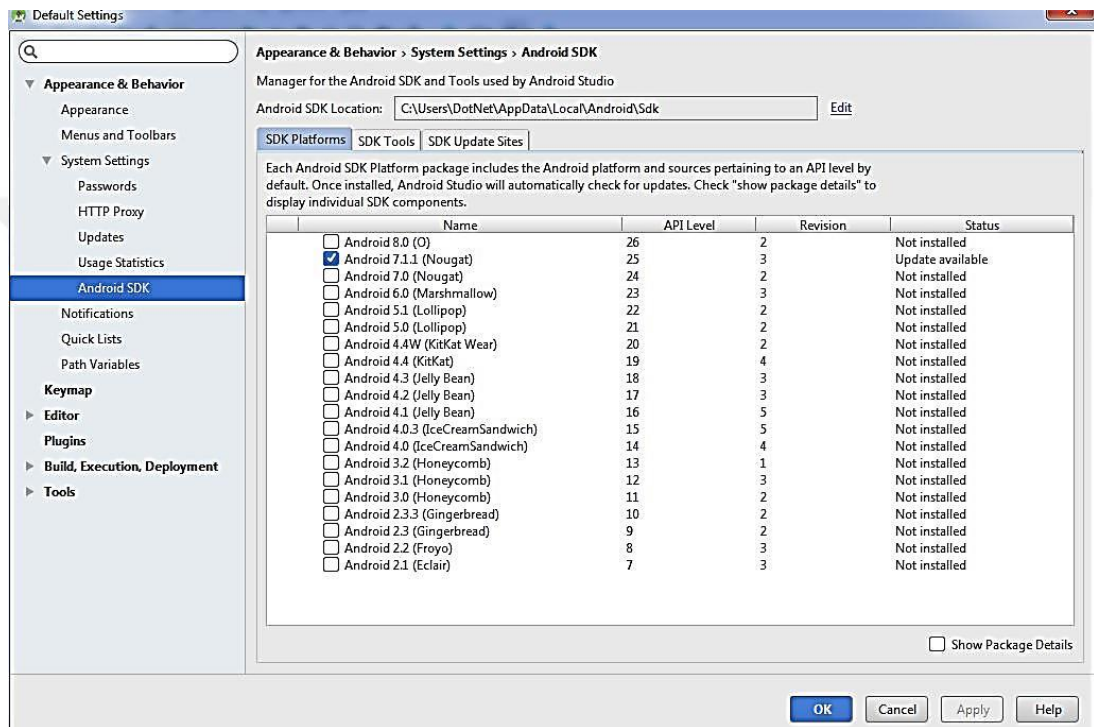


Figure 3.2. Android SDK installation process

### 3.6.4. Setting-up Java Development Kit

If the system has an up-to-date JDK installed, then the receiver needs to setup it at a different time. The JDK gives equipment, which includes Java compiler, utilized by IDEs and SDKs for growing up Java programs. JDK also incorporates Java Runtime Environment (JRE), which permits Java programs, together with Eclipse, to be designed in the way of choice. If a Macintosh walking version of Mac OS x, preferred by Android, is used, then SDK and JDK would be already installed as shown as in Figure 3.3.

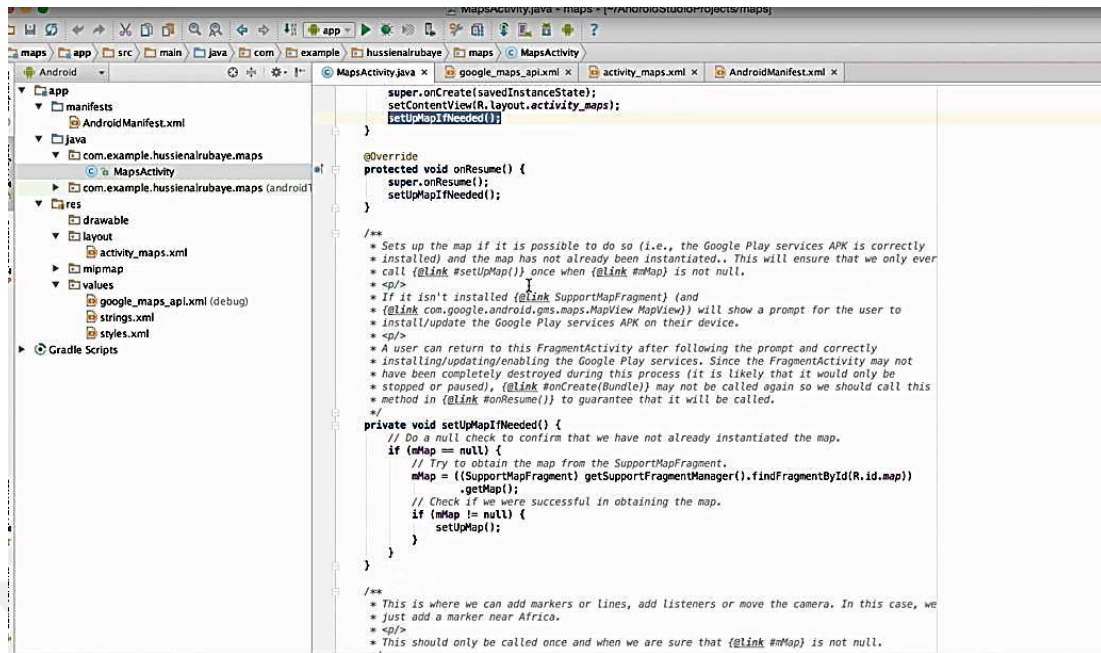


Figure 3.3. Java map activity

### 3.7. Java Standard Edition

The programming language of Java was originally advanced with the aid of Sun Microsystems. It was started out by “James Gosling” and launched in 1995 as a center constituent of Sun Microsystems; the developed Java software platform back then was referred to as (Java 1.Zero [J2SE]). The trendy model release of Java standard edition is called Java ES eight program. With the development of Java functions and its famous recognition, multiple configurations have been released to a number of systems. For clearer example: Module (J2EE) program is generally used for venture applications and (J2ME) program is used in sensor utility. The modern-day (J2) program releases have been renamed as Java ME, Java EE, and Java SE respectively. Java is warranted to be written once and run anywhere Java is:

- Object-oriented characteristic: The program written by Java is blanketed, everything is encapsulated as an item. Also, Java may be prolonged due to the fact that it's program components are built in the object module.
- Platform independent advantage: Unlike numerous other programming languages like (C and C++), Java now is not compiled into the level of a particular system, as an alternative into podium impartial bytecodes. The bytecode is distributed over the Internet and explicated by way of the used virtual machine.

- The simplicity advantage: The software of Java is designed to be very easy to apprehend. If you are gaining information of the primary connotation (OOP) Java, this would be convenient to understand.
- The comfy: With the Java's software satisfying features, it's no longer certain to grow virus-free and temper unfastened systems. Endorsement techniques are built on public-key encryption.
- The architecture-impartial feature: The software of Java compiler produces a structure-impartial object record format, which makes the gathered code, successful on many processors with the attendance of the Java run-time device. The structure-impartial and having no implementation elements of the allotment make Java transportable. The compiler in Java is written in (ANSI\_C) with a spotless portability border, which is a POSIX subgroup.
- The robustness advantage: The program written in Java makes an exertion to judicature mistake inclined conditions, through stressing often on bring collectively time fault checking and runtime checking.
- The multithreaded advantage: With this device of Java signs and symptoms characteristic, it is far viable to write down applications that may need to operate many duties at the same time.
- The interpreted advantage: Bytecode of Java is translated on the fly to nearby device pre-script and it is not saved anywhere. The approach enhancement is faster and more analytical considering that the connection here is incremental and a mild-weight system.
- The high-performance advantage: with the use of quality compilers, this system of Java conforms to high-performance characteristics.
- The distributed feature: The software program of Java is designed for the dispensed situation of the Internet.
- The dynamic advantage: Programming with Java is to be considered extra positive compared to C or C++. This is due to the fact that it is designed to conform to the growing demands of modern applications. Java can deliver a sizable quantity of saving time statistics that may additionally be used for verification and reply accesses to gadgets.

### **3.7.1. Java Environment Setup**

In this stage, an explanation for setting up the congenial environment for Java in order to try its alternatives online is elaborated. Basically, the private environment should not be randomly set to start exercising Java programming. The purpose ought to be very regular; formerly Java programming was done online so that it can gather and put into effect all the reachable examples available at the same time. This presents the dependability on what is being analyzed as well as checking the closing outcomes with unlikely to get alternatives. The discussed online environment at this stage can be found in [37].

#### **3.7.1.1. Locate Environment Setup**

If the developer is inclined to set up his environment of Java programming language, then this section would offer the required information on how to deploy and download Java to the machine. The utility Java (SE) is available online for free. A mode can be set up constructed to the strolling device. Follow the steps to setup Java and run the .exe to download Java to the required device. Basically, setting up environment variables should be done prior the installation in order to issue to the suitable download directories. This is done by inserting in the path. For instance, in Windows, the setup of Java file is located in C: Program Files-Java-j d k –directory. The following step should be going to “My Computer” then “Homes”. The step next is clicking the “Advance” button and then “Next” [37].

### **3.7.2. Experiments/Simulations of Location**

The information about the process built is presented in the flowchart given in Figure 3.4. This part explains the graphical representations of data normality. Imagining and visualizing are very important for public and readers who are going to read about the findings of the study as shown in Figure 3.5.

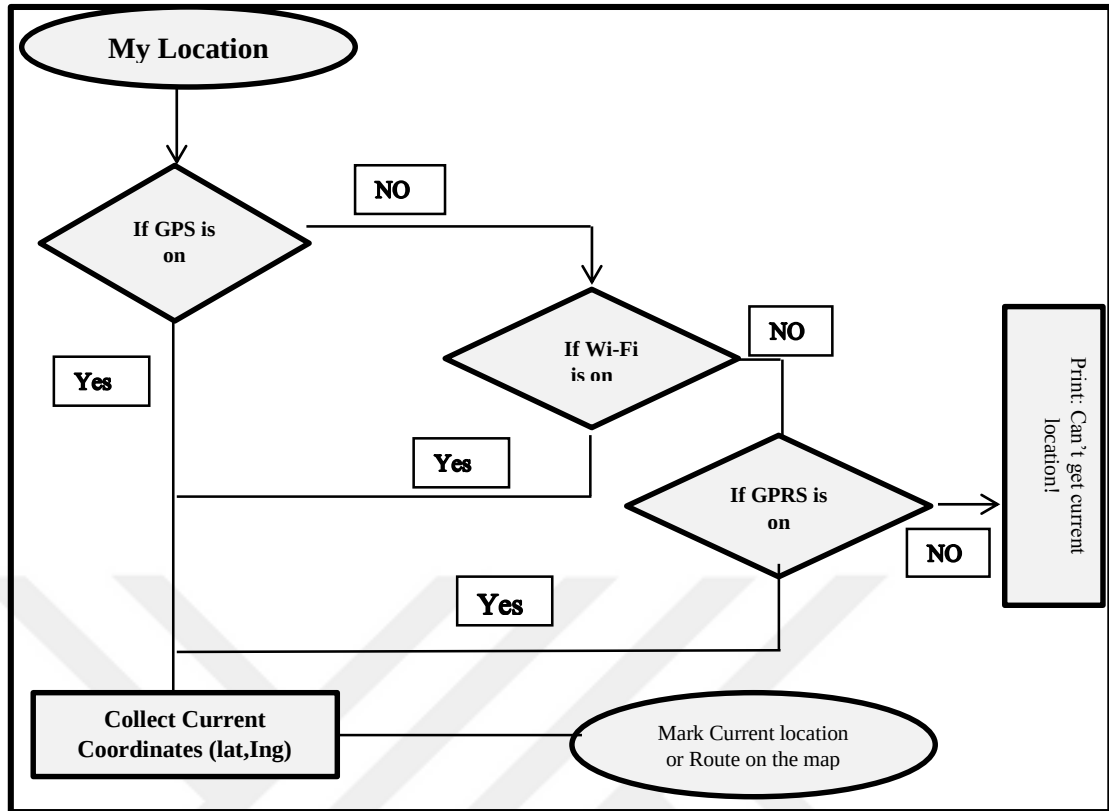


Figure 3.4. The flowchart of my location information processing

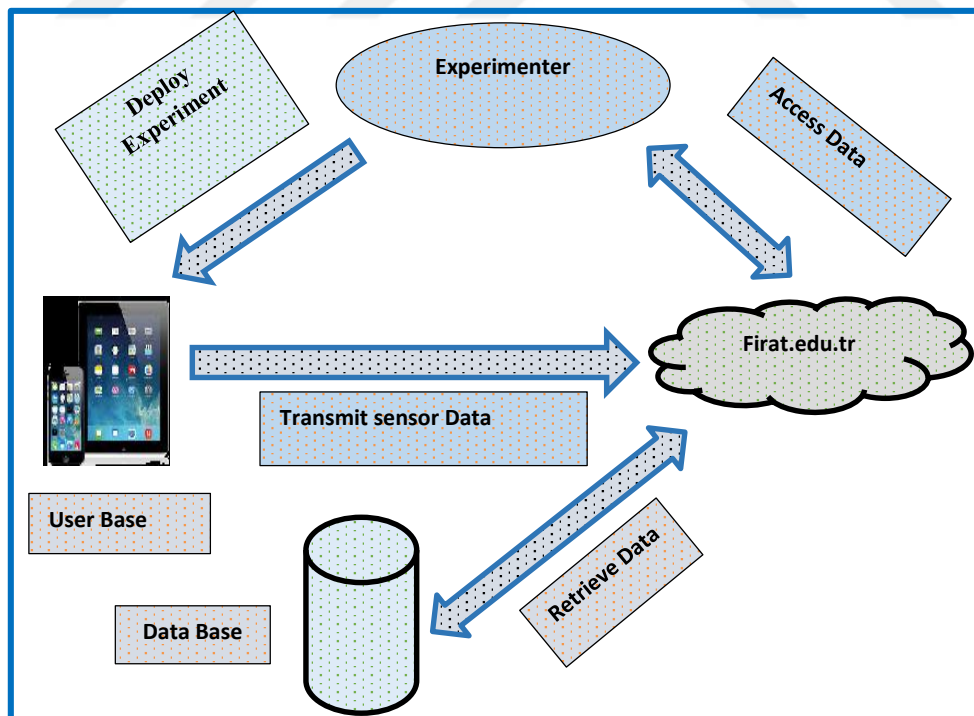


Figure 3.5. Visualizing process of collect and store of sensor data

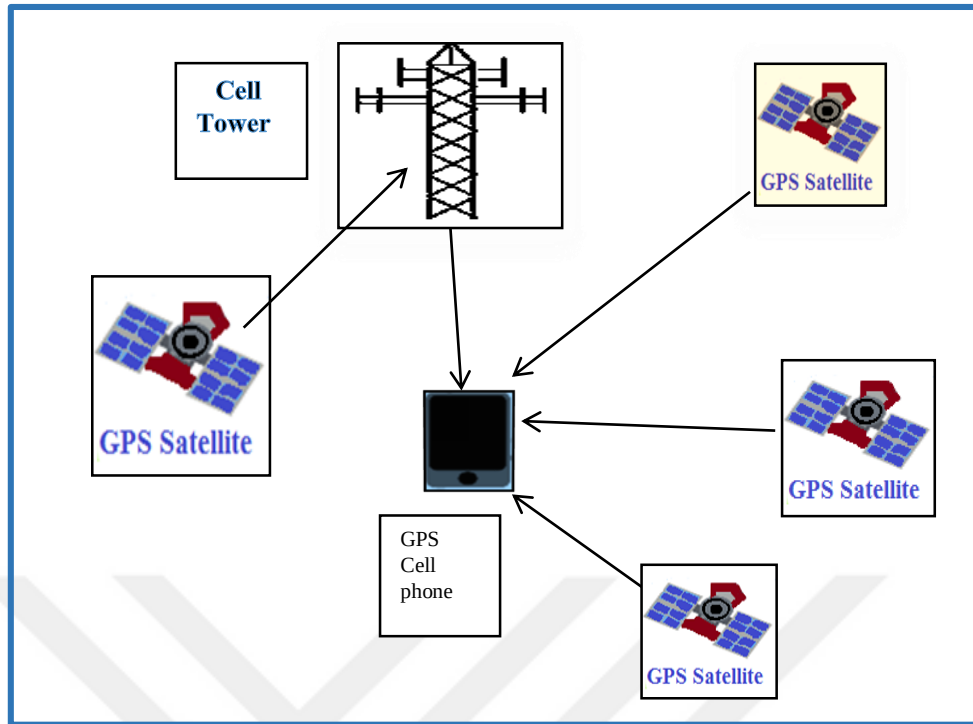


**Figure 3.6.** GPS operation visualization

Figure 3.6 shows the satellite orbiting the earth that has an atomic clock and often broadcasts radio signals related to the time. The GPS system is a constellation gadget with 29 recorded satellites. There are 24 satellites to offer a global insurance; this leaves five spares the maintain the overall performance. At any given time anywhere on earth, a minimum of 4 satellites or more is needed for feasible results. At least four satellites should be visible for a smartphone to communicate and to activate the GPS receiver [13].

### ***Visualization of Map***

- The map must be visualized in step with the housing from the computer display.
- The map should be optimized for display on the laptop screen.
- The map should be easy, intuitive and large to apply. Colors must be in a compatible mode.
- Each map scale should be taken into the account each time: what statistics should be protected and how they should be visualized in each stock. Information about the accuracy and accuracy of information should be provided.

### ***Map special Tools***

- Special map tools, on the other hand, should now not be obscured by the amount of information on the map.
- Cycle: Measurement system may be useful (in bar scale calculation).
- New hardware may be useful to the player: spreading of distinctive features, signs, and symptoms on the map. Clicking on various elements will attract additional statistics about them. Modifying or adapting the map is possible via "containers"; this is done for exposing or hiding specific archival layers or signs on the map [41].

### **3.7.3. Evaluation of Map**

Some experiments have been completed with the aim of classifying as many usability issues as possible on the maps. First, a normal scenario has been developed to use these types of websites: the traveler is designed to visit Iraq and benefit from the web mapping net page to plan the day ahead. In general, there were 24 participants involved and 32 evaluations from a variety of assessments. Therefore, all 4 Internet maps were evaluated with the help of 8 outstanding entrants (4 customer checks and four masters). Tracks were run using Home Windows edition of the home mode using a laptop or a desktop computer [41].

### **3.8. Data Processing of Travel Behavior**

A validation of the journey notice down is needed to the consolation of the exception of the information provided to educate the strategies. Advantageous extraction is offered simplest for those legitimate travels. For the documentation of journeys, containing the transportation mode, best features of taking out from the accelerometer indicative were used. This is because the literature discovers that data from cell phones can be plenty for figuring out tour modes. Thus, GPS information has been most effectively used for validation of the statistics used to standardize the method [19].

For all trips described and accumulated by operators, the manual was verified. The validation method was once needed as the registered methods using shoppers may hold unusual errors regarding the opening time, final time or transfer mode degree. Samples of

these errors are: Once the travel was started earlier than the real start time, the time it ends would be after a real final out. Similarly, a short entertainment is once performed somewhere on the road.

- Can view the usage of API key which can be extracted from Google Maps.
- Show the same itinerary inside the path scheme of Google Maps and accounting the ride time by means of skill of the transportation mode specific.
- Rapprochement of the tour time defined by way of the operator trip time. This is done by predestined through the ride time defined by the resource of operator and tour time predestined by the course designer of Google Maps. Three in all likelihood situations upward thrust up from this assessment:
  - A.** Trip or travel time isn't always much less or more than 20% of the trip time expected using Google Maps.
  - B.** Trip or travel time is more than 20% (time >20%) of the trip time predicted the using Google Maps.
  - C.** Time of trip or tour is much less than 20% (time <20%) of the trip time estimated using Google Maps.

Whether it is the case A, B or C, it would affect the advantage of the routes for standardization process. Routes in the case A can be used for standardization of the procedures, and routes in the cases C and B are not immediately used for standardization because they may not be properly informed down or categorized. In addition, to make sure the greatest of these routes as a way to function ground verify records for the algorithms, the primary and last 30 seconds of a direction A become not considered [19], [51].

The feature extraction method is known for each tested flight. This step consists of extracting the remarkable features of the acceleration tag that can provide reference records to the workbook to be aware of the travel modes, for instance taking the metro, riding, biking, and cycling. Since the cell phone path affects the values of three acceleration channels, a neutral-orientation variable is necessary for its calculation because the effect of the phone has 3-channel acceleration values. An independent variable is required for its calculation to control this effect. Therefore, the three acceleration orientations are mixed to obtain acceleration dimensions, representing the rectangular root of the total squares of the three sides of the acceleration. Focus transfer mode makes use of sliding home windows for the home tool. With this system, the actual measurement of the time window is chosen because of the length of the class. The size of the sliding windows of the home chain is set

to 30 seconds, preventing the inner lace between the running windows. Here, the acceleration frequency is 1 Hz, and 30 samples (acceleration amounts) are used to calculate the capacities. Each window, first-class full of six neutral points of acceleration volume, the first and third quarters are extracted. Other researchers have shown that those statistics are useful in the technique of determining round ways [50], [19].

### **3.9. Analysis of Errors in Android**

The greater composite the app becomes, the more likely it will hold errors. Nothing frustrates an operator more than an app that shatters, be unsuccessful to run below-confirmed conditions, or receives inner the way of the challenge that it emerges as intended for fulfillment. A naïve method to consider is thinking that the developed code will constantly execute alongside the described trails. This is now and once more referred to as the glad route. Understanding in which code can deviate from the right course is critical to becoming a higher software developer. Because one cannot forecast all the probably deviated paths of improvement, it assists in enlarging records used for analytical equipment and strategies involved in Android development [29].

#### **3.9.1. Bridge Debug of Android**

ADB is an application that allows the user to control both simulation and sensors, and place them in a shell that will execute commands in a set of emulators or sensors. Android bridge patch is particularly useful with running and deleting programs from emulators or sensors [33]. A documentation on the robot patch bridge can be found on the web from the Android developer ([Guide-developing-tools-abd.html](http://developer.android.com/tools/developingtools/adb.html)).

#### **3.9.2. The Monitor Server Debug of Dalvik**

The Android robot monitor is integrated into Android Studio and it provides Logcat, memory, CPU, GPU, and network monitors for application debugging and analysis. ADB robot patch bridge is a versatile command-line tool that enables the communication with a rival instance or it connects Android-powered devices. It also provides access to the shell device. Dalvik Patch Monitor Server (DPMS) allows the debug of Android applications.

Android device's monitor is a stand-alone tool that provides a graphical user interface for debugging the application and analyzing Android tools. Systrace provides the execution analysis of the order in the context of system operations. This is done to diagnose the display and performance problems. Trace view provides graphical scenes for saving execution records for the applications. The Open (GL ES) trace allows the capturing of open (GL ES) command-line commands and frame-by-frame images. This is usually done to help understanding how the application is executing graphical commands [33].

### **3.9.3. Exploring Data Collection and Analysis on Smartphones**

This phase's motive is to offer the overall building of the methods which are planned and have been examined. In addition, it offers a view of the used techniques of the findings and the studies of the investigation of Google Maps. The explosive records onto sensor stations have a couple of viewpoints of values for the operators and provider companies. For instance, improving purchaser understanding, beneficial, useful resource distribution and making a contact with marketing, and so on. It lacks a large peak sensor scale statistics for analysis. It seems that taking the former though is limited to the grain scale. In this part, a computer vital information is provided for checking and finding out sensor facts in the pool to learn more about them. It attains a collection of the first-class scale of a dynamic technique records. Accordingly, the exploration analyzing feature is also fashioned to familiarize with the dynamic growth in statistics. Also, this case can be clearly prolonged over specific modules. To show this physical development of the system, many demonstrations of observing effects in elements of customer utilization style are elaborated. Besides, clustering analysis is made for a few specific new smartphones that contribute to the quick growth of telephone facts [16].

### **3.10. Eclipse Integrated Development Environment**

Eclipse is a usual-purpose technology platform. It has been carried out to a collection of users in making IDEs for more than one language. It is also used in constructing a customized IDEs design for lots of generalized SDKs, as well as to apply externals of software program enlargement gear, together with imparting a rich client platform for Lotus notes and a few other usages. Eclipse is usually used as an IDE for trying out,

writing and debugging software programs, mainly Java programs. There is likewise some spinoff IDEs and SDKs for diverse styles of Java programs based totally on Eclipse. In this situation, a typically used Eclipse package deal can be chosen, then it can be customized by adding plug-in extensions to make it work for the Android developer. For the getting the suitable Eclipses package and setting it up, the information is provided on its official website [54].

### **3.11. Controlling the Map with Menu Buttons**

It is desired to give the user the needed capabilities to flip on satellite, traffic, and street views of the map. Also, providing the user with a little menu button to allow zooming and alternative way to get the jobs' list is highly recommended. Android has a developed set of menu capabilities that incorporates three sorts of menus (context, options, and submenus). Every one of those has its own abilities, icon menu buttons, and different sophisticated features. This work uses text-based menu buttons. The following two things are generally considered and done:

1. Building a menu of buttons that will be displayed.
2. Control the menu events and invoke suitable activities.

The menu buttons are built by means of overriding the created selections of the menu system, where a menu parameter is bypassed for prompting the menu. Next step, enabling the superclass to do what it is supposed to do. Typically, the buttons objects are added to the menu using the Menu class.

### **3.12. Controlling the Map with the Keypad**

Some operators might desire to manage the map via a keypad (mostly one “click” versus two “clicks” to control the menu events). Enabling this behavior also demon begins how to answer for the keypad activities in an overall, so some codes to zoom in, zoom out and lower back out of the current activity were added.

To manage key-down events, normally a surpass on key down and supply a change for the extraordinary important keys are taking place. In addition, the consideration should tackle the common key codes (*Key code \_ A ...Key code \_Z; and things like Key code \_ Space, Key code \_ Shift \_ Left, and Key code \_ Shift \_ Right*). Further, Android contains

*key codes that may or may not be related to any specific sensor (Key code \_ camera and Key code \_ volume \_ Up). A whole set of key codes and the way they can be setup are provided in [52].*



## **4. APPLICATION OF DATA COLLECTION USING ANDROID STUDIO**

### **4.1. Introduction**

This part explains the developed application incorporated with Google Maps. This application depends on (Google developer console) website for finding the Application Programming Interface (API) key and registering “My Location”. When the map view is being used, Android makes all things very clear with the part of (My Location Overlay). However, if the map view is not desired, then it won't be difficult to get the location information. The code in this section is not a part of the “MJ” Android, but it displays how to find the location information freely without using the map view. The following points explain the details on how to use the application:

- 1) What matters first is discovering the (MV-Map View) in details. The XML format records the equal details that allow discovering every view if needed. The view can be allocated to the flexible MV-Map, in Map View format, in order to be able to point out the location if needed.
- 2) Also, the Map Controller has to be taken care of when dealing with the Map View. This step is used for activating the map, zooming out, zooming in, changing perspectives, and so on.
- 3) To use My Location Overlay, a new example has been made, giving it the finest innovative call (m-My Location Overlay).
- 4) The first aspect done with (m-My Location Overlay) is describing a gadget that Android will call while acquiring the first area restored from the current location.
- 5) This (run on the first repair) gadget moves the map to the recent region (given through m-My Location Overlay. Get my Location) and then zooms to a practical level to peer neighboring activity prospects.
- 6) Next, a marker is attained that is obvious to apply on My Location Overlay to mark available jobs. An image that's saved in the res/draw table directory is used for this purpose; this image is called “android\_tiny\_image”. It's a photograph of a little Android robot. The boundaries of the draw abilities are

described and then the marker overlay finalizes the listing of overlays for the map view of the mv map to be uploaded.

- 7) It is desired to accumulate a few preliminary attributes for the mv map. This is provided to the user as an alternative process done via menu buttons.
- 8) Subsequent, a belt-and-suspenders philosophy is used, in case there isn't a place company to cause the run (On First Fox). The zoom set level here is maintained as 2d time.
- 9) At the cease, Map View calls for exceeding the route displayed machine to signify whether or not the location is placed on view route statistics on the map. If the case is negative, then a wrong return message shall be provided.
- a) My Location Overlay encapsulates the view of the site and the mapping code.
- b) Instruct Android to find out what position providers are accessible in the current situation (GPS, Cell ID, and triangulation).
- c) Link to the "best" of those location providers.
- d) Instruct or ask the location provider to deliver periodic location updates as the receiver moves.
- e) Connect to routines that will automatically move the map as required to any track alteration in the location.

Figure 4.1 shows the block diagram of the application program.

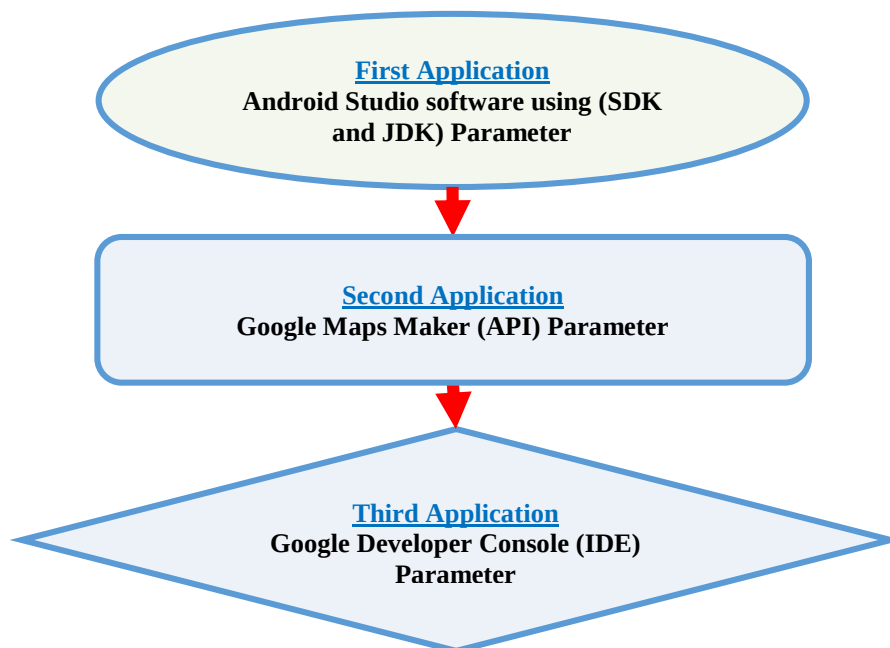


**Figure 4.1.** Block diagram of the application program

### ***Enabled (Boolean) system.***

Integrating Google Maps in the usage basically consists of the following steps:

1. Installing and configuring Google Play and SDK offerings.
2. Getting an API key Google Console.
3. Configuring Android Manifest settings.

## **4.2. The Manifest and Layout Files**

This is basically referring to a suitable Android “manifest.XML” file trails. This file should be made accessible for the usage of the Android SDK. Here, Android will show up an editor that comes as a part of it. The alternate desired to be created with the editor is adding the uses-permission tag for Android approval ACCESS\_FINE\_LOCATION (in the next-to-last line of the file). This permission is desired all the time to capture vicinity statistics from a GPS location provider. The API key for Google Maps-based APIs is defined as a string resource. Note that the API key is linked to the encryption key used to signal the APK. For every encryption key, an extraordinary API key is needed, along with the launch key that is used to sign APK for pushing. The debugging keys can be outlined as well as the release aims in src-debug-and src-release as shown in Figure 4.2.

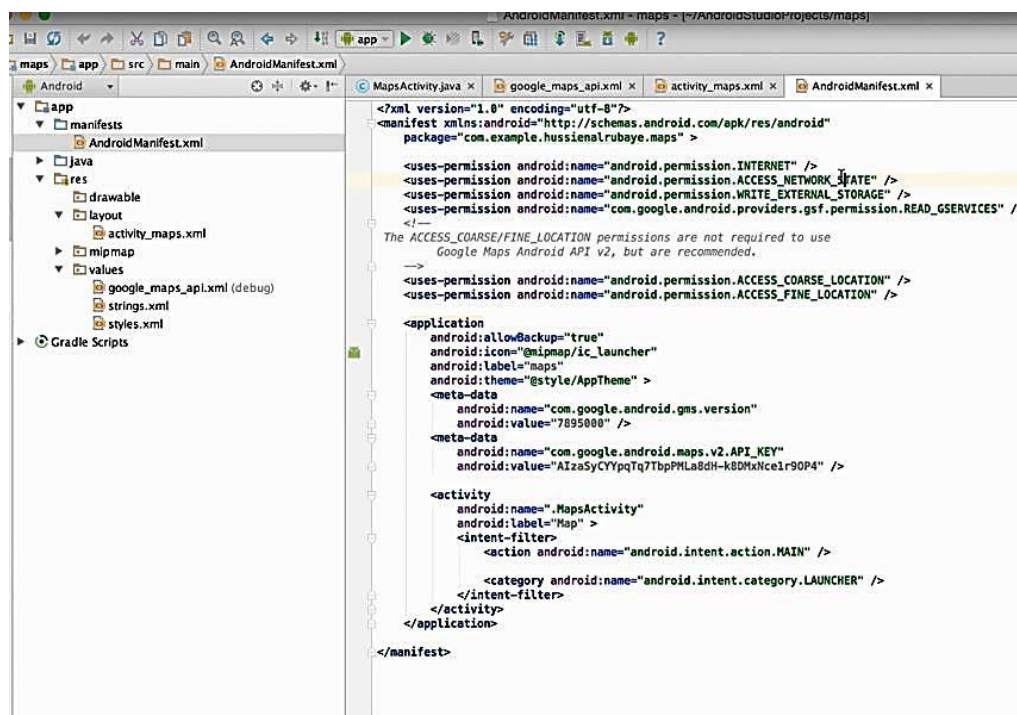


**Figure 4.2.** Android Manifest XML coding

### Map view and map activity

Currently, what is needed is adding the map pane XML to the included formatting record. The general installation functions obtained from Android path need an overlay feature that displays locations for functions within the area. So, as an opportunity to use the Google Maps tool, the map view can be used, which can be overlaid with the images in a dynamic way. It can be more effective to use one map view in line with the activity. This process will extend the activity of the map. As it will be seen, a little attention paid for the study of geographic functions that Map View provides for the usage is needed. There is more than one unpaired stipulation for the use of Map Views, and they can be noticed during the initialization of (Micro Jobs) of Android map view library. The map view isn't contained inside the presumptive Android libraries. As a substitute for, it is needed to be specified in Android Manifest.XML, which is used from this additional library as shown in Figure 4.3.

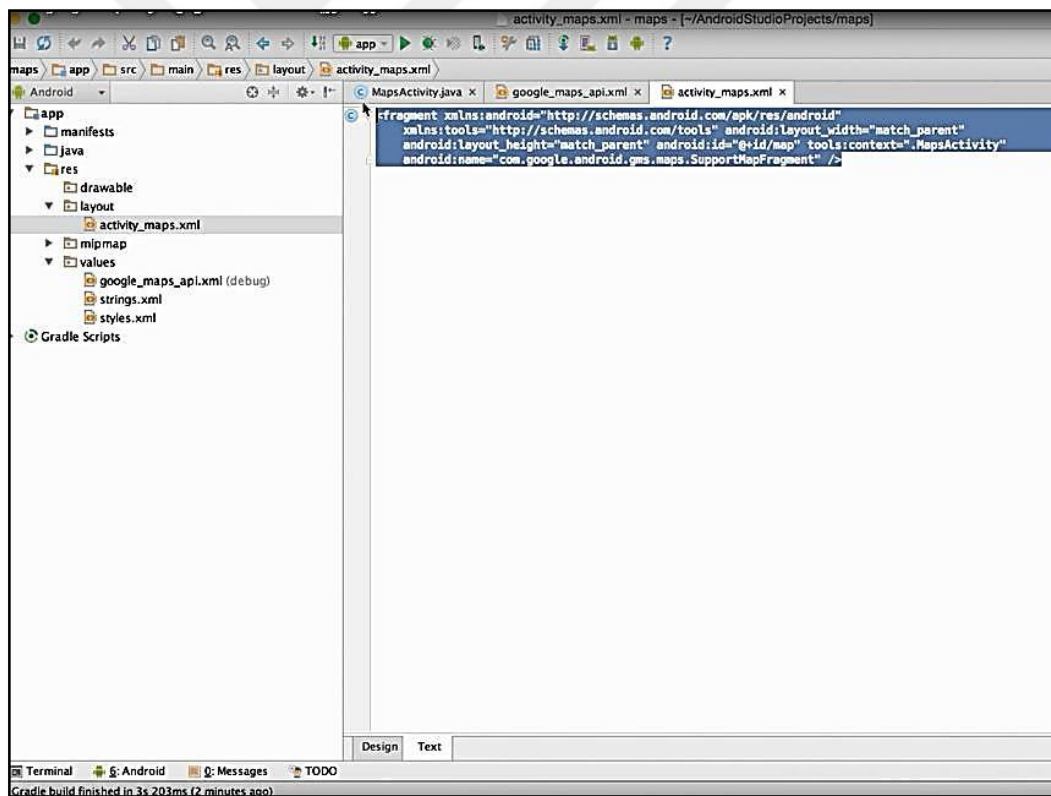


**Figure 4.3.** Android Maps Layout Activity XML

The use should be marked and the API key should be obtained from Google while using the Map View. Here, the actual Google Maps facts are being used for the map design as shown in Figure 4.4.

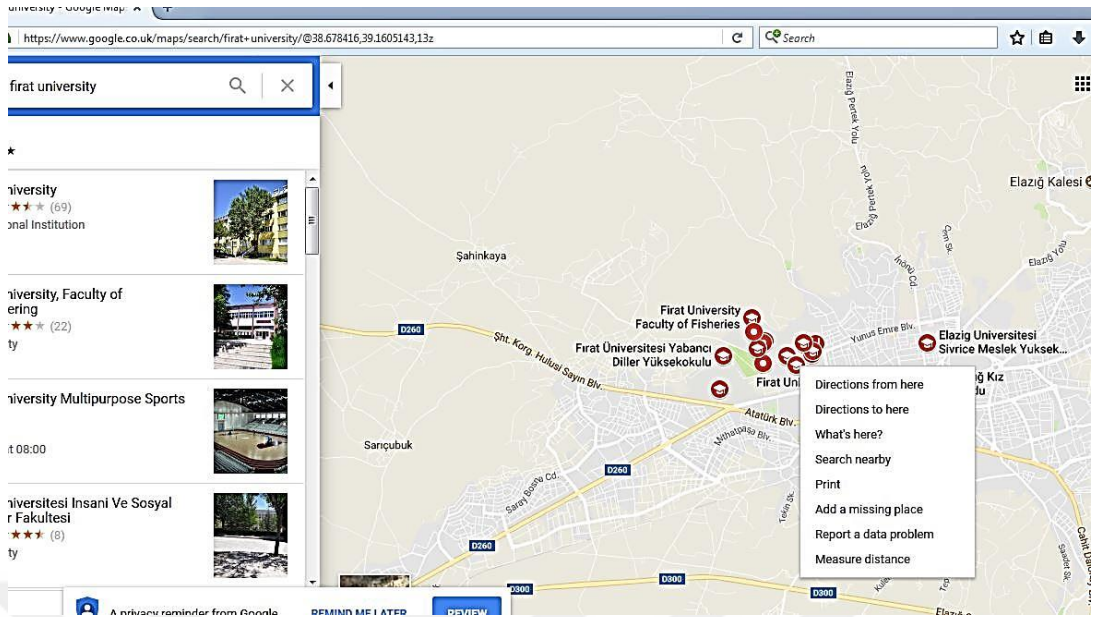


**Figure 4.4.** Google Maps view of Firat University

For legitimate motives, Google would like to track which is to use for the map records. Google does not care about the use of statistics, but it is needed to report or sign up with Google for getting the API key, and accepting the appropriate resource requirements. This tells Google that mode is to use map statistics and whether or not there is a need for using routing statistics that are accessed from Google Maps as shown in Table 4.1 and Figure 4.5.

**Table 4.1.** Google Maps Maker code in the normal view.

| Name                         | Codding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Google map maker normal view | <pre> <b>public class</b> MapsActivity <b>extends</b> Activity <b>implements</b> OnMapReadyCallback {      <b>@Override</b>      <b>protected void</b> onCreate(Bundle savedInstanceState) {         <b>super</b>.findFragmentById(R.id.map);         mapFragment.getMapAsync(<b>this</b>);     }      <b>public void</b> onMapReady(GoogleMap mMap){          LatLng center=<b>new</b> LatLng(38.677723, 39.201873);         mMap.moveCamera(CameraUpdateFactory.newLatLngZoom(center ,13));         mMap.addMarker(<b>new</b>MarkerOptions().position(<b>new</b>LatLng(38.679641,         39.202506)).title("ElazığTurkeyFirat University"));onCreate(savedInstanceState);         setContentView(R.layout.activity_maps);     }         </pre> |

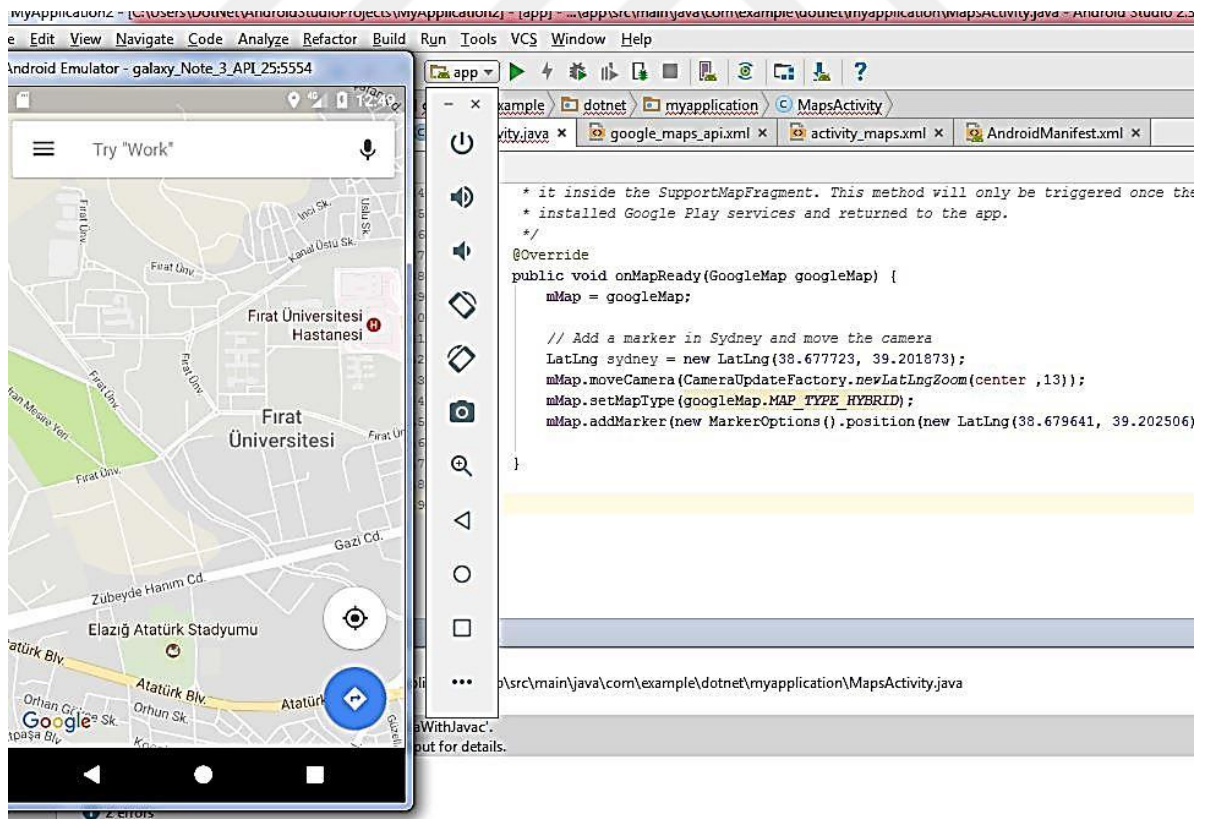


**Figure 4.5.** Firat University Google Map Maker

### 4.3. Location Provider and Getting Location Updates

Initially, the beginning shall be with an action that simply hyperlinks with the GPS location company, catches and indicates the current place (with no updates). Here, the manner is nice-looking and straightforward. The following are some of the code highlights:

- Connect to the location supervisor using get system provider (Context/Location/Service).

- Request the area manager to place the location using get the closest known place (“Provider”).

- Become the longitude and latitude of the region. Additionally, it is required to get periodic vicinity updates from the location manager so that the vicinity will be tracked on the move. For that, an auditory of events is added which inquires the area manager to request it when there is update. Location updates from the region manager are reachable for a utilization via a display listener class. So, an occasion will be made for this category in the “on create device” of the core activity.

- It is required to override a wide variety of structures in the DispLoc listener to meet the location listener interface description, but they are not chosen for this application, so the description is left empty.

- Obtaining the API key

This ID part is further separated into two ladders. The first point to be gotten is (sha 1 fingerprint key) from the computer, and the second point is the map API key from the Google console as shown in Figures 4.6, 4.7, and 4.8.



Figure 4.6. Creating projects with Android Studio

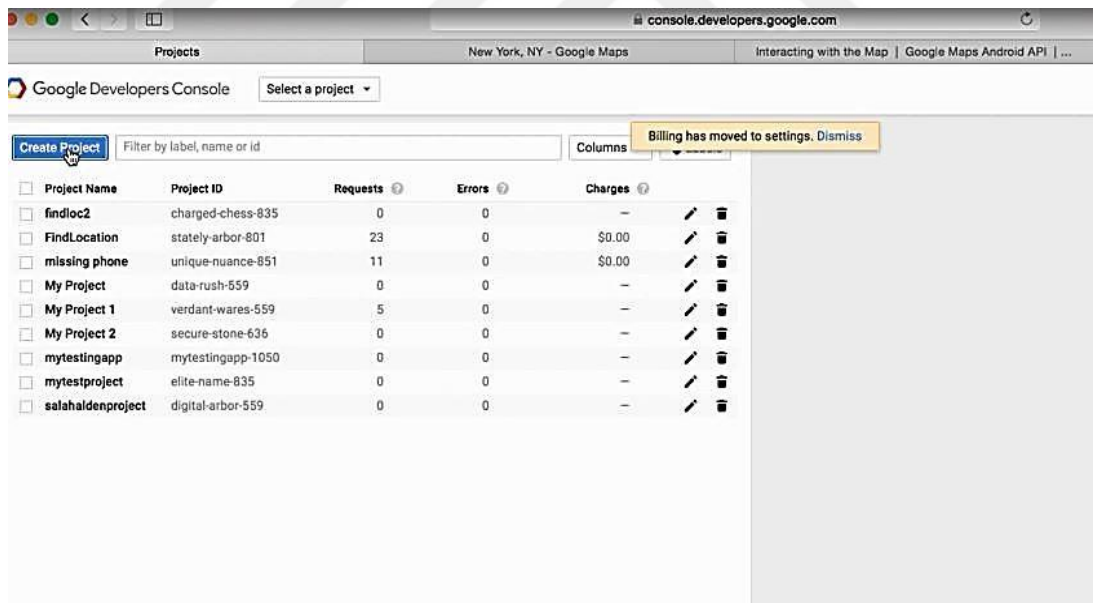


Figure 4.7. Google development console for creating projects

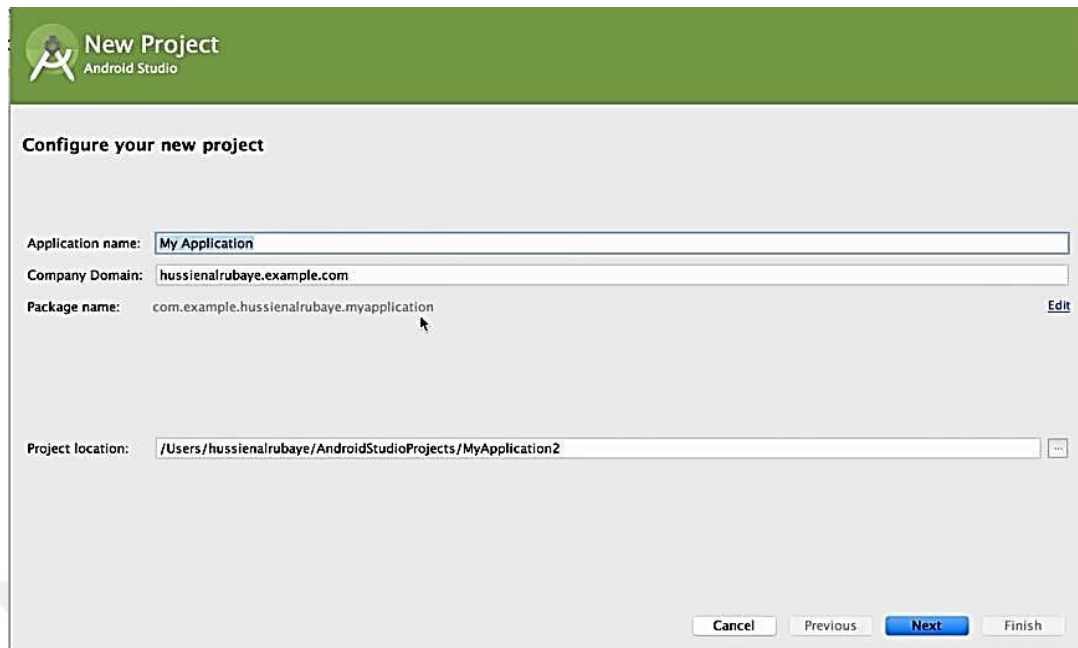


Figure 4.8. A new project using Android Studio



Figure 4.9. Android Types of map (Google Maps activity)

- Getting certificate from the key tool

Working on developing Google Maps requires choosing to get a certificate key. This is due to the fact that this key should be provided to the Google console while acquiring

the API key for the needed map. Opening the command operator and moving to the path where the Java Jri has been placed provides the user with a variety of options as shown in Figure 4.10.

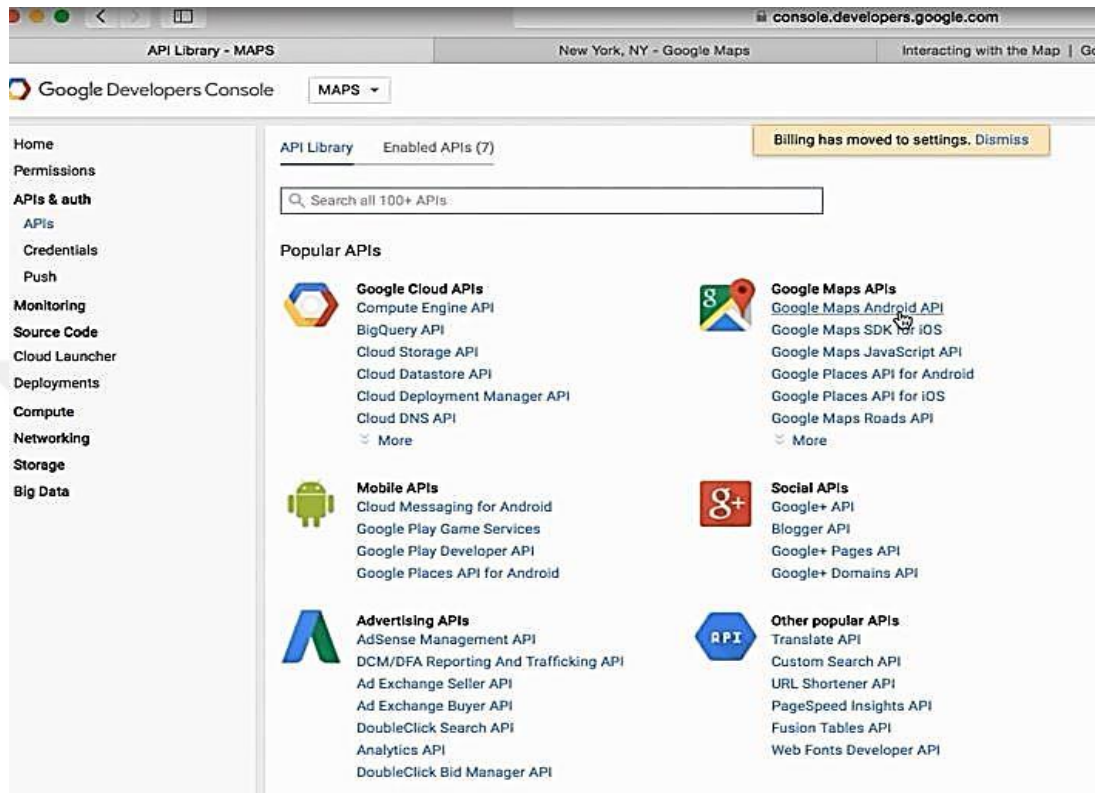


Figure 4.10. Google console API

- Google Maps addition

Google provides this facility using the Google Play Carrier library, which has to be set up externally. After setting up the library, it has to be plugged along with its own task. In later steps of this project, connecting the program with Google through the Google controller shall be made as shown in Figure 4.11.

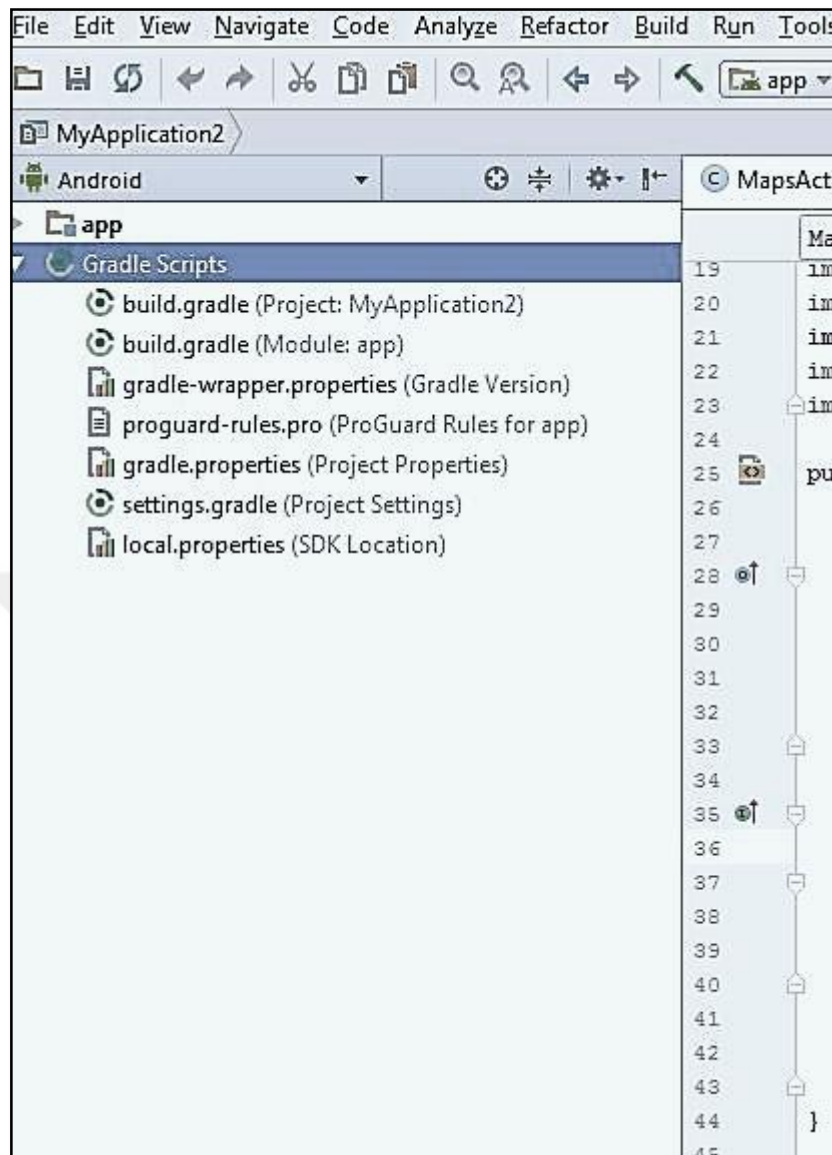


**Figure 4.11.** Android Application GUI

- Google Maps activity file

One of the norms that include Android is Google Maps itself. If appropriate, Google Maps can be used from the program as an identical step to start some other mapping activities:

1. Built Intent (new Intent (String action, Uri)), this proves that it is needed to display a map. The parameters here are:
  - An action, for that it should be agreed upon (ACTION\_VIEW).

- A URI, for which it must be agreed upon related to the following URI preparations and changing of data.
2. Start Activity (Intent intent), this is exactly referring to using the intent that has been made.

An example that creates a map according to the previous steps is given in Table 4.2 and Figure 4.12.

**Table 4.2.** The code creating a Google map view for the center of Elazığ.

| Name             | Codding                                                               |
|------------------|-----------------------------------------------------------------------|
| Google map maker | Intent intent = new Intent(ACTION_VIEW, "geo: 35.564542, 45.431932"); |

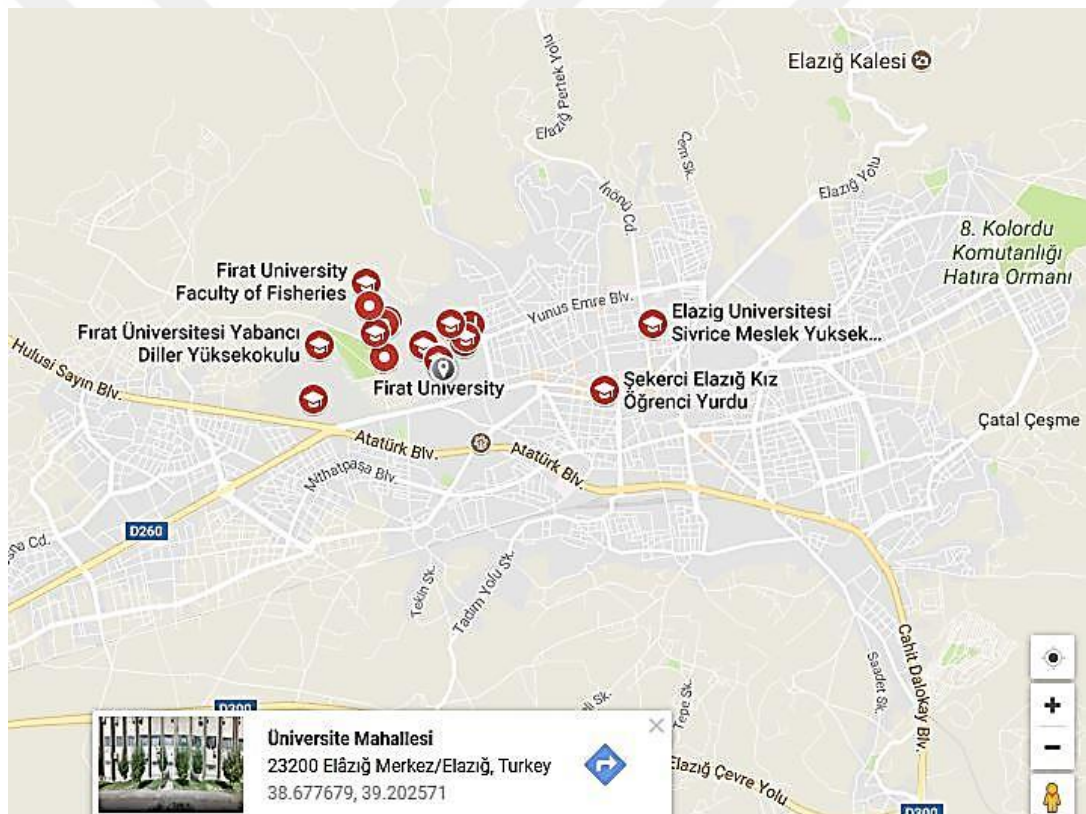


**Figure 4.12.** Android SDK View for the center of Elazığ

This is definitely easy, and it provides the total power of Google Maps. However, this way does not really allow joining in the maps into the application. Google Maps app is used by itself, and there's no way to replace anything about the user interface or add superposition graphics to the map to point out whatever interests the operators. Android offers more flexible packages to add this feature. For instance, getting started with Google

Maps maker for (Firat University in Elazig-Turkey) is given and elaborated in Table 4.3 and Figures 4.13, 4.14, 4.15 and 4.16.

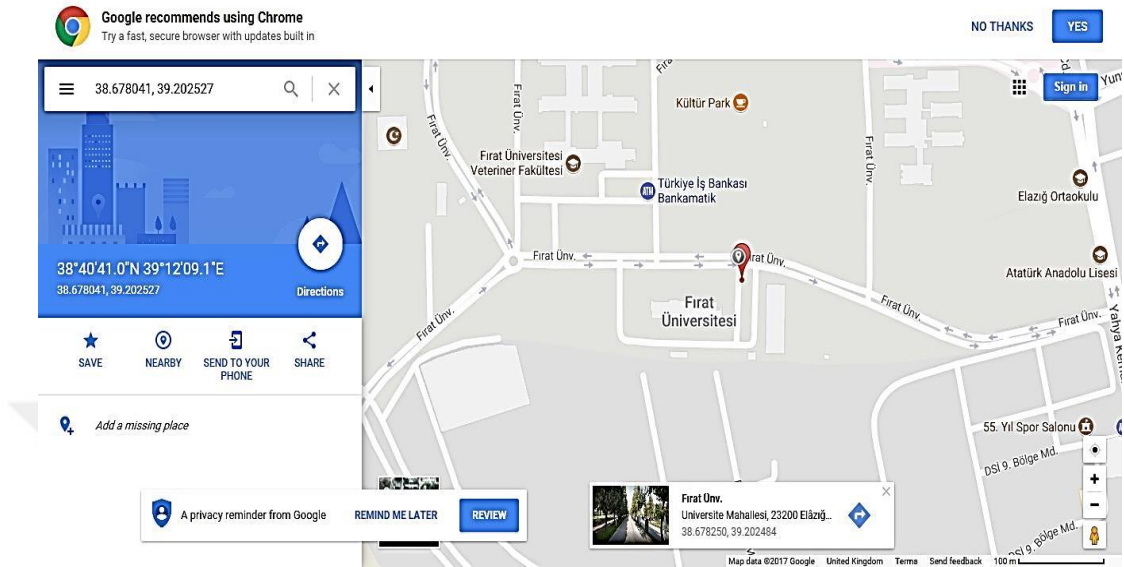


**Figure 4.13.** The result of Google Maps maker code for Firat University in Elazığ

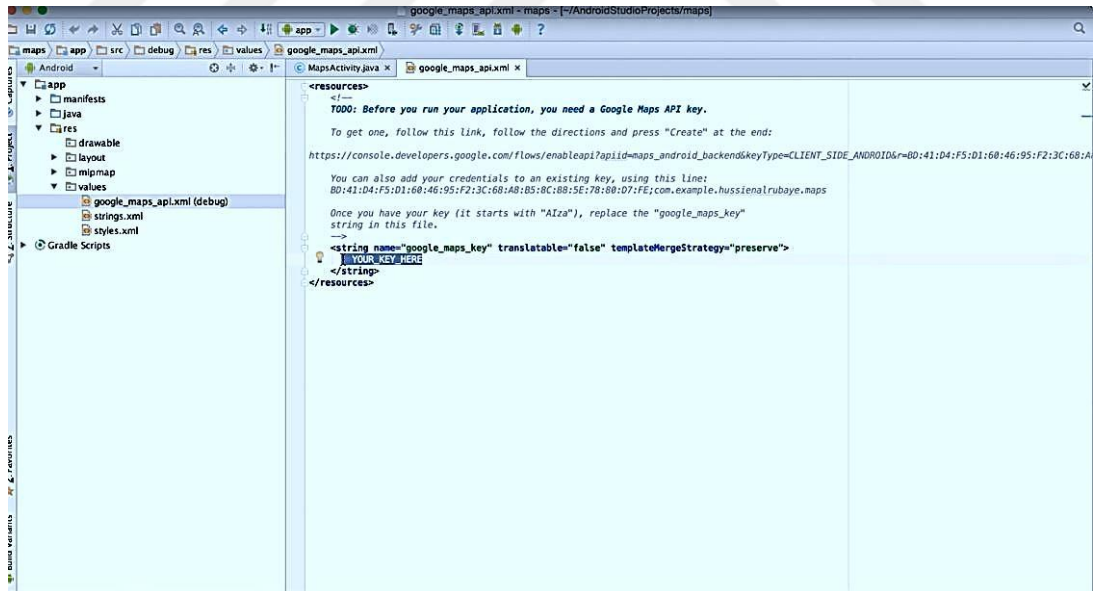


**Figure 4.14.** Android windows activity.

**Table 4.3.** The code for creating an API key from Google developer console:

| Name    | Codding                                                                                                                                                                                                                             |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| API Key | <p>Put this code inside the SHA-1 certificate fingerprint:</p> <p>79:8D:EB:45:CD:4B:30:3C:E5:FB:7F:8F:BB:63:2C:3D:15:5E:D1:4E</p> <p>Put this code inside Package name:</p> <p><a href="#">com.example.dotnet.myapplication</a></p> |

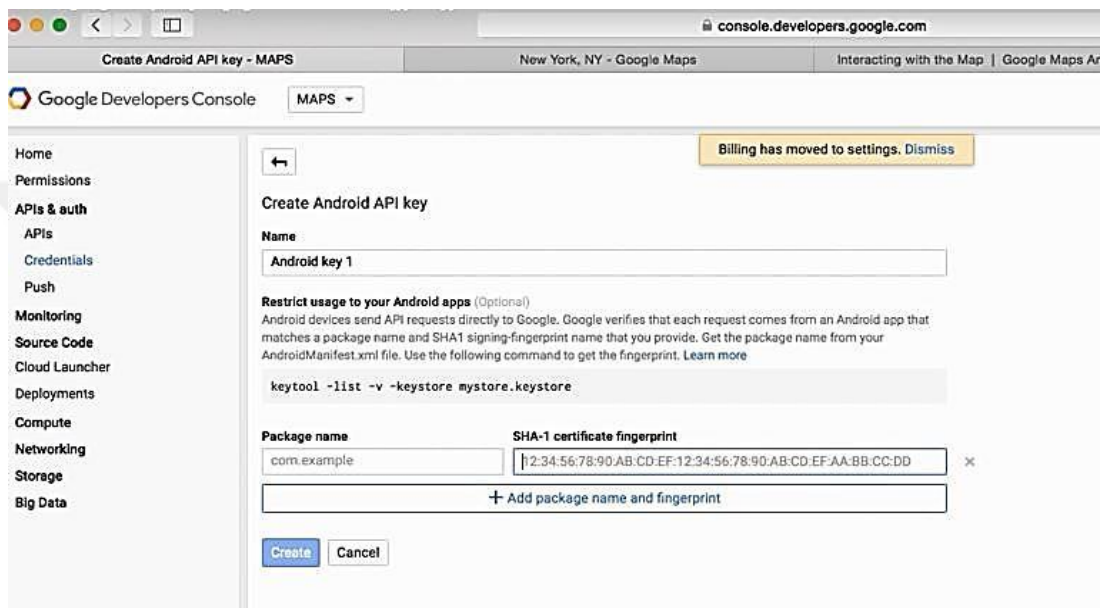


**Figure 4.15.** Google API key for the My Location

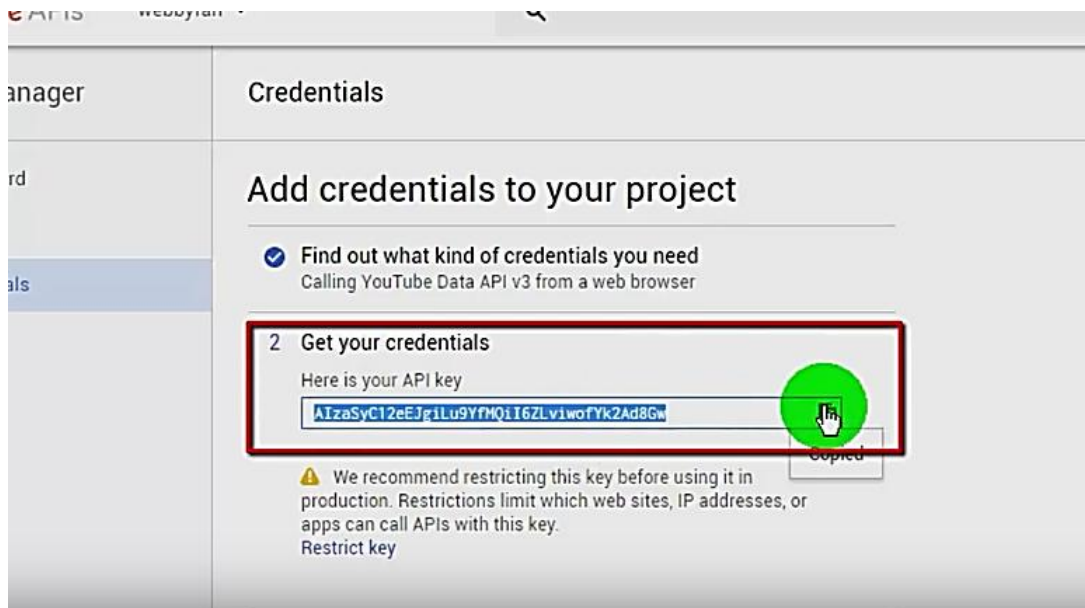


**Figure 4.16.** Getting an API key from Google console

### • Working with Map Views

The map view summarizes a lot of very complicated mapping software. It is provided with a view to use for Android purposes for free. Some of the things that ought to be done with the map view, with solely a little programming: Appearance of the street map of any place in the world, with an up-to-date mapping information courtesy of Google.

- Altering the map view to show:

**Street view:** Photos taken at the roadside in many places in North Iraq.

**Satellite view:** An aerial photographic view of the location.

**Traffic view:** Original-time site visitor's statistics imposed at the map or satellite perspectives.

- Change the map beneath software manages.
- Design the desired images in overlays on top of the map.
- Reply to the user's touch events on the map.

### • Map View and My Location Overlay Initialization

The map in Micro Jobs has modes:

- A. At the start, and whilst a cutting-edge Location from the spinner is desired, it is required to display a map of the present day place. This map should course the user as he moves around. For this initialization map, My Area Overlay is used.
- B. When an actual location is selected from the spinner, a map of that vicinity is requested to be shown. The region updates should be switched off and the movement should be tracked. The Java code that initializes My Location and the map view Overlay, and tracks the present region is provided in Figure 4.17.

From Google developer, the Marker Key is inserted using the code given in Table 4.4.

**Table 4.4.** Code Marker option from Google Maps option "What's here"

| Name              | Codding                                                                                                                                 |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Google Map Option | <pre>Privoate void setupmap() [<br/>mMap.addMarker(new Marker options(new LatLng(33.380354, 44.702082)).<br/>title("hospitale"));</pre> |

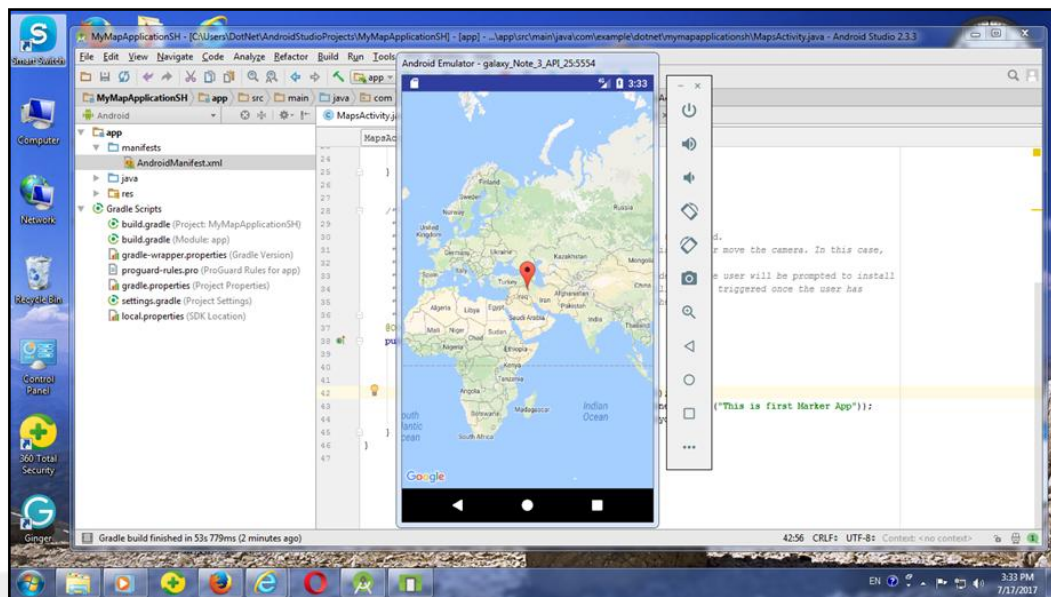


**Figure 4.17.** My location overlay initialization

### 4.3.1. Pausing and Resuming a Map Activity

Initially, the focus point should be placed on the map and pause the process to save the battery consumption of the cell phone. The respectable news is that Android makes this kind of application very easily. In the cellular situation, battery lifetime is a crucial issue, and everything possible should be done to reduce the unnecessary power consumption. When an undertaking (such as Micro Jobs) beginning to any other recreation (such as Micro Jobs List), the new endeavor takes the screen, and the demanding exercise gets pushed onto a stack of things to do that are ready to run. Hence, Android requests the on pause activities in the requesting endeavor so that they can prepare themselves to go into hibernation. At this time, in Micro Jobs and Java (or only about any Map Activity that uses place updates), it is needed to change off vicinity updates. Doing so will, at least, shop the cycles dedicated to the update. This also lets the receiver to store even extra power through placing the area provided in a quiescent region that uses less power. When the termed activity (in this case, Micro Jobs List) arrives, the calling activity is popped off the stack and it would take over the control of the screen. Finally, the outline calls the on resume gadget in the calling activity.

Updating the emulated location, while increasing and debugging a usage like the one shown in the preceding section, is usually achieved from a specialized emulator. It would

be agreeable (maybe even essential) to be successful to replace the current area that the emulator uses as it would disable the code. Such a mock region provider can get stuck, but Android gives some made-in ways of updating the emulated location:

- The Geo program created into the Android shell.
- On-time updates through DDMS.
- Tracks that are sequentially updated through.

#### **4.4. The Problems Faced During This Work and the Resolving Methods**

The problems that have been occurred during the practical part of this work are listed as follows:

1. When downloading the API key, the laptop showed an error. In this case, the smartphone should get connected to the laptop to complete the process.
2. When connecting the laptop to the smartphone it should be disconnected from the setting side in order to be able to install the shield wizard.
3. The big problem which had delayed the work for several days occurred when the API key was opened from Google.com. Initially, it was not accessed and the following message was shown {OHNOES! :( Your ancient browser broke your internet. Want to see how badly)?}

#### ***My Location Overlay***

Also, a compass rose is put on the Map View and it was set to be updated as well. However, this is done using MJ Android as shown in Tables 4.5, 4.6 and 4.7 and Figures 4.18 and 4.19.

**Table 4.5.** The Code for “My Activity. Java” of Details View for two markers

| Name                                            | Coddling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Google Map Maker<br/>Details View</b></p> | <pre> <b>public class</b> MapsActivity <b>extends</b> Activity <b>implements</b> OnMapReadyCallback {     <b>@Override</b>     <b>protected void</b> onCreate(Bundle savedInstanceState) {         <b>super</b> .findFragmentById(R.id.<i>map</i>);         mapFragment.getMapAsync(<b>this</b>);     }     <b>public void</b> onMapReady(GoogleMap mMap){          LatLng center=<b>new</b> LatLng(<b>38.677723</b>, <b>39.201873</b>);         mMap.moveCamera(CameraUpdateFactory.newLatLngZoom(center ,<b>13</b>));         mMap.setMapType(GoogleMap.<i>MAP_TYPE_HYBRID</i>);         mMap.addMarker(<b>new</b> MarkerOptions().position(<b>new</b> LatLng(<b>38.679641</b>, <b>39.202506</b>)).title("<b>Elazig TurkeyFirat</b> <b>University</b>"));.onCreate(savedInstanceState);          setContentView(R.layout.<i>activity_maps</i>);         MapFragment mapFragment = (MapFragment) getFragmentManager().             mMap.addMarker(<b>new</b> MarkerOptions().position(<b>new</b> LatLng(<b>38.679549</b>, <b>39.202527</b>)).title("<b>Kültür Park</b>").snippet("<b>click to get</b> <b>details</b>").icon(BitmapDescriptorFactory.fromResource(R.drawable.<i>news</i>)));          }     } </pre> |

## Two point marker view

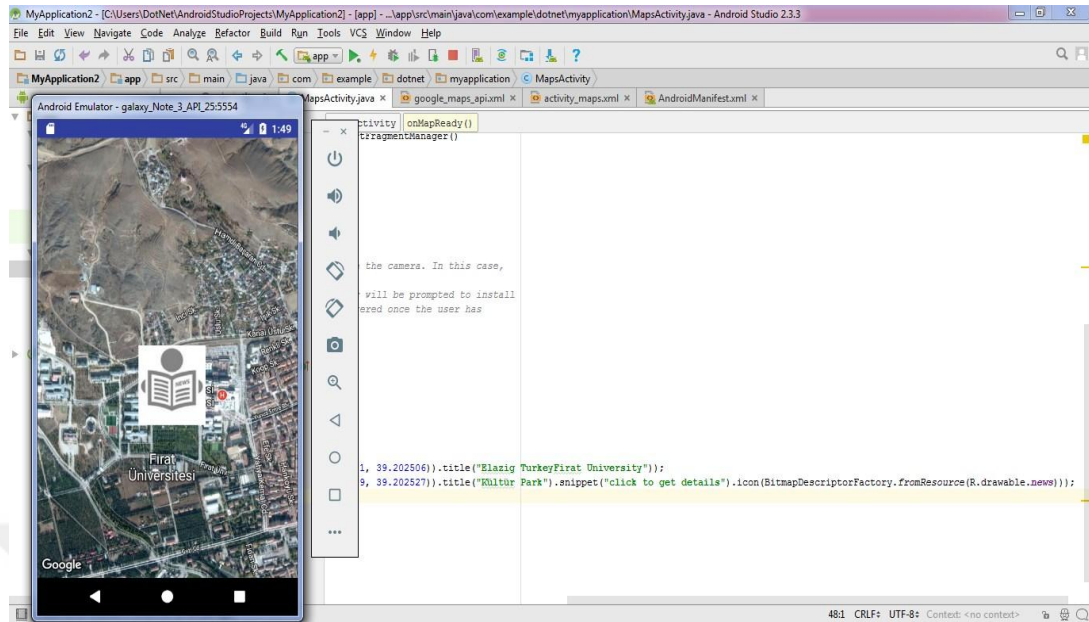


Figure 4.18. The result of the two-point marker from Android Google Maps

Table 4.6. The code for “My Activity. Java” of one marker location in normal view

| Name                                        | Codding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Google Map<br>Maker Two<br>Location<br>View | <pre> <b>public class</b> MapsActivity <b>extends</b> Activity <b>implements</b> OnMapReadyCallback {      <b>@Override</b>      <b>protected void</b> onCreate(Bundle savedInstanceState) {          <b>super</b>.findFragmentById(R.id.map);         mapFragment.getMapAsync(<b>this</b>);     }      <b>public void</b> onMapReady(GoogleMap mMap){          LatLng center=<b>new</b> LatLng(33.380354, 44.702082);         mMap.moveCamera(CameraUpdateFactory.newLatLngZoom(center, <b>13</b>));         mMap.addMarker(<b>new</b> MarkerOptions().position(<b>new</b> LatLng(33.380354,         44.702082)).title(<b>"hospital"</b>)).onCreate(savedInstanceState);          setContentView(R.layout.activity_maps);          MapFragment mapFragment = (MapFragment) getFragmentManager().             }     } </pre> |

**Table 4.7.** The code for “My Activity. Java” of one point location in the normal view.

| Name                                | Codding                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Google Map<br>Maker Details<br>View | <pre>public class MapsActivity extends Activity implements OnMapReadyCallback {      @Override     protected void onCreate(Bundle savedInstanceState) {         super .findFragmentById(R.id.map);         mapFragment.getMapAsync(this);     }      public void onMapReady(GoogleMap mMap){          LatLng center=new LatLng(33.380354, 44.702082);      }  }</pre> |

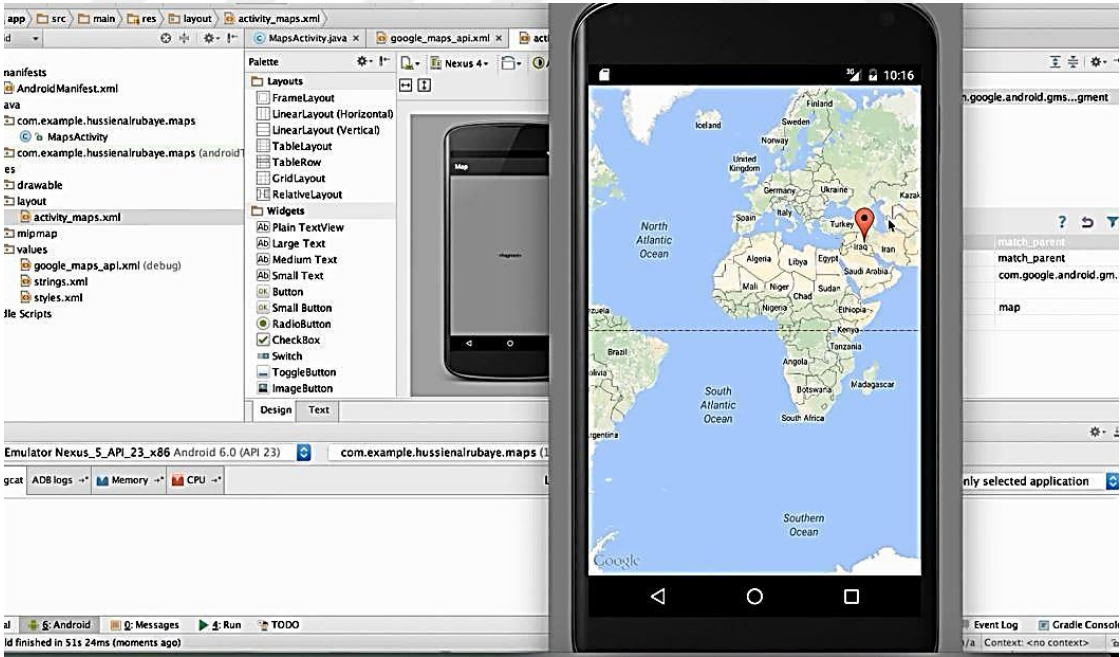


**Figure 4.19.** The result of the normal map view.

The map attributes set by the code are:

- **Set Clickable**

This is to make sure that users tap on a task to cause MJ Android to show more details about that job, so it is set to correct.

- **Set Enabled**

This approach is really a successor from Android view. Google Maps view doesn't point the exact area the user wants to find out, but it may permit the popular map functions: zooming, panning, and so on.

- **Set Satellite**

Setting this flag adds a satellite outlook from the composite map while clearing the flag removes the view. To begin with, no needed satellite information on the map shall be required.

- **Set Traffic Set**

In the same way, placing or clearing this flag adds or removes recent visitors statistics from the map, respectively. Once more, it is not usually desired to start with the site visitors' data on the map.

- **Set Street View**

The road views at this moment are not preferred either, although it is left to the user to enable them later. The street code is given in Tables 4.8 and 4.9, and Figure 4.20.

**Table 4.8.** The code for “My Activity. Java” street view details without a move.

| Name                                                    | Codding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Google Map<br/>Street View With<br/>Move Details</b> | <pre> <b>public class</b> MapsActivity <b>extends</b> FragmentActivity <b>implements</b> OnStreetViewPanoramaReadyCallback {      @Override     <b>protected void</b> onCreate(Bundle savedInstanceState) {         <b>super</b>.onCreate(savedInstanceState);         setContentView(R.layout.<b>activity_maps</b>);         StreetViewPanoramaFragment streetViewPanoramaFragment =         (StreetViewPanoramaFragment)getManager().findFragmentById(R.id.<b>map</b>);         streetViewPanoramaFragment.getStreetViewPanoramaAsync(<b>this</b>);     }      @Override     <b>public void</b> onStreetViewPanoramaReady(StreetViewPanorama panorama){         panorama.setPosition(<b>new</b> LatLng(40.748782, -73.985375));         panorama.SetStreetNameEnabled(false);         panorama.setUserNavigationEnabled(false);         panorama.setZoomGestturesEnabled(false);         panorama.setpanninggesturesEnabled(false);      } } </pre> |

**Table 4.9.** The code for “Activity\_map.XML” street view details with the move.

| Name                                                                                | Codding                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>“Activity_map.X<br/>ML”<br/>Google Map Street<br/>View With Move<br/>Details</b> | <pre> &lt;fragment 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:id="@+id/map"     tools:context=".MapsActivity"      android:name="com.Google.android.gms.maps.StreetViewPanoram aFragment" /&gt; </pre> |

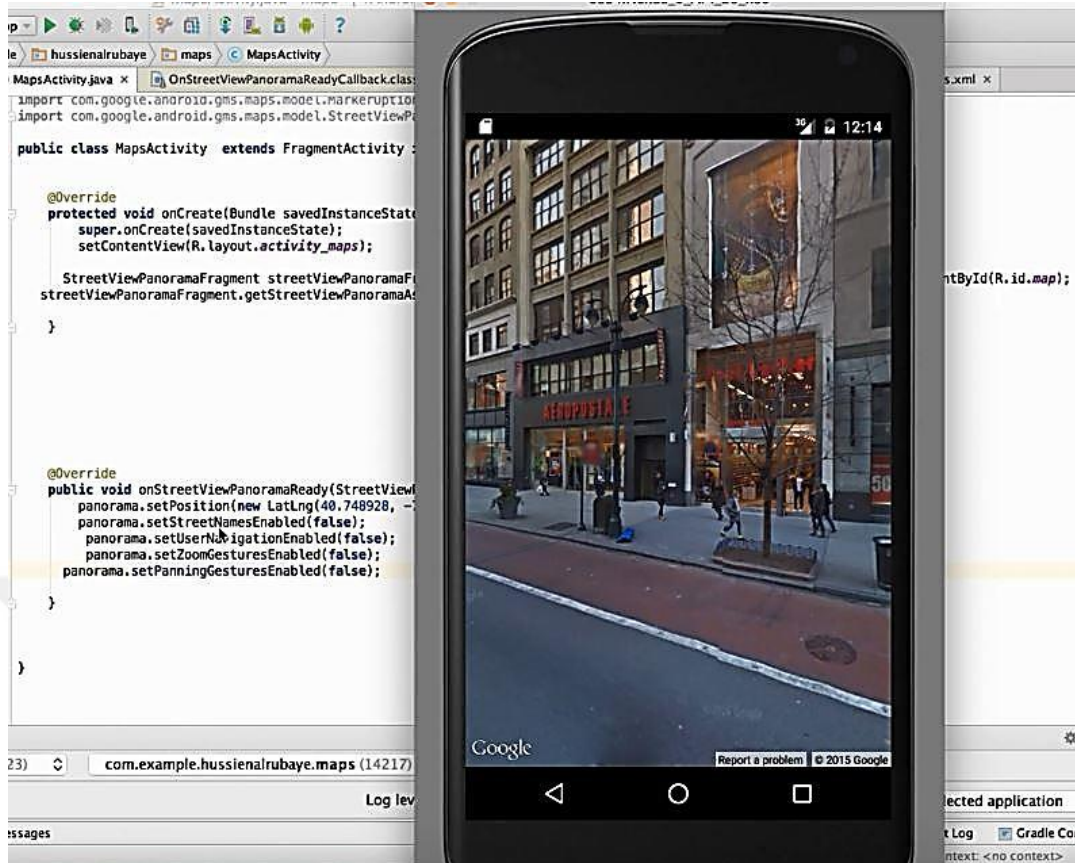


**Figure 4.20.** The result of View Street with road

### • Enable/Disable Zoom

Android smartphone maps come outfitted with backup for zooming out and zooming in. The “i” key zooms in on the map, while the “o” key zooms out. Maps can also zoom in and out from the below application control, from the side to the facet of the map controller. Many strategies are described for zooming, yet many users just simply use the map controller. Android describes 21 zoom levels for maps. By the facet of zoom level 1, the equator of the earth is 256 pixels long. They are deployed in zooming degree and they get multiplied by 2. Google advises that the high-resolution maps are not yet available worldwide. Every zoom system clamps the zoom level in the range 1 thru 21 if it is requested to go beyond the current level. The structures that control the zoom, alongside with their parameters, are given in Table 4.10 and Figure 4.21.

#### **Zoom in with the move on road**

Zooms in one level.

**Table 4.10.** The code for “My Activity. Java” street view details with the move.

| Name                                     | Codding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Google Map Street View With Move Details | <pre>public class MapsActivity extends FragmentActivity implements OnStreetViewPanoramaReadyCallback {      @Override     protected void onCreate(Bundle savedInstanceState) {         super.onCreate(savedInstanceState);         setContentView(R.layout.activity_maps);         StreetViewPanoramaFragment streetViewPanoramaFragment =         (StreetViewPanoramaFragment)getFragmentManager().findFragmentById(R.id.map);         streetViewPanoramaFragment.getStreetViewPanoramaAsync(this);     }     @Override     public void onStreetViewPanoramaReady(StreetViewPanorama panorama){         panorama.setPosition(new LatLng(40.748782, -73.985375));         //panorama.SetStreetNameEnabled(false);         //panorama.setUserNavigationEnabled(false);         //panorama.setZoomGestturesEnabled(false);         //panorama.setpanninggesturesEnabled(false);      } }</pre> |

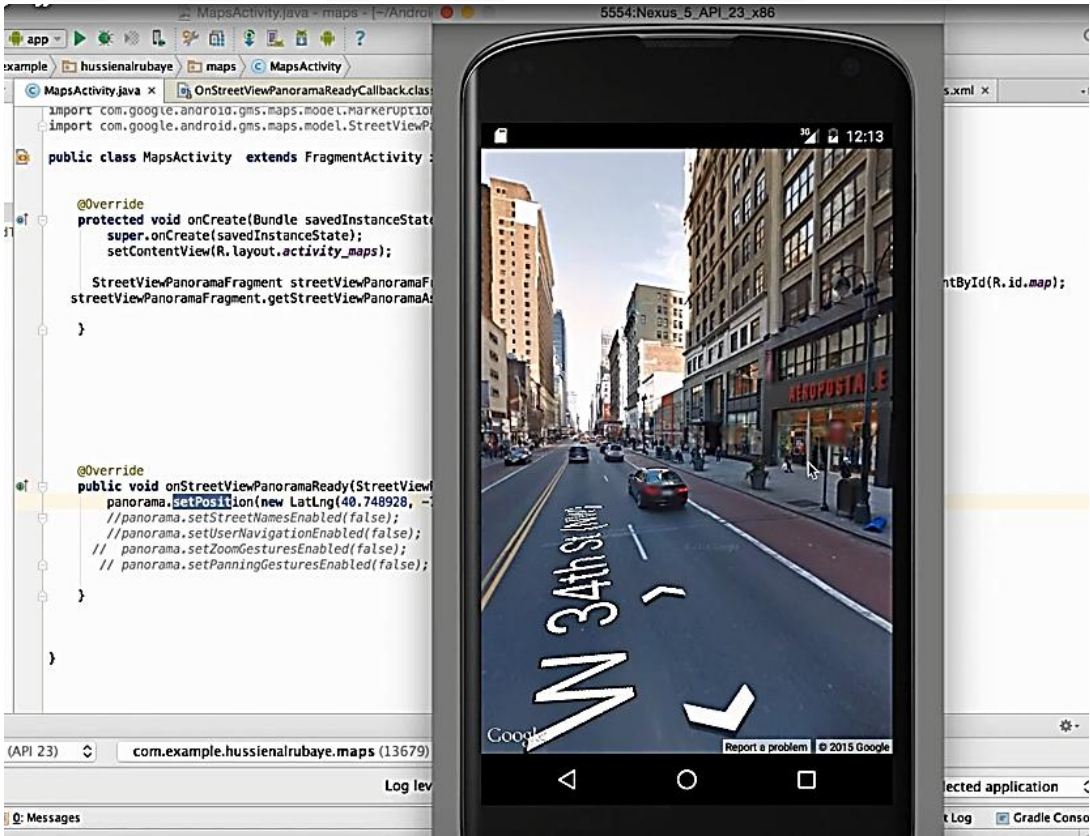


**Figure 4.21.** The result of View Street with the move on road

## Zoom out

Zooms out one level.

**Set Zoom** (int zoom level): Zooms to the given level and restricts it to the range 1 to

13.

**Zoom in fixing** (int x pixel, int y pixel) as shown in Figure 4.22.

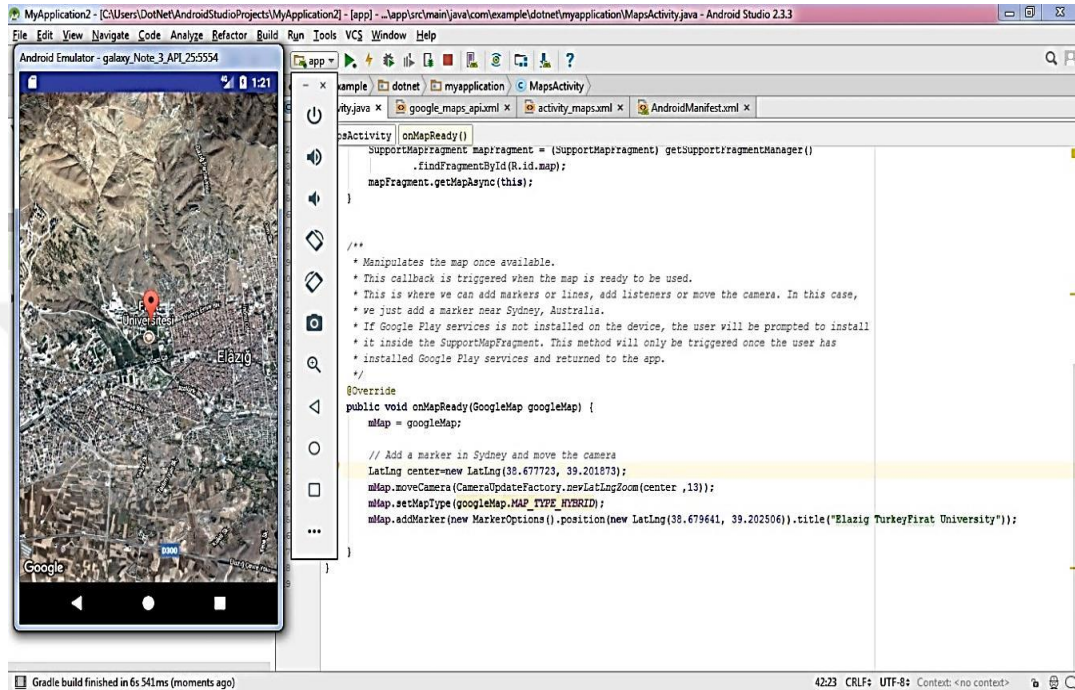


Figure 4.22. First University point from Android Google Maps

## Zoom out fixing (int x pixel, int y pixel)

**Zoom in** one level, but keep the given point fixed on the screen. Usually, when the zoom in or the zoom out is done, the middle of the screen is the only point that stays stable. These routines let the user choose any point on the map to be the fixed point as shown in Figure 4.23.

Obtaining the circle round with overlay zoom view is shown in Table 4.11, Table 12 and Figure 4.24.

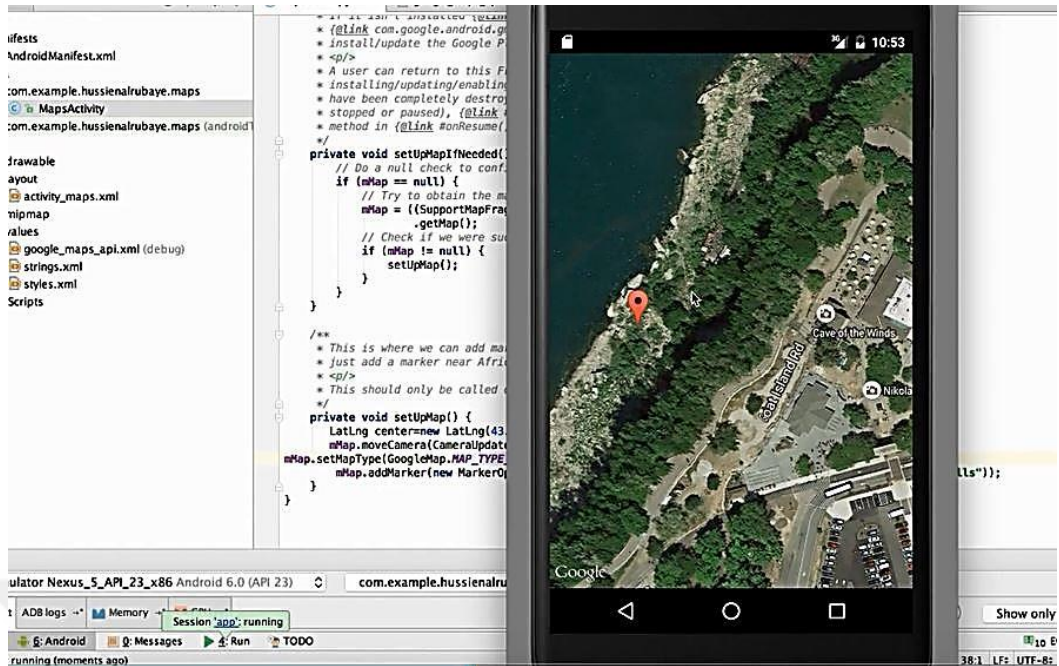


Figure 4.23. The details viewed by the “zoom in” option

Table 4.11. The code for “My Activity. Java” the detailed street view with move

| Name                                                                            | Codding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>“My Activity. Java”<br/>Google Map Street<br/>View With Move<br/>Details</b> | <pre> @Override protected void onCreate(Bundle savedInstanceState) {     super.onCreate(savedInstanceState);     setContentView(R.layout.activity_maps);     MapFragment mapFragment =     (MapFragment)getFragmentManager().findFragmentById(R.id.map);     mapFragment.getMapAsync(this); }  public void onMapReady(GoogleMap mMap){      LatLng center=new LatLng(43082243, -79.072471);     mMap.moveCamera(CameraUpdateFactory.newLatLngZoom(center, 8));     mMap.setMapType(GoogleMap.MAP_TYPE_HYBRID);     mMap.addMarker(new MarkerOptions().position(center).title("Niagarar Falls")         .snippet("person is reading")         .icon(BitmapDescriptorFactory.fromResource(R.drawable.news)));      CameraPosition cp=CameraPosition.builder()         .target(center)         .zoom(13)         .bearing(90)         .build();     mMap.animateCamera(CameraUpdateFactory.newCameraPosition(cp), 2000,     null);     Circle circle = mMap.addCircle(new CircleOptions()         .center(center)         .radius(1000)         .strokeColor(Color.RED)         .fillColor(Color.BLUE)); }         </pre> |

**Table 4.12.** “Activity\_map.XML” codes the detailed street view with the move

| Name                                                                                                  | Codding                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>“Activity_map.X<br/>ML”</b><br><b>Google Map</b><br><b>Street View With</b><br><b>Move Details</b> | <pre> &lt;fragment 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:id="@+id/map"     tools:context=".MapsActivity"     android:name="com.Google.android.gms.maps.MaFragment" /&gt; </pre> |

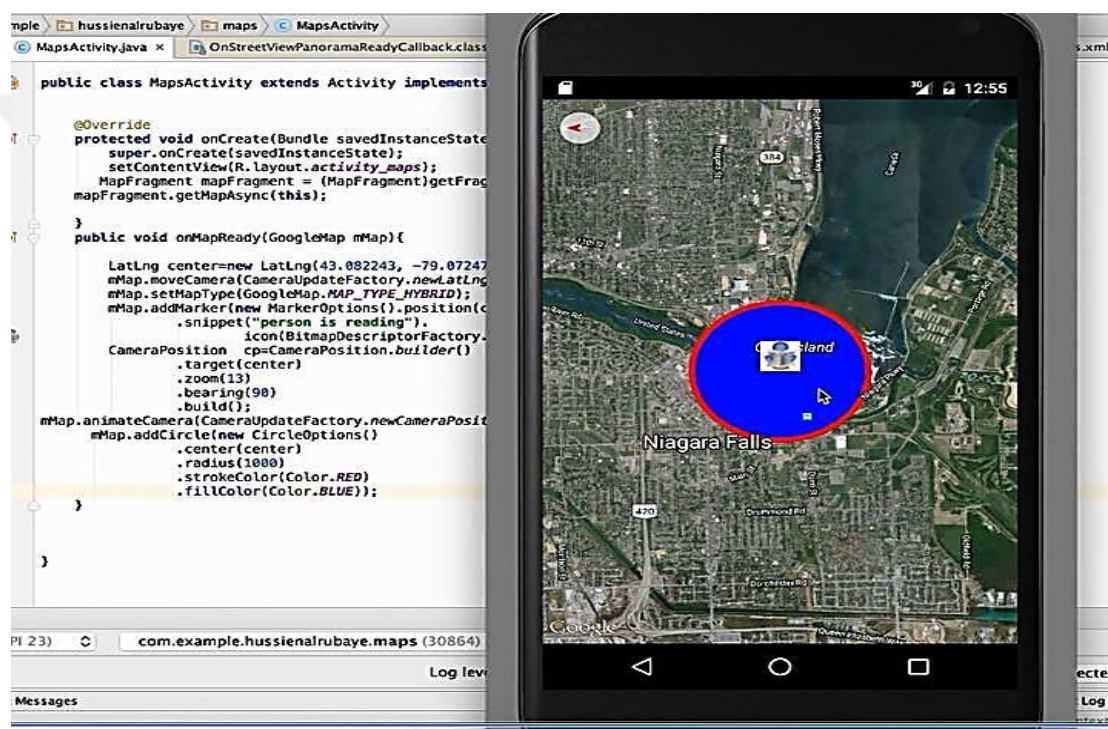


**Figure 4.24.** Circle round to overlay view zooming.

## 4.5. Application of Data Collection on Digital Map

### *Google Map Multiple Markers:*

The developed Map Marker allows the search for a location on Google Maps. In addition, it allows the highlighting of the nearby hospitals, restaurants, schools, and shopping malls. For instance, if Elazığ city is searched for in the application, in a short while the developed application would provide the marking ability for the designed options: HOSPITAL, RESTAURANT, SCHOOL AND SHOPPING MALL. As shown in

Figure 4.25, these “Option Marker” options will be activated and can be clicked to highlight the desired places. On the top right corner of Figure 4.25, the numbers of the available options’ locations of Google Map Marker are reported based on the searched location.

### **Map Marker Development Steps:**

#### **1. Internal AndroidManifest.xml Code:**

Going inside AndroidManifest.xml will provide a key which is displayed in the meta tags. Here, it is needed to add device permissions for accessing location. The required permission should be as follows:

*ACCESS\_NETWORK\_STATE* – To check the network state, i.e. if we are connected to any network or not.

*INTERNET* – If we are connected to the Internet or not.

*ACCESS\_COARSE\_LOCATION* – To determine the user’s location using Wi-Fi and mobile data. It will give us an approximate location.

*ACCESS\_FINE\_LOCATION* – To determine the user’s location using GPS. It will give us the precise location.

*OpenGL ES V7* – Required for Google Maps V7

*compile 'com.android.support:appcompat-v7:25.3.1'*

*compile 'com.google.android.gms:play-services-maps:10.2.6'*

*compile 'com.google.android.gms:play-services-Location:10.2.6.'*

#### **2. Code writing inside the activity\_maps.xml.**

#### **3. Adding the MapsActivity.java code for Google Maps search of the nearby options.**

#### **4. Coding and Building of the (Google API) client.**

#### **5. Coding the finding nearby locations on Google Maps.**

#### **6. Coding the retrieval of the nearby locations data and downloading them to the summary table; a typical example is provided in Table 4.13.**

**Table 4.13.** Option Marker record results for the four options nearby Fırat University

| <b>Option Marker</b> | <b>Record Finder</b> |
|----------------------|----------------------|
| Hospital             | 19                   |
| Restaurant           | 16                   |
| School               | 20                   |
| Shopping Mall        | 20                   |

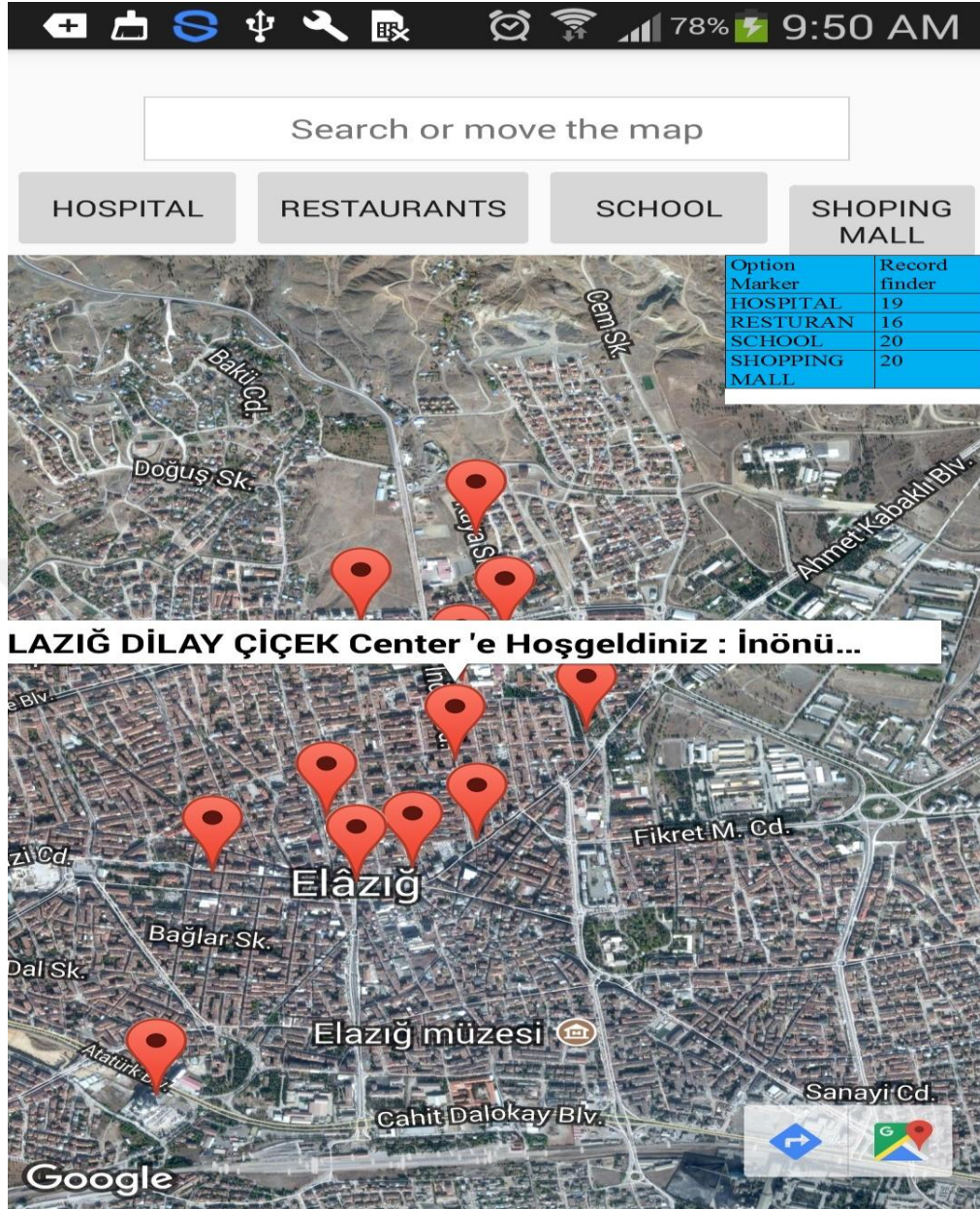


**Figure 4.25.** The Result of the four search options on the record Marker

Figure 4.25 shows location marker as well as record finder table which provides the available number of each option. Any marked location can be clicked on to read its information (for instance the address) and the summary of the record shows the availability of the options.

Generally, Map Maker App needs a short while to be able to recognize Google Maps and establish the proper communication with Google Map server. The App allows the search for the desired address or a location name, and within a few seconds, the location

will be shown on the map. Once the desired location is displayed on the map, it would be possible to click on any of the options (HOSPITAL, RESTAURANT, SCHOOL, and SHOPPING MALL) to view their markers on the map and summaries in the table. In the provided example of Figure 4.25, the search for the four options Marker was made for Elazığ/Turkey.



## **5. CONCLUSIONS AND FUTURE WORK**

### **5.1. Conclusion**

The possible base of this study can be realized from the fact that the web maps included in the assessment are well known and widely used, with new features and technologies that are constantly revolutionizing the way mobile phones are used. In the coming years, it is expected to witness the emergence of 3D phones. It is expected that they would come in ever smaller and with slicker-dimensional, thanks to the rapid advances in the technology of the smartphone market. It is also expected that the augmented reality technology to become a standard on smartphones. In this work, the mounting of digital information on the visual images obtained from the smartphone camera is obviously clear; this means that it is possible to look at a particular site simply by pointing the software towards the street. The thesis has exhibited the practical maneuver of using persistent data collection of software program and hardware statistics to classify transportation mode.

This is the most beneficial in sponsoring efforts, as distinctly technical assets are a pretty scary in many parts of the growing world. Three dimensions of variability's in normal detecting applications were comprehended, specifically: conversation channel, data series style, and system configuration. At the end of this thesis, the attention was guided towards the Google Maps app. An attempt of providing a suitable explanation for how to set it up, from the beginning until the end, step by step was given. In addition, the results of manipulating Google Maps for further enhancement were presented and discussed. Further, the most critical troubles faced throughout this research work were given and highlighted for the benefit of the reader.

Google Maps can be extremely useful for enterprise owners as they can add their business locations to the Google community so that it will be displayed on Google Maps. Providing the details of the business's location and orientation to Google community will allow the organization to be located by customers searching for the business or service. The other benefit of Google Maps is the changing ability of the viewed streets. This includes the way that existing customers would like to interact with the business, and how new customers will locate and decide whether to buy or not. Viewing the business in

Google Maps can help taking advantage of both latter cases. Moreover, the interesting benefit provided to the police is extremely useful, especially locating and chasing criminals using the GPS.

## **5.2. Future Work**

In the future, the following points may be considered for investigation and research purpose:

- A new generation of smartphone applications.
- An up-to-date version of smartphone communication application suitable for 4G and newer communication generations.
- Developing offline Google Maps application that works anytime and anywhere.

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