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Application for Covid-19 Real Time Counter

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Abstract
The World Health Organization has declared the outbreak of the novel coronavirus, Covid-19 as pandemic across the world. With its alarming surge of affected cases throughout the world, lockdown, and awareness (social distancing, use of masks etc.) among people are found to be the only means for restricting the community transmission. In a densely populated country like India, it is very difficult to prevent the community transmission even during lockdown without social awareness and precautionary measures taken by the people. Recently, several containment zones had been identified throughout the country and divided into red, orange and green zones, respectively. The red zones indicate the infection hotspots, orange zones denote some infection and green zones indicate an area with no infection. This paper mainly focuses on development of an Android application which can inform people of the Covid-19 containment zones and prevent trespassing into these zones. This Android application updates the locations of the areas in a Google map which are identified to be the containment zones. The application also notifies the users if they have entered a containment zone and uploads the user's IMEI number to the online database. To achieve all these functionalities, many tools, and APIs from Google like Firebase and Geofencing API are used in this application. Therefore, this application can be used as a tool for creating further social awareness about the arising need of precautionary measures to be taken by the people of India.
Keywords: Covid-19, Android, Geo-fencing, Firebase, Location tracking, Notification, IMEI number

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I. INTRODUCTION

Currently there are several research works undergoing in the country to prevent Covid-19 cases from rising. Previously our country was importing medical kits like PPE (Personal Protection Kits), mask from outside, but now it has been successful in developing these kits. Along with taking initiatives to fight this disease, our country has also taken steps to make people aware of the disease. The news and media have a great part in creating this awareness by informing the public about the preventive measures that can keep them away from infection. Awareness among the people to carry out all the preventive measures can immensely help to reduce spread of the virus. The country has created containment zones throughout the cities wherever Covid-19 cases have been reported to prevent further spread of the virus. These containment zones have been kept isolated from the outside public to ensure no contamination occurs outside. After more than 2 months of the lockdown, the government has relaxed some of the lockdown rules and has permitted reopening of government offices, bus and other road transportation facilities and shopping markets. People can move inside the city for work and other purposes. But the containment zones are still being kept isolated, and new containment zones are being formed wherever Covid-19 cases have been reported. These zones are highly contagious as droplets with virus coughed out from an unscreened asymptomatic patient can travel up to 8 m (Bahl et al. 2020). Though these containment zones are guarded by policemen, still there remains a chance that people might unknowingly step into them. In this situation where people can move in the city, these containment zones pose a risk of infection to these city dwellers. Therefore, informing people about the location of the containment zones can help them bypass and avoid these zones and thereby reduce the chance of community transmission.

In this paper, we focus on developing a mobile based application to provide information regarding the Covid-19 containment zones in West Bengal. The application further tracks the user's location and provides notification alert if the user has entered a containment zone. The application also provides daily Covid-19 case statistics to the users to keep them updated. The application is developed on Android SDK and uses Firebase Cloud Firestore to store the location data. Android's geofencing client is used to create geofences around the containment zones and notification manager is used to provide notifications. The application also uses RESTful web services to show the Covid-19 cases in West Bengal.

We have tested our application with different users in different locations across West Bengal and it works efficiently and is able to attain our target.

1.1.1 Overview

We have conducted a brief survey on the existing apps published in Google playstore which are related to Covid-19. Efforts have been made to include most of the apps in the survey. The summary of the survey is given in Table Table11 which includes the name of the apps, the description of the apps given in Google Playstore by their developers and our comments on the apps after using them.

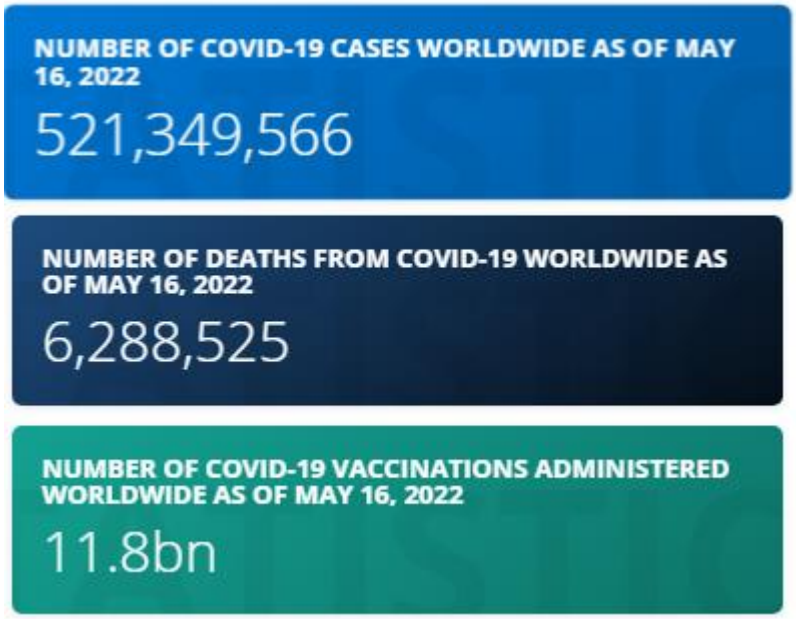
Serial no	Application name	Details from playstore	Comments
1	Aarogya Setu	Aarogya Setu is a mobile application developed by the Government of India to connect essential health services with the people of India in our combined fight against COVID-19. The app is aimed at augmenting the initiatives of the Government of India, particularly the Department of Health, in proactively reaching out to and informing the users of the app regarding risks, best practices and relevant advisories pertaining to the containment of COVID-19 (Aarogya Setu 2020)	The application is developed by the government of India. It uses contact tracing technology with the help of bluetooth to check if a user comes near a Covid-19 patient
2	Bihar Saathi	Bihar Saathi app by iBiharorg to aid the people in Bihar on health issues. It captures details of the person raising the SOS along with their geo-coordinates, that is their exact location, and shares it with the 'relevant government department for redressal'. Additionally, the app provides information about various initiatives and schemes by the government that raises awareness about the various health issues including outbreak (Bihar Saathi 2020)	The application contains safety and preventive information regarding Covid-19, an option for submitting suspected patient information who are not diagnosed to a database and links for making donations
3	CG Covid-19 ePass	The Government of Chhattisgarh has launched this app to issue Interstate and Intra-State e-Pass for vehicular movement during the lock-down period to enable migrants/stranded people to reach their homes and join with their families. It would also facilitate people to undertake travel in case of personal emergency like Medical treatment or Death in the Family. This app would also allow seamless transportation of essential commodities within the State of Chhattisgarh. The applicant can obtain an e-Pass by submitting a photograph, Id Proof and valid proof for travel. The Applicant will be able to select the travel date, time and destination (CG Covid-19 ePass 2020)	The application helps in issuing e-passes in Chhattisgarh for interstate and intrastate vehicular movement and in case of emergency travel, for people during lockdown period
4	CoBuddy-Covid19 tool	CoBuddy-Covid 19 Coronavirus Help Tool-to help stop the spread of Covid 19, get info and help from the Government. The app makes sure that the people quarantined are within their location, communicate directly with them, provide information, and receive alerts if the quarantined are in need of any help. Location tracking and user verification with heat-maps, communication management, notifications and alerts, health tracking and feedback, essential operations management (CoBuddy-Covid19 tool 2020)	The application keeps track of the home quarantined Covid-19 patients and their needs by the concerned authorities

Fig. 1 Summary of existing apps in google playstore related to Covid-19

The survey shows that there are several apps developed in the country to fight and contain COVID-19. Most of the states of our country have their own apps with specific features and functionality to help their citizens to stop COVID-19 spread, get medical assistance during a crisis, create awareness, and understand safety precautions. The study also shows that there are a limited number of apps which show the COVID-19 containment zones in the country or state and out of these none has the functionality of notifying and alerting the user when they have entered a containment zone. Therefore, no app in the Google Playstore is comparable with our proposed application because the idea behind the development of the proposed app is different. This highlights the novelty of the proposed app.

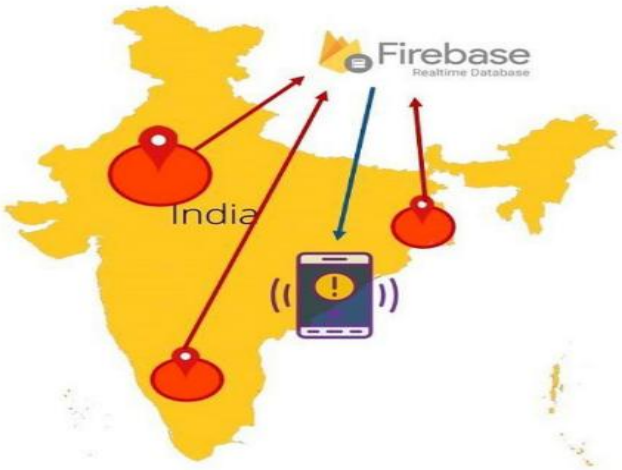
Some shocking data:

The COVID-19 pandemic continues to impact countries around the world. Many are experiencing further waves of infection, and the number of new coronavirus cases worldwide continues to fluctuate. However, several COVID-19 vaccines have been approved for use in different countries, and immunization programs are well underway. Nevertheless, it remains important for the public to stay vigilant, continue to follow safety precautions, and adhere to rules and regulations.



1.1.2 Purpose

The Android application shows the location of the containment zones to the users. It also notifies the user when he or she trespasses the boundary of a containment zone or stays in the containment zones



1.1.3 Significance

On the basis of the EPHPP criteria for selection bias, design, confounders, blinding, data collection, and dropouts, we found the methodological quality to be moderate for 2 of the 12 (17%) studies and weak for the remaining 10 (83%) studies.Most studies were poorly rated because of their observational or cross-sectional nature, insufficient care in controlling for confounders, insufficient reporting on the validity and reliability of the tools used for data collection, and the absence of description on withdrawals and dropouts. The

1.1.4 Objective

This systematic review aims to shed light into studies found in the scientific literature that have used and evaluated mobile apps for the prevention, management, treatment, or follow-up of COVID-19.

II. PLATFORM AND TECHNOLOGY USED

2.1 Android

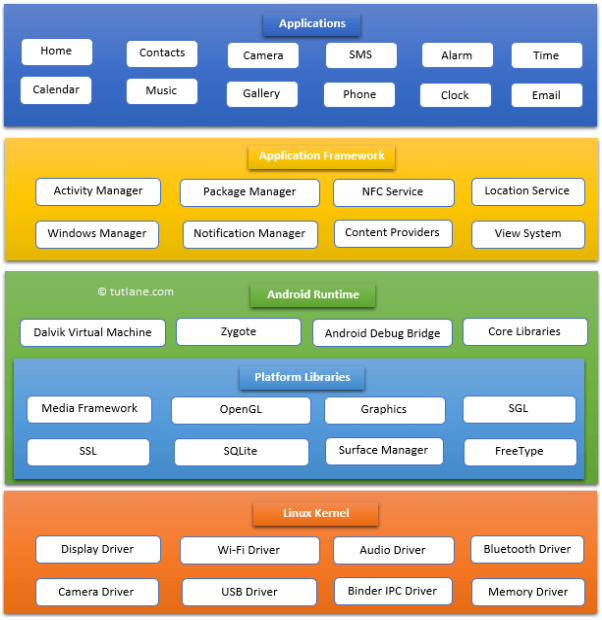


Fig. 2 - Android Architecture

Android architecture includes a variety of components to meet the demands of any Android device. Android software includes an open-source Linux Kernel with a suite of C/C++ libraries that are accessed via application framework services. Among all the components, the Linux Kernel delivers the primary functionality of the operating system to smartphones, while the Dalvik Virtual Machine (DVM) offers a basis for executing an Android application.

1. Linux Kernel

Linux 3.6 is near the bottom of the layers, with around 115 fixes. This offers a degree of abstraction between the device hardware and includes all of the necessary hardware drivers such as camera, keyboard, display, and so on. Furthermore, the kernel handles all of the things that Linux excels at, such as networking and a huge number of device drivers, which make connecting to peripheral hardware a breeze.

2. Libraries

On top of the Linux kernel, there is a set of libraries that includes the open-source Web browser engine WebKit, the well-known library libc, the SQLite database, which is a useful repository for storage and sharing of application data, libraries to play and record audio and video, SSL libraries responsible for Internet security, and so on.

3. Android Runtime

This is the third component of the architecture, and it is accessible from the bottom of the second stratum. This section contains a critical component known as the Dalvik Virtual Machine, which is a kind of Java Virtual Machine specifically created and optimized for Android. The Dalvik virtual machine makes advantage of Linux fundamental characteristics such as memory management and multi-threading, which are inherent in the Java programming language. Every Android application may operate in its own process, with its own instance of the Dalvik virtual computer, thanks to the Dalvik VM. The Android runtime also includes a set of fundamental libraries that allow Android application developers to create Android apps in the standard Java programming language.

4. Application Framework

In the form of Java classes, the Application Framework layer provides various higher-level services to applications. These services may be used by application developers in their apps.

The following major services are included in the Android framework:

a) Activity Manager
The Activity Manager manages the whole application lifecycle and activity stack.

b) Content Provider
Content Providers enable apps to publish and share data with one another.

c) Resource Manager
Access to non-code embedded resources like as strings, colour settings, and user interface layouts is provided through the Resource Manager.

d) Notification Manager
Notifications Manager enables programmers to show the user alerts and notifications.

e) View System
A view system is an extendable set of views that is used to develop application user interfaces.

5. Applications
The top layer of Android architecture is applications. Pre-installed programmers like as home, contacts, camera, gallery, and so on, as well as third-party applications downloaded from the play store such as chat apps, games, and so on, will be put solely on this layer. It uses the classes and services supplied by the application framework to execute within the Android run time.

2.2 Android Studio

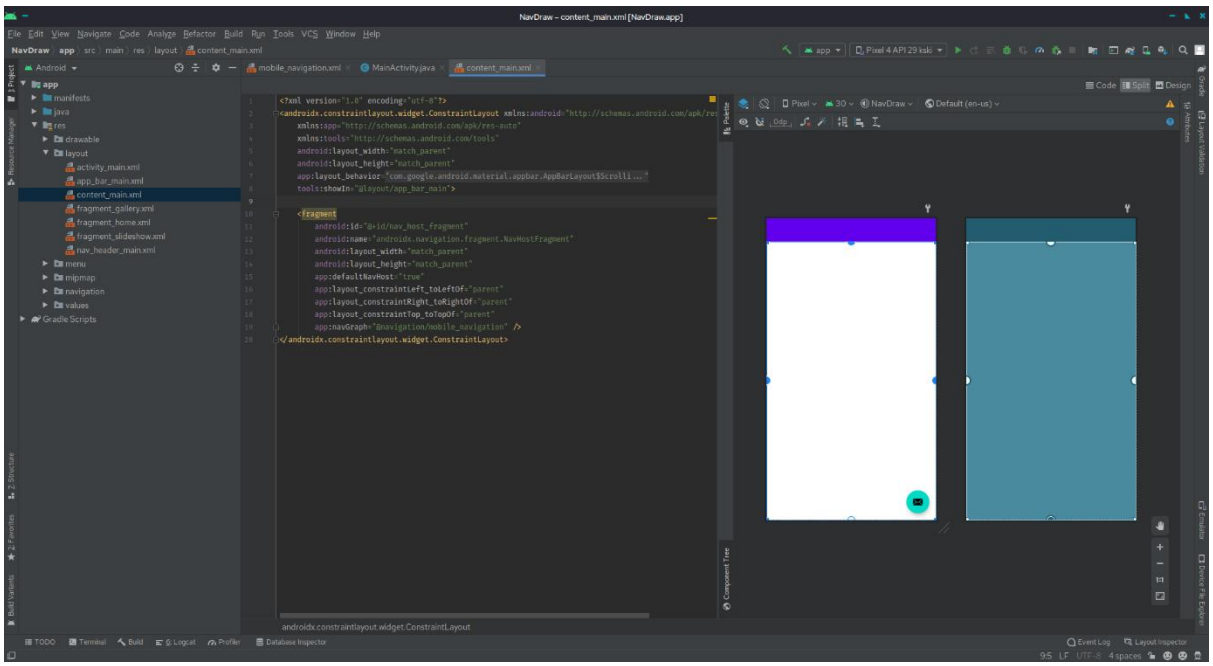


Fig. 3- Android Studio 2021.1.1 running on Windows

2.3 Java

Fig. 4 – Java Version 8

Java is a programming language as well as an operating system. Java is a high-level programming language that is powerful, object-oriented, and secure. Java was created in 1995 by Sun Microsystems (which is now an Oracle company). James Gosling is often regarded as the "Father of Java." It was called Oak before Java. Because Oak was already a registered firm, James Gosling and his team renamed it Java.

It is a programming language that may be used for a variety of purposes designed to allow programmers to write once and run anywhere (WORA), which means that generated Java without the requirement for recompilation, code can execute on any platform that supports Java. Java programmes are often converted into bytecode capable of running on any Java virtual machine (JVM), independent of computer architecture. Java's syntax is comparable to those of C and C++, although it has fewer low-level features than any of them. The Java runtime provides dynamic features (such as reflection and runtime code change) that traditional compiled languages do not. J2EE offered technology and APIs for corporate applications that normally operate on servers, whereas J2ME had APIs tailored for mobile apps. J2SE was the moniker given to the desktop versio

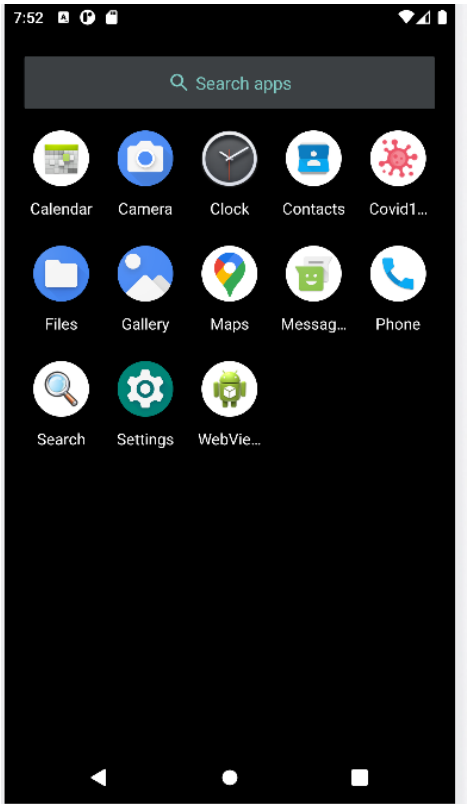


Fig1-look for our app icon

Fig 2-App Icon

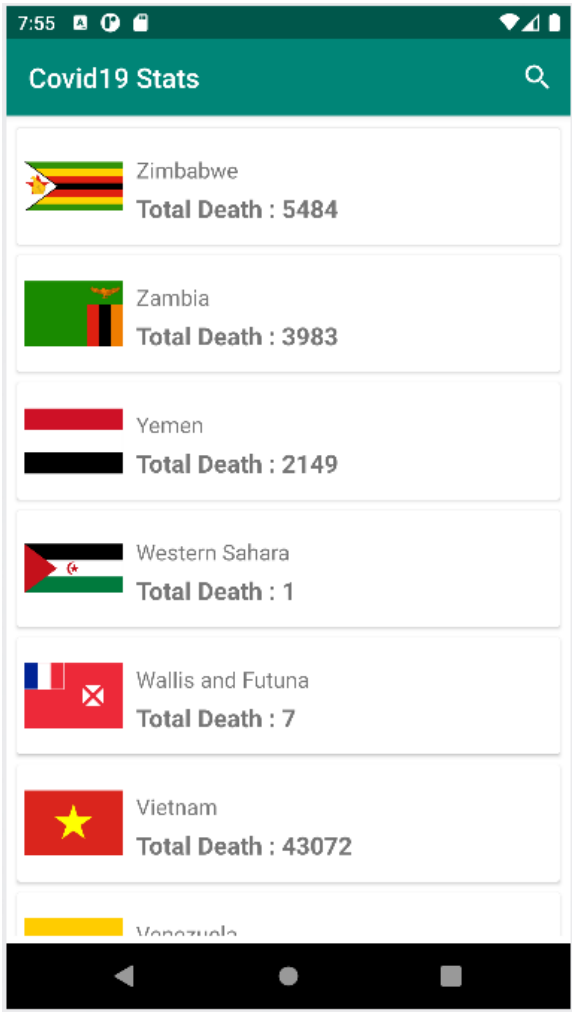


Fig 3 -starting page showing every country in world

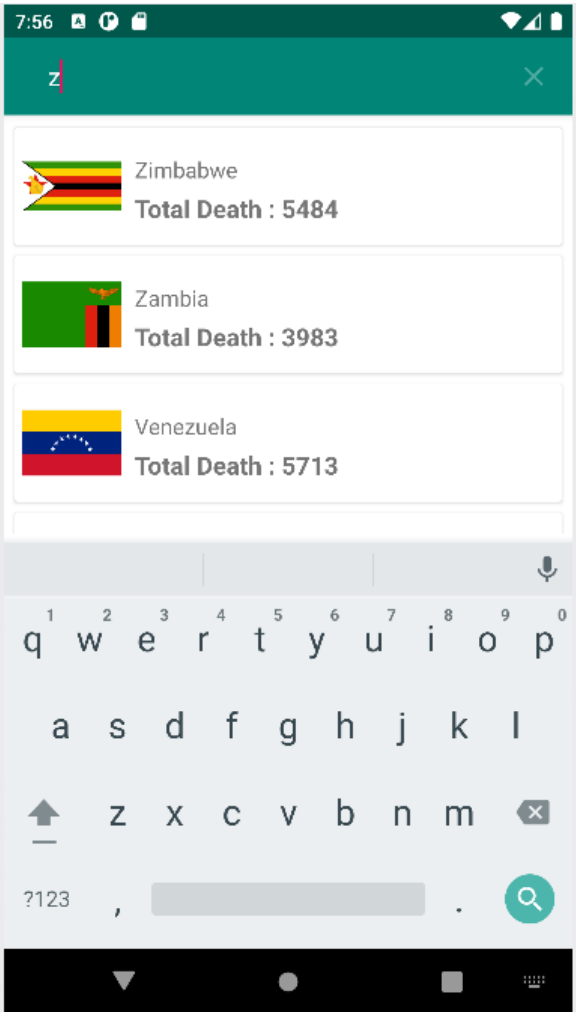


fig 4-search option for countries

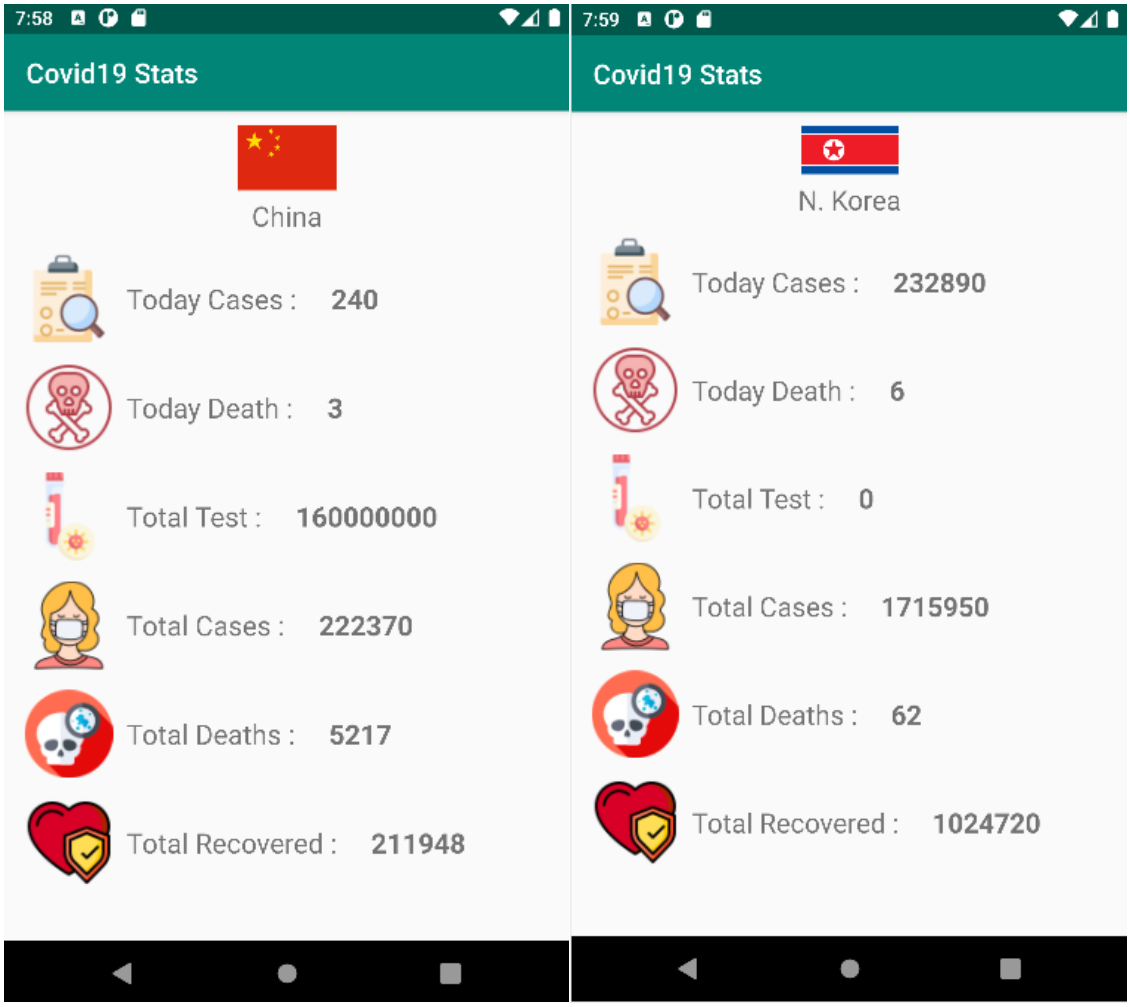


Fig 5- live information showing after clicking on any country

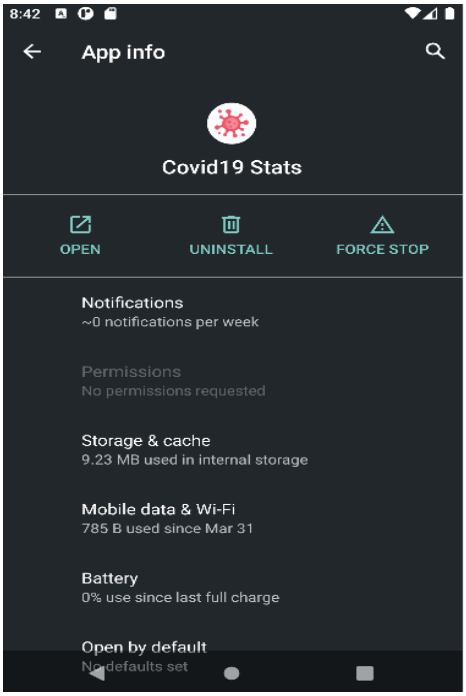


Fig 6- app info

VI. CONCLUSION

A systematic review on COVID-19 mobile apps, as used and evaluated in research studies published in the scientific literature, is presented. Our literature search returned a significant number of records (476 unique published manuscripts), despite the short time period covered (December 2019 to June 2020), thereby showing the high interest of the scientific community in the research of mobile apps for COVID-19. Our main finding is that, despite that the current research evidence is fragmented and requires greater methodological rigor, mobile apps have been found to benefit citizens, health professionals, and decision makers in facing the COVID-19 pandemic. In particular, mobile apps can help in solving several COVID-19–related challenges by increasing the reach of reliable information to both citizens and health professionals, decreasing misinformation and confusion, tracking symptoms and mental health of citizens, home monitoring and isolation, discovering new predictors, optimizing health care resource allocation, and reducing the burden of hospitals. The participants in the studies were mainly young and middle-aged adults. Further studies are needed that will involve older participants, who are in greater risk of developing serious complications due to COVID-19. Understanding the needs of older individuals in the COVID-19 pandemic period would be the first necessary step toward designing and developing mobile apps to encourage their physical and mental well-being. Our review, in contrast to other reviews that have not examined the evaluation of COVID-19 mobile apps in pragmatic studies identified that the majority of included studies were not of high methodological quality, mainly because of their observational nature. This could be justified by the fact that the COVID-19 pandemic crisis generated an international appeal for fast response and rapid development of digital health tools by the research community, which might have inevitably led to the publication of early results by observational studies. This result can be seen as complementary to other reviews that report that many of those apps are of high quality, offering many functionalities and advanced user experience. Longitudinal studies with rigorous design such as randomized controlled trials are now required to systematically assess COVID-19 mobile apps and provide strong evidence of their value. However, ethical implications might arise due to possible conflicts between liberty and privacy, equity, fairness, and justice In this direction, health outcomes that have scarcely been used so far, such as infection rate and quality of life, could be used as primary end points.

VII. FUTURE SCOPE

Although we tried to cover almost all of the aspects during our developmental phase, however we were forced to leave some aspects because of lack of time as well as monetary and other reasons.

Just like in the field of software development where there are always some shortcomings and room for improvement our application can be enhanced further:-

1) The application can include various government organization to help act faster.
2) The dataset obtained from the application can be used for predictive analysis to determine prone areas and include special method for tackling the problem in those areas.
3) Emergency signal in case of network failure and internet connection loss.
4) Tackling victim's movements.
5) Improved Google positioning system's precision.
6) The client part of application can be integrated in a single intelligent device.

For analysis purpose, we could use machine learning (ML) algorithms as well as data mining applications. There is a sub branch of machine learning known as time series analysis (TSA), which could be used to predict and analyze the data obtained through this application. Time series analysis is used to predict crop production as well as sales in different quarter**.**

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