

QR based Contact Tracing Application

Alwin Varghese¹, Anu Justin¹, Ashly Sibichan¹, Augustine S Aykara¹, Prof. Smitha Jacob²

¹UG Student, Dept. of CSE, SJCT Palai, Kerala, India

²Assistant Professor, Dept. of CSE, SJCT Palai, Kerala, India

Abstract - A pandemic can handicap a particular state or just like the present scenario, can affect the entire globe. With such a situation, everyone including the medical arena and the organizational authorities are depending on technological mechanisms more than ever to narrow down on solutions and methodologies that could combat the pandemic. This paper is curated to enhance the requirements faced when tracking down people who come in contact with the virus and develop on procedures to optimize the data and use it for the benefit of the inhabitants, in particular, the health authorities and the government. Innumerable data has to be validated and authenticated with the interference of only the required people and alert the crowd with the correct information. The paper presents to meet the requirement of people getting affected at a particular point and assist the government to take actions to face the situation effectively.

tious disease to identify and provide support to people (contacts) who may have been infected through exposure to the patient. This process prevents further transmission of disease by separating people who have (or may have) an infectious disease from people who do not. It is a core disease control measure that has been employed by public health agency personnel for decades. Case investigation and contact tracing are most effective when part of a multifaceted response to an outbreak. [3]

With loads of data that gets accumulated along the process, it is important to validate and authenticate the data collected beginning from the patient's records to the places he/she visited after getting infected by the virus. COVID-19 is one such virus that shows no symptoms during a course of 1 week, making primary contacts at risk. In such cases, contact tracing is a prominent methodology that must be carried swiftly and be thorough with the process. Case investigation and contact tracing are well-honed skills that adapt easily to new public health demands and are effective tools to slow the spread of COVID-19 in a community.

1. INTRODUCTION

Society's reliance on technology is increasing during the COVID-19 pandemic, with social and occupational changes that may persist long after the current crisis abates. Therefore, it is imperative to make mindful and intentional choices about how to leverage technology to improve our lives, reduce stress and improve mental health. [1]

COVID-19, the respiratory virus, first detected in Wuhan-China and declared by WHO as an outbreak on March 11, 2020 is taking the world by storm and crippling the actions of the entire globe. The pandemic has revamped our lives to such an extent that has changed our daily lives with social distancing leading to virtual existence.

To reduce community spread many countries around the world adopted unprecedented restrictions to isolate their populations in their homes and implemented social isolation measures that upended countless people's lives. [2]

Scientists have declared that this is not the end, but just a beginning alerting every nation to be prepared and act as responsible citizens during a pandemic like this. A primary requisite to contain any outbreak is to curb the spreading of the virus various technological methodologies that assist in contact tracing, validating data and securing with utmost security.

1.1 Background

Case investigation and contact tracing are fundamental activities that involve working with a patient (symptomatic and asymptomatic) who has been diagnosed with an infec-

1.2 Objective and Scope

The immediate risk of being infected by a virus, for now, the Covid-19, is increasing day by day as the outbreak expands. It has been suggested that further spread can be controlled by taking proper and urgent precautions and raising health awareness among people. With loads of data that must be managed efficiently without the risk of privacy issues, the world is on the run for systems that assist in combating the pandemic.

The project primarily aims to use the QR code technique to be scanned for a person's details while entering any premise, say a shop, and using the specific data for tracking a person's route map. This will be highly beneficial if the person is affected by the virus and there is an urgent need to alert the people who were near him during his course of travel.

2. EXISTING SYSTEMS

Various online platforms such as applications and websites, are existent to combat the spread of a virus, as of now the COVID-19:-

2.1 Immuni, Italy

All foreign citizens who arrive in Italy can use the app Immuni, created by the Ministry of Health and the Minister of technological innovation to limit the spread of COVID-19. Immuni tracks contacts between people and warns users

potentially exposed to the SARS- CoV-2 virus. If a foreign citizen has symptoms compatible with COVID-19, or has received a risk exposure notification, he or she may call 118 (in case of emergency), the national toll-free number 1500, or the toll-free numbers of the individual regions available at: www.salute.gov.it. The telephone operator will guide him to be taken charge of by the National Health Service. [4]

2.2 Aarogya Setu, India

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. [5]

2.3 NHS Covid-19 App, United Kingdom

The new NHS COVID-19 app, now available to download in England and Wales, is the fastest way to see if one is at risk from coronavirus. The app has a number of tools, including contact tracing, local area alerts and venue check-in. Using the Google and Apple Exposure Notification API, the app will let you know if you have been near another app user who has tested positive for coronavirus. Scanning QR codes at participating venues that were visited over the last 2 weeks, data will be stored securely on your device. An alert will be received if any of these locations was judged to be a 'high risk venue'. This is driven by data from the JBC and local Health Protection Teams within a region. [6]

2.4 CO 100m App, South Korea

The Corona 100m (Co100) app, was launched on February 11 and, using government data, alerts users when they come within 100 meters of a location visited by an infected person. It had a million downloads in its first ten days after launch, according to South Korean government website Korea.net, which said the app "allows users to conveniently avoid potentially dangerous locations without checking the travel histories of those infected". [7]

2.5 Disadvantages:

Certain disadvantages were narrowed down while studying the applications mentioned above:

- The Bluetooth contact tracing only works if the app is also installed by the users one has been in immediate contact with.
- Major of the well-developed apps are not present in India, one of the countries with maximum number of cases.
- The route map associated with the person is not fully authenticated.

3. SYSTEM STUDY

The system is divided into three modules:

- (1) User/Premise Registration
- (2) QR based Contact Tracing
- (3) Administration

3.1 User/Premise Registration

Registration module consists of procedures for user registration and premise registration. The user registers through the app providing his/her details, name and contact information, location information, health details (if any) and nearest health center, to be specific. Validation is done through One Time Password (OTP). Upon successful registration, a unique QR code is generated for the specific user that needs to be scanned by the premise owner, while entering and exiting the location, storing the time details.

When registering a premise, basic details like name and contact details have to be given and authorization details needs to be produced to verify the organization.

Users/Premise can login by providing the email-id and password (in case for premise) or by the OTP process (in case of user)

3.2 QR Scan for Contact Tracing

Basically, a QR code works in the same way as a barcode at the supermarket. It is a machine-scannable image that can instantly be read using a Smartphone camera. [8]

When a user registers through the application, a unique QR code is generated. This has to be scanned at the counter/reception when the person enter/exit the place by the premise in-charge. The duration of stay, personal details validated by an OTP are stored while scanning and this becomes the primary piece of information while contact tracing.

Using the QR ID, the admin can obtain the list of primary contacts who were exposed to the virus by the infected user.

3.3 Administration (Web Application)

Administrator is responsible for verification of the details obtained and using it for contact tracing and also transferring only the required details to health authorities/police department as and when needed.

An infected person transfers his/her QR details to the admin via health authorities.

Alerts are sent to the primary contacts and are managed by the administrator.

Administrator is responsible for maintaining the log of the registered users/premises through the system. Only the administrator has the sole access to medical information, highly private data of users, premise registration details which is highly beneficial to ensure utmost security and privacy.

4. TECHNOLOGY USED

- Web Application
 - Angular
 - Bootstrap
 - MySQL
 - Spring Boot
- Mobile Application
 - Flutter
 - Google Firebase
 - QR Scan
 - http
 - Dialogflow
- Other Requirements
 - Android 6.0+
 - System that support web browser

5. RESULTS AND DISCUSSIONS

The app is initiated with the Welcome page. There are two options for SIGN UP as “Users” or “Premise”, as shown in Figure 1, below.

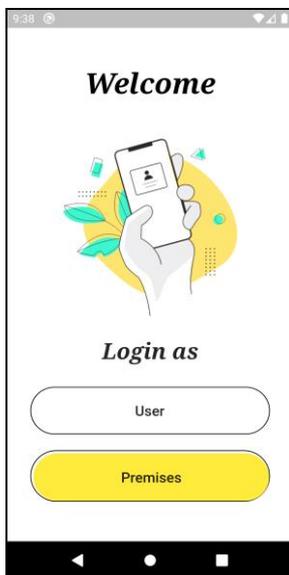


Fig.1: Welcome Page

The User create an account with providing the basic credentials and is validated with OTP. Using the contact number, he/she can log in back to the account.

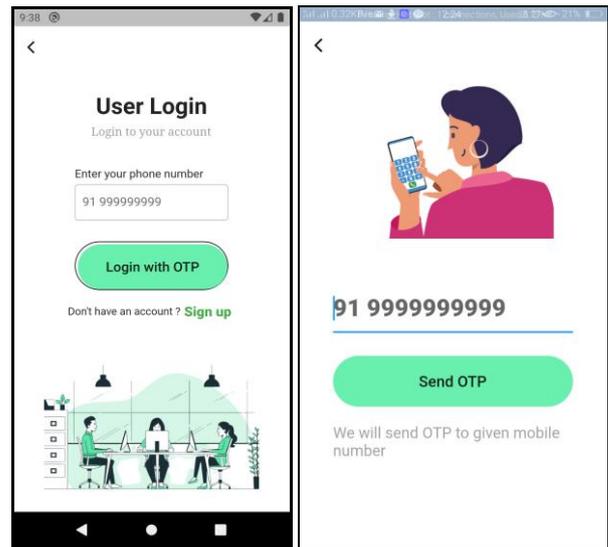


Fig. 2: User Log-In/User Sign-Up

Similarly, the premise can create an account providing with the organizational details and log in back to the account using e-mail and password.

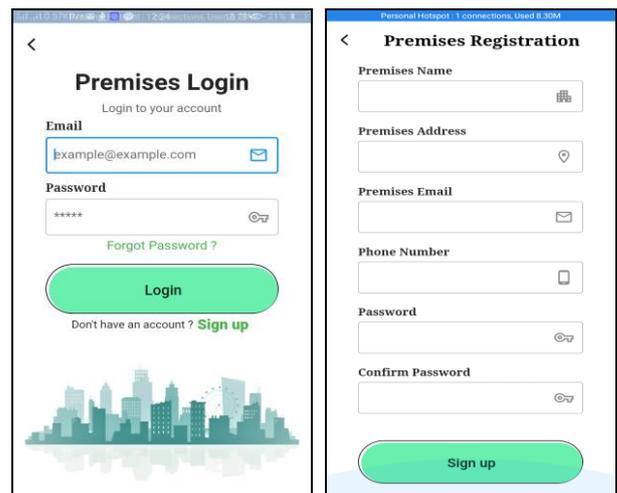


Fig.3: Premise Login/Premise Registration

The user is provided with a unique QR code with an ID, upon successful registration which can be downloaded. Also latest COVID statistics and headlines from major sources is also provided along the user dashboard.

When a user enter a premise, this QR code is scanned by the premise authority, where this information is stored along the database. This leads to the updating of the user journal.

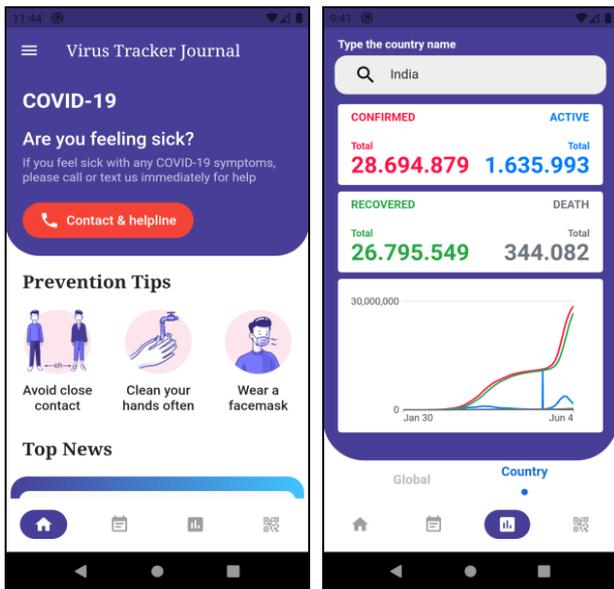


Fig. 4: User Dashboard

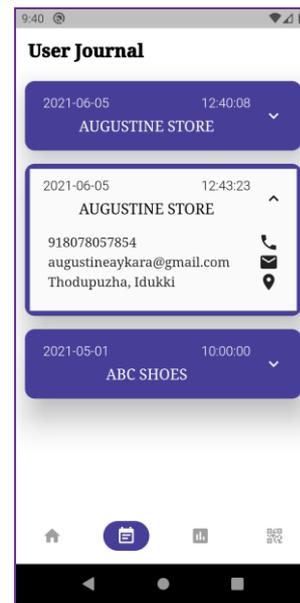


Fig. 6: User Journal

A unique QR code is generated as mentioned earlier.



Fig. 5: Unique QR Code

In case of a premise log in, when a user enter the shop (say), the employee scans the QR code of the user, which leads to the successful registration of the person and storage of this data is solely handled by the administrator.

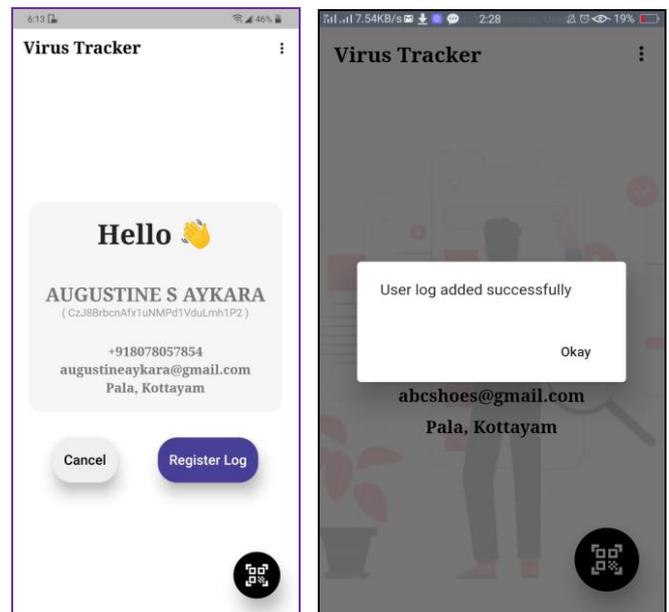


Fig.7 Registration of User by Premise Owner

The user journal is updated with every visit to a specific location by the person. This helps in user log, beneficial for evaluating the course of travel.

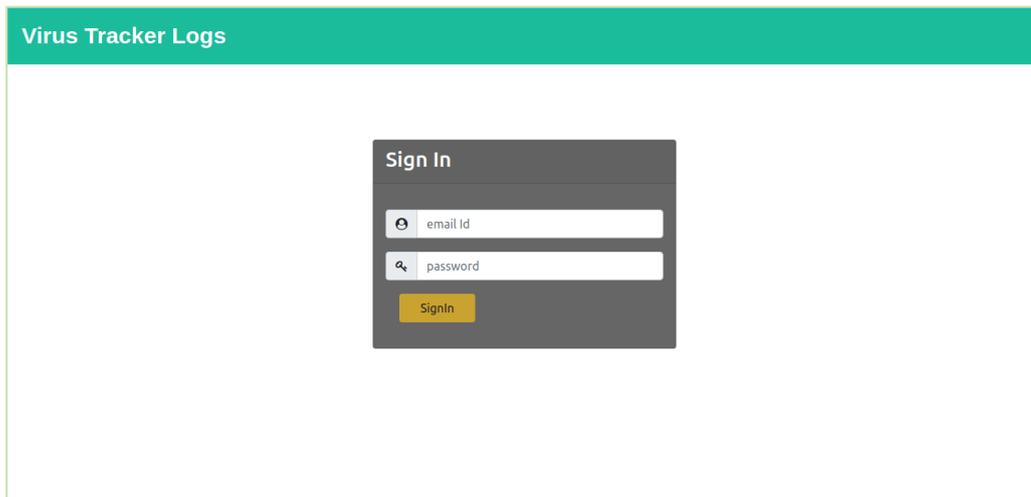


Fig. 8: Admin Login

Moving onto the web application, the access is fully controlled by the administrator (admin).

In a situation where a user is confirmed with the virus, there arises an urgent situation to alert the primary contacts who were near him during the course of his travel.

For example, the user “Bijesh Biju”, has been tested positive from the virus. He exchanges his QR ID to the health department, who in turn provides this information to the administrator.

The admin uses this ID to get the list of primary contacts from various locations, he visited.

Here, it shows that 4 contacts has been exposed by the user “Bijesh Biju”.

The “View Details” tab gives more details of the primary contact, like the name, email, contact number, address etc. as well as the Premise details like the Premise name, contact number etc.

The send alert tab sends an ALERT message to these primary contacts via e-mail.

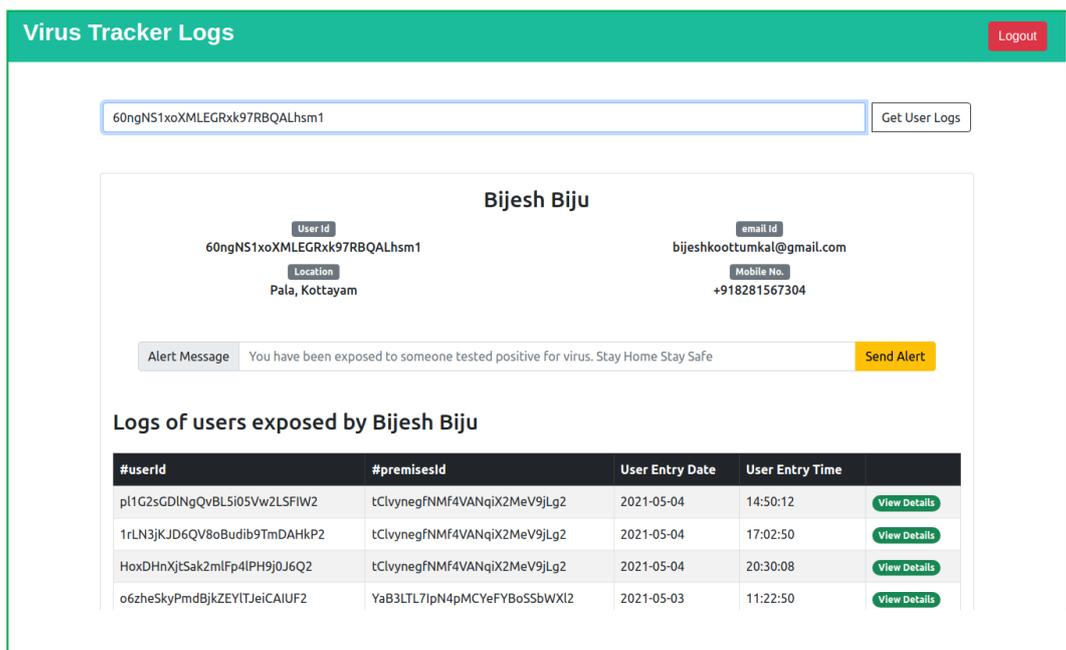


Fig. 9: List of Primary Contacts

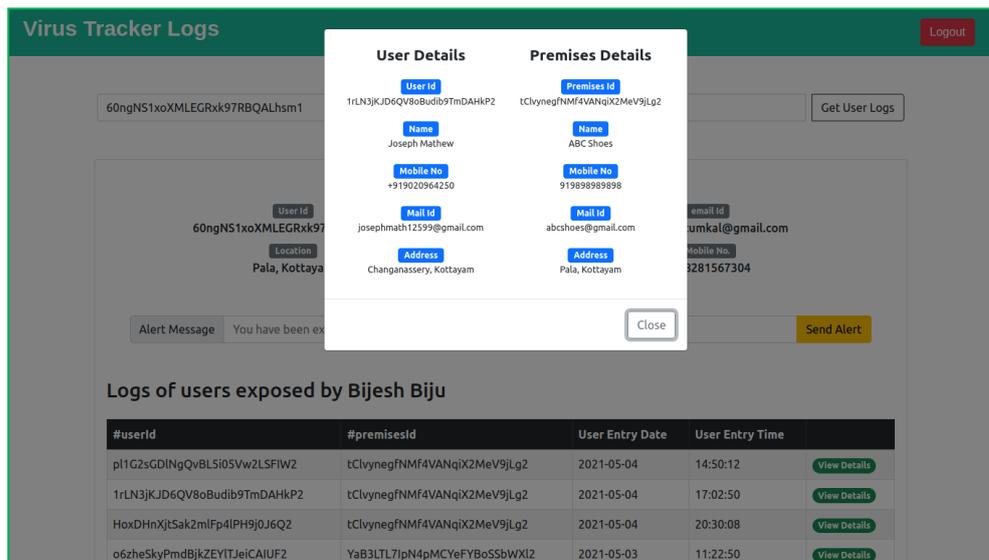


Fig. 10: View Details Tab

CONCLUSIONS

- COVID-19 cases are rising day by day, which needs to be combated with the help of technology.
- The application described can be of assistance for contact tracing and helps get authenticated data, without the risk of data breach.
- Developing it to a large scale, can be beneficial in urgent situations like in case of a pandemic outbreak.
- With the interference of the government, health authorities and the people, a pandemic can be dealt effectively.
- The project curated keeps in mind the need of authenticity, validation and privacy.
- One needs to realize the situation the globe is facing as of now, and provide maximum cooperation to combat the same.

REFERENCES

- [1] <https://onlinelibrary.wiley.com/doi/full/10.1002/smi.2975>
- [2] https://www.researchgate.net/publication/346029749_How_the_COVID19_pandemic_has_changed_our_lives_A_study_of_psychological_correlates_across_59_countries
- [3] <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/overview.html>
- [4] <http://www.italia.it/en/useful-info/immuni-the-contact-tracing-app-to-travel-safely-in-italy.html>
- [5] <https://aarogyasetu.gov.in>
- [6] <https://covid19.nhs.uk>
- [7] <https://www.smartcitiesworld.net/news/news/south-korea-to-step-up-online-coronavirus-tracking-5109>
- [8] <https://www.fastprint.co.uk/blog/quick-response-codes-what-are-they-and-how-do-they-work.html>