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Automation System to Find Out Plasma Donors for Corona Patients

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ABSTRACT

COVID-19 is a global pandemic that we are facing from the end of the year 2019. Scientists are trying to develop a vaccine to get rid of coronavirus as soon as possible. In the meantime, doctors are trying to treat patients in different ways. They are trying their best by applying many methods, therapies to patients so that the patients can recover fast from coronavirus. Some doctors are recommending plasma therapy. In this process, doctors are giving plasma therapy to patients who are in a critical situation. Nevertheless, not everybody can donate plasma. Only those who have recovered from COVID-19 can donate plasma after getting a doctor's advice because they have a corona antibody in their blood, which will help a COVID-19 patient to improve health conditions. However, we have seen that when a COVID-19 patient needs plasma therapy, his/her relatives try hard to find a donor. They post on social media, call their known relatives, friends that are time-consuming and take much effort. To make it simple, we have made an application that will store the information about the people who have recovered from COVID-19 and are ready to donate plasma. The donor can also share his COVID-19 positive journey and the lifestyle he/she has followed to recover which will motivate others to recover early. A

COVID-19 patient can find a plasma donor near his/her current location utilizing the proposed automation system. It will save time and effort.

Keywords: COVID-19, plasma, mobile & web (python) application, plasma donation.

1. INTRODUCTION

The global pandemic COVID-19 has made our life harder. Scientists are trying to discover the vaccine still as there is not available any specific treatment. As a temporary solution, plasma therapy may be a good option. When a patient recovers from COVID-19, his/her body produces antibodies of corona virus that is carried by plasma. If we transfer those antibodies to the COVID-19 patients, then there is a chance to get the result COVID-19 positive to negative though this process is not the permanent solution. The patient may have COVID positive again after getting the plasma therapy.

That's why there is a lot of research on whether plasma therapy is a safe and temporary solution or not. Korean researchers said that they had experimented with plasma therapy to two COVID patients resulting in the patients having recovered from COVID-19 that was not a permanent treatment but was an impactful treatment in the absence of a specific solution [1]. Plasma therapy is effective, safe in COVID-19 patients and improves radiologic abnormalities, and clinical symptoms [2]. A study on Chinese research said that they had experimented with plasma therapy on 5 patients who were in critical situations, and they tested COVID negative after taking the therapy [3]. Another study said that plasma therapy had reduced patients' hospitalization period from 12.88 to 9.54 days [4]. It may be beneficial to take plasma from a minimum of two donors to achieve effective immune protection [5]. American research said that they experimented with plasma therapy on 20,000 hospitalized patients and the mortality rate has decreased about 13% after 7 days of therapy [6]. Donors must be recovered from COVID-19 and will be able to donate after 14 days of recovery [7]. A study said that 10 patients had taken one dose (200ml) of plasma therapy that results in para clinical criteria and clinical symptoms improved quickly within 3 days [8]. A chinese study said that 4 patients took plasma therapy including a pregnant woman who had SARS-CoV-2 and the result was they all recovered from SARS-CoV-2 [9]. Plasma therapy taken by COVID-19 patients impacts no serious adverse reactions [9]. Convalescent plasma therapy should be used as a treatment for COVID-19 patients who are in a critical situation as soon as possible [10]. From the above different studies, it is clear that convalescent plasma therapy will play a vital role in the COVID-19 pandemic situation until the vaccine is invented. Many vaccines are developed by the medical scientists but those are in

the clinical trial so the world needs to wait a while for the certified one. Our proposed application will help people to find the donor whenever they need it. This automation system won't require storage for convalescent plasma so that there is less chance of damaging the plasma. We proposed an automated application that is developed by using Google Flutter. Flutter is a cross-platform application that means if any application is developed using flutter it will run in both Android and iOS devices.

2. RESEARCH METHODOLOGY

State management has always been a great priority while developing a reactive application. Unlike native applications, our application differs on state management. We planned not to make any imperative changes on the UI every time. Instead, we decided to change every state and then rebuild the specific component from scratch. We identified the features which are most important like showing real-time available donors or to push notifications as per user needs. We used a built-in feature called "ChangeNotifier" to manipulate the data over real time and a state-management library named "Provider" to simplify the allocation of available resources [11]. Besides, our priority includes better experience for our users. Using the "Provider" pattern we've leveraged our objectives like fastest loading, real-time memory allocation, and smooth user interface at best. In each component, we're just updating its state based on the Build Context provided by flutter whenever the provider notifies for new resource allocation.

2.1 User Authentication

As we have a separate application programming interface to filter, validate and modify data in the database, so we had to ensure minimum standard

security for user authentication. In every new account creation or user authentication, a new token is generated in the server side, stored as per the newly created session and sent back to client side. In our mobile application, we store the token generated in the server side in local storage. So that in future we can easily validate the user and authenticate the session ongoing. In case, the user logs out from all devices at once from a device, we then invalidate all those tokens created for those sessions and keep the token working for the current device and its session.

2.2 Plasma Donor

Fig 2. represents the activity diagram of a plasma donor. A COVID-19 recovered person can be a donor. For being a donor, a person needs to fill-up a form where he has to give his name, mobile number, blood group, location of his present residence, story of COVID positive journey and lifestyle. After that, he has to submit the form and an OTP code will be generated for verification by the system. After authentication, he will get a confirmation message and he will be added to the list of donors.

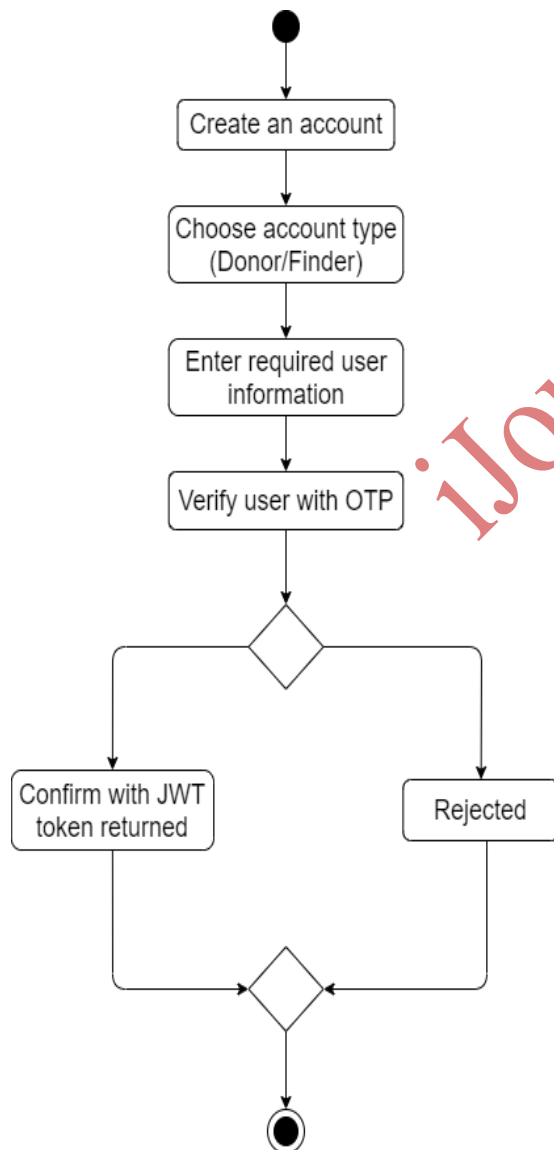


Fig 1: Activity diagram of user authentication

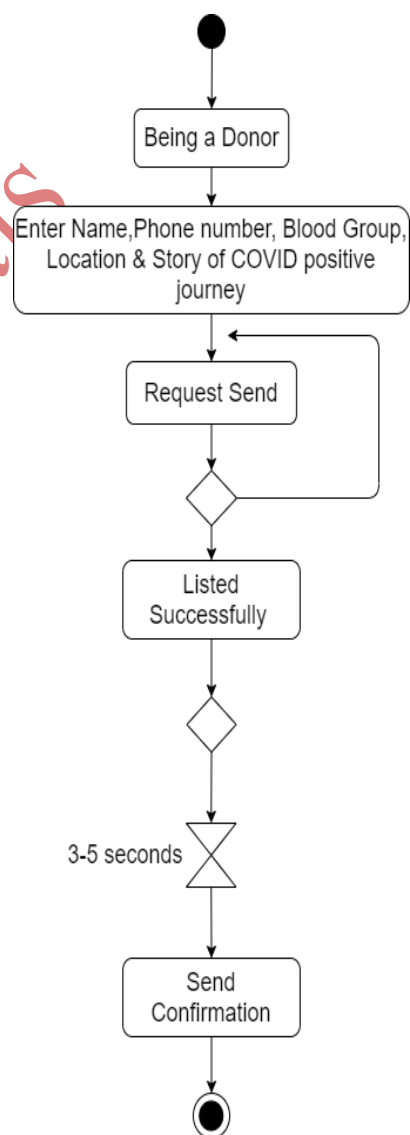


Fig 2: Activity diagram of plasma Donor

2.3 Plasma Finder

Fig 3. Represents the activity diagram of a plasma finder. A COVID-19 patient or his/her relatives can find plasma for him/her through our proposed application. First of all, if anyone wants to be a plasma finder then he/she has to be a verified account in the system. If he/she has an account then the next step is browsing the dashboard and selecting the blood group. Then he/she has to allow GPS access to see available donors near COVID-19 patients. After that he/she can communicate with the donor personally.

If a plasma finder is not interested in turning on the location of his/her mobile phone, he/she can find a donor in the region of his/her living area. It can be possible by using the Dart DateTime function that collects the current local time from the mobile phone of the application user. This feature will allow a finder to find donors without allowing GPS access. But it will not be convenient for a finder because he/she will not be able to find a donor near his/her current location. So, it is recommended that allowing GPS access will add value as the intention of the application is finding a donor within a short time while needed.

3. RESULT AND DISCUSSION

User Interface: These are the user interface of our proposed application. In the Fig-1 we can see the user interface for a plasma finder. A plasma finder can see the plasma donor's information with their story of COVID positive journey. Donors will share their experience on how they took care of themselves and how their lifestyle was while they were COVID positive. Their lifestyle can guide other COVID positive patients to recover earlier.

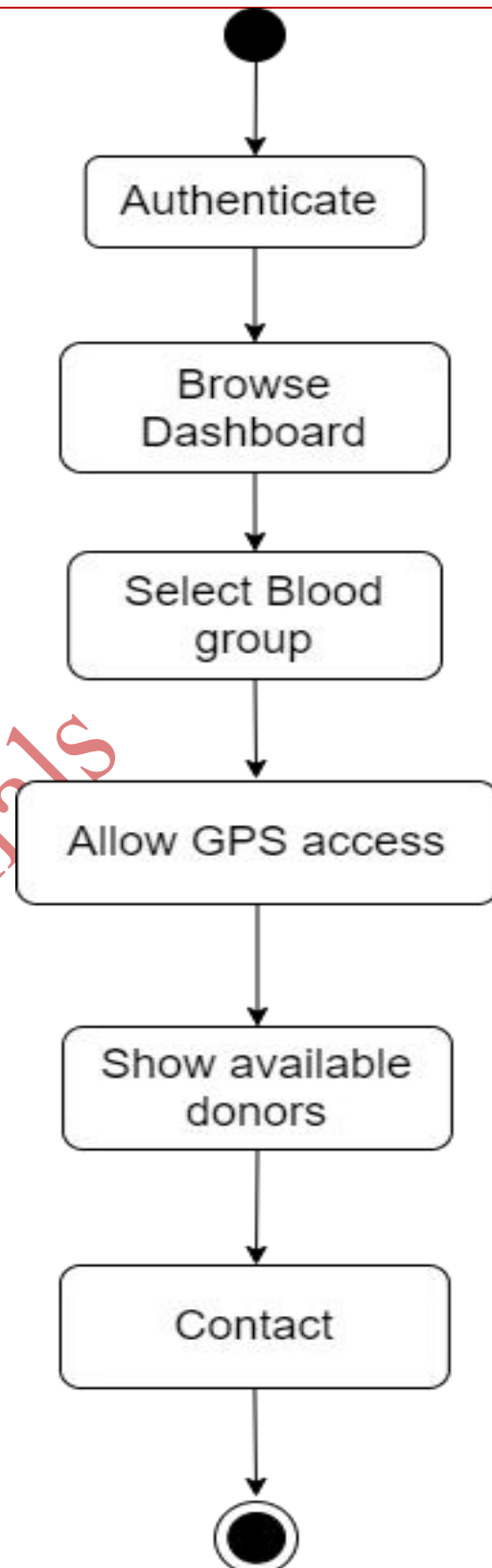


Fig 3: Activity diagram of plasma Finder

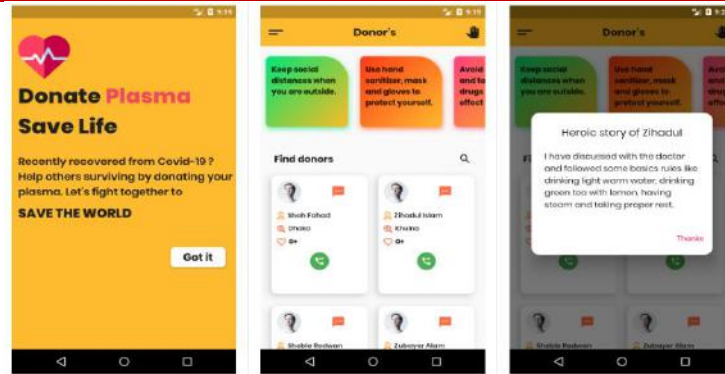


Fig 4: User interaction in home screen after authentication

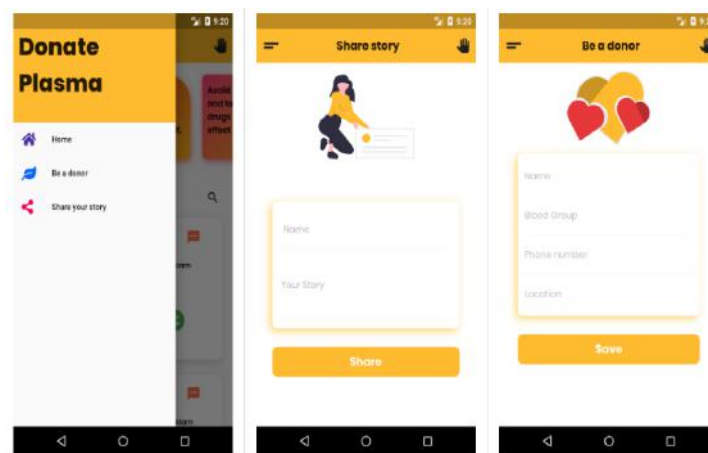


Fig 5: Donor's interaction to donate plasma and motivating others by sharing story

Fig-5 is showing the user interface for a donor. There are two forms that show that the donor needs to fill-up. One is about the detailed information of a donor and another is the heroic story of the donor. We have experimented with the feature by inserting some data.

Table 1. Donors List

Name	Mobile	Blood Group	Location
Sarkar Shahriar	+8801680 060243	A+	Dhanmon di
Sheble Redwan	+8801921 583285	B+	Begum Bazar

Ahmed Hossain	+8801566 448567	O+	Dhanmon di
Nibir Alam	+8801755 996654	A+	Dhanmon di
Farehina Shahzadi	+8801735 202151	O+	Dhanmon di
Faquid Hossain	+8801752 999578	AB+	Dhanmon di

From fig-6 we can see that a plasma finder finds a donor near his current location when he turns on his GPS access. He can select one of them and contact the donor. The plasma finder can also find

donors by searching blood groups that are shown in fig-4.

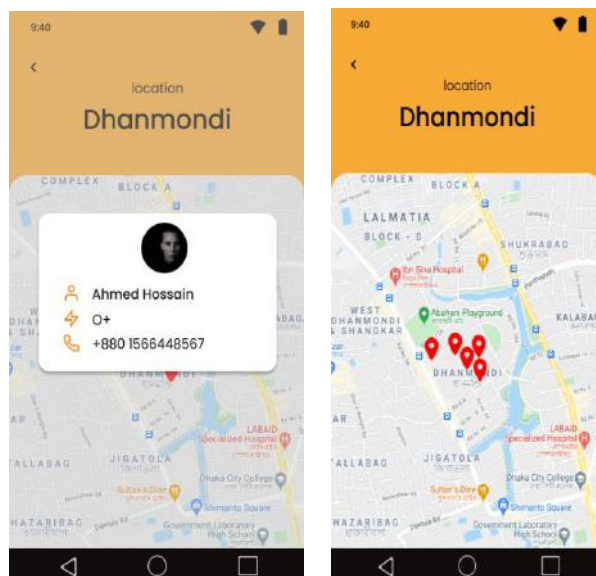


Fig 6: Location of Donor

4. CONCLUSION

The world is suffering because of COVID-19. Everywhere in the world is declared a national emergency over COVID-19. The vaccine is not invented yet which results in no permanent solution of this COVID pandemic. In this situation, we can't stay home waiting for the vaccine. People have to survive in the race of living. At this point, plasma therapy may play a vital role as a temporary treatment of COVID-19. From the perspective of Bangladesh, we have seen that many Facebook pages are running social activities for searching for plasma donors for COVID patients. We have come with an idea through this situation and proposed an application to make the process a centralized system. From that perspective, we have designed the automation system that will help a COVID patient to find a plasma donor. We have proposed this application so that we can serve our society as

voluntary work. The proposed system can also be used in future as Plasma Bank.

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