ABSTRACT

**College Name: SIES Graduate School of Technology (SIES)**

**Team Details:**

|  |  |  |
| --- | --- | --- |
| Name | Member/Leader | Year (Second/Third/Final) |
| Kaushik Shridhar | **Leader** | **Second Year** |
| Shinit Shetty | **Team Member 2** | **Second Year** |
| Nandita Nandakumar | **Team Member 3** | **Second Year** |
| Pournami Pottekat | **Team Member 4** | **Second Year** |

**Problem Selection: Geofencing using IOT (GOT)**

**Understanding of the problem:**

Since, the outbreak of Covid-19, the situation of India has worsened to an extent where we have around 80,000+ active cases coming up daily and hence, we cannot afford to put at stake the lives of our essential workers. Reports of various attempts of patients sneaking out of the hospitals have raised the concern of increasing the potential spread of virus. Some patients even put the lives of the hospital staff at risk by carelessly roaming within the facility.

Healthcare facilities tend to avoid adoption of these new technologies as people consider it an invasion of privacy. This is where the challenge arises, but we have covered this issue, as we do not intend to make use of patient’s personal information at any phase in our application.

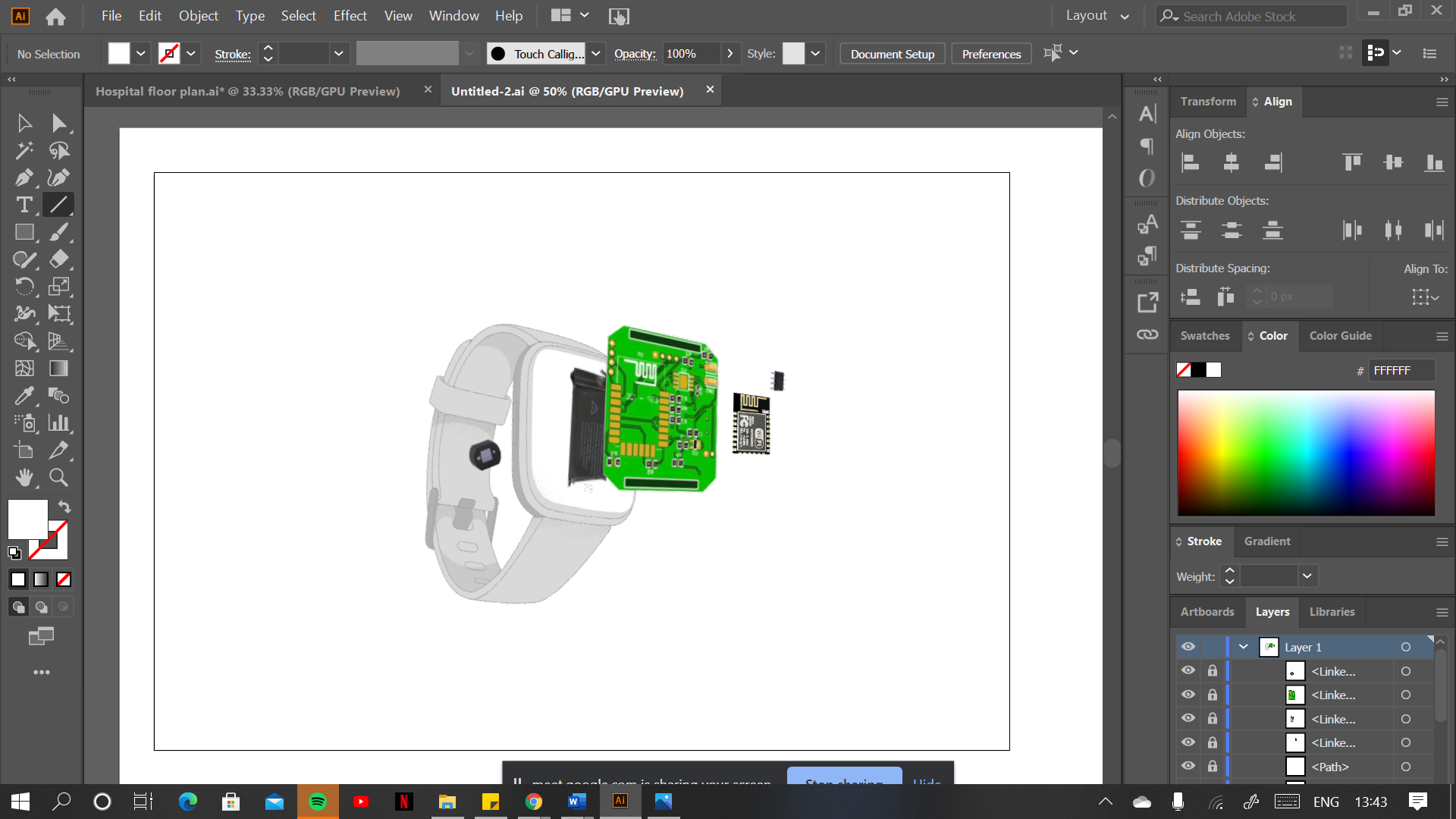
We believe this product will have applications beyond being of help to CoVID centers, like, it can serve a long-term use in prisons, asylums and rehabilitation centers. Also, after careful research, we came to know that India hasn’t launched any such product of its own in the market yet, which allows the foreign companies to quote exorbitant price and overcharge us.

In addition to that, we chose this topic so as to enhance our knowledge and increase our exposure to such unique technologies. We believe that we can solve this problem within the stipulated time.

**Approach:**

We are planning to build a portable device(watch) which consists of an ESP 12E wi-fi module which scans the surrounding for available wi-fi access points , after which , the RSSI value and the SSID of the access point gets stored in the database. We will also have a photo diode sensor incorporated in our device which sends an alert when the device is tampered and the light hits the sensor.

**Prototype of our watch:**

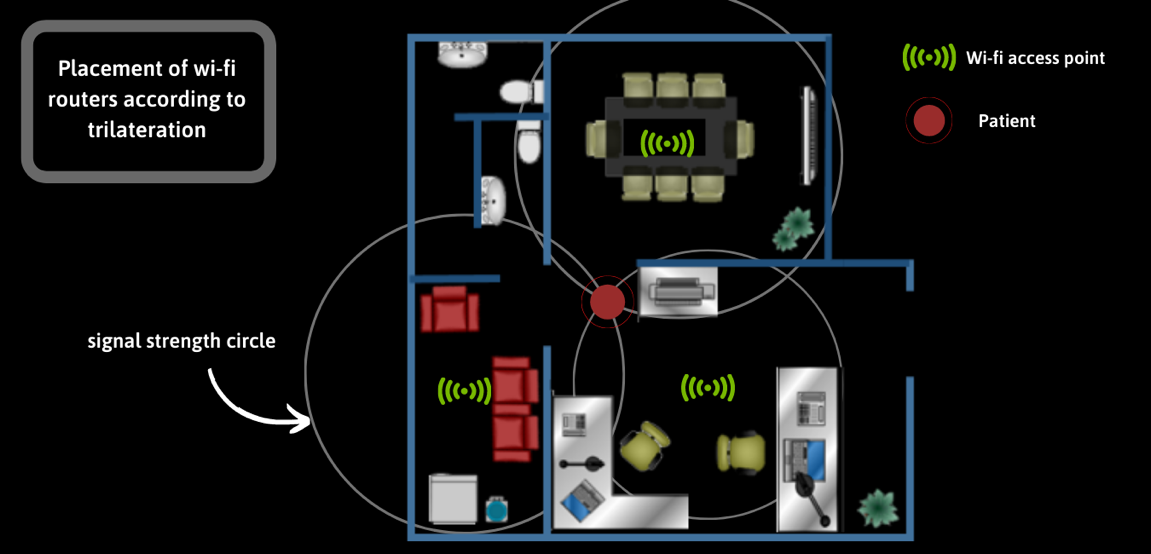


**Components used:**

* + ESP 12E wi-fi module
  + LI-ION Battery
  + TP4056 Micro-controller
  + Two-sided printed PCB
  + 3.3V regulator ic
  + Photodiode sensor
  + [10k resistors](https://potentiallabs.com/cart/buy-10k-ohm-smd-package-1206-resistor-online?gclid=CjwKCAjwnK36BRBVEiwAsMT8WP168x4qBEtYYyZzGNQQm6MbkypYT9i06g7Muq0zSei-vKIxnc4QMRoCkjoQAvD_BwE) (8 pcs)
  + [10 μF capacitors](https://www.evelta.com/10-uf-25v-0805-smd-multi-layer-ceramic-capacitor-0805x106k250ct-walsin/?gclid=CjwKCAjwnK36BRBVEiwAsMT8WDHuGCuikyuStEdN519HTmSB-udiXgRGrA0xpi-fsTmqSMAJBBYYaRoCeqMQAvD_BwE) (2 pcs)

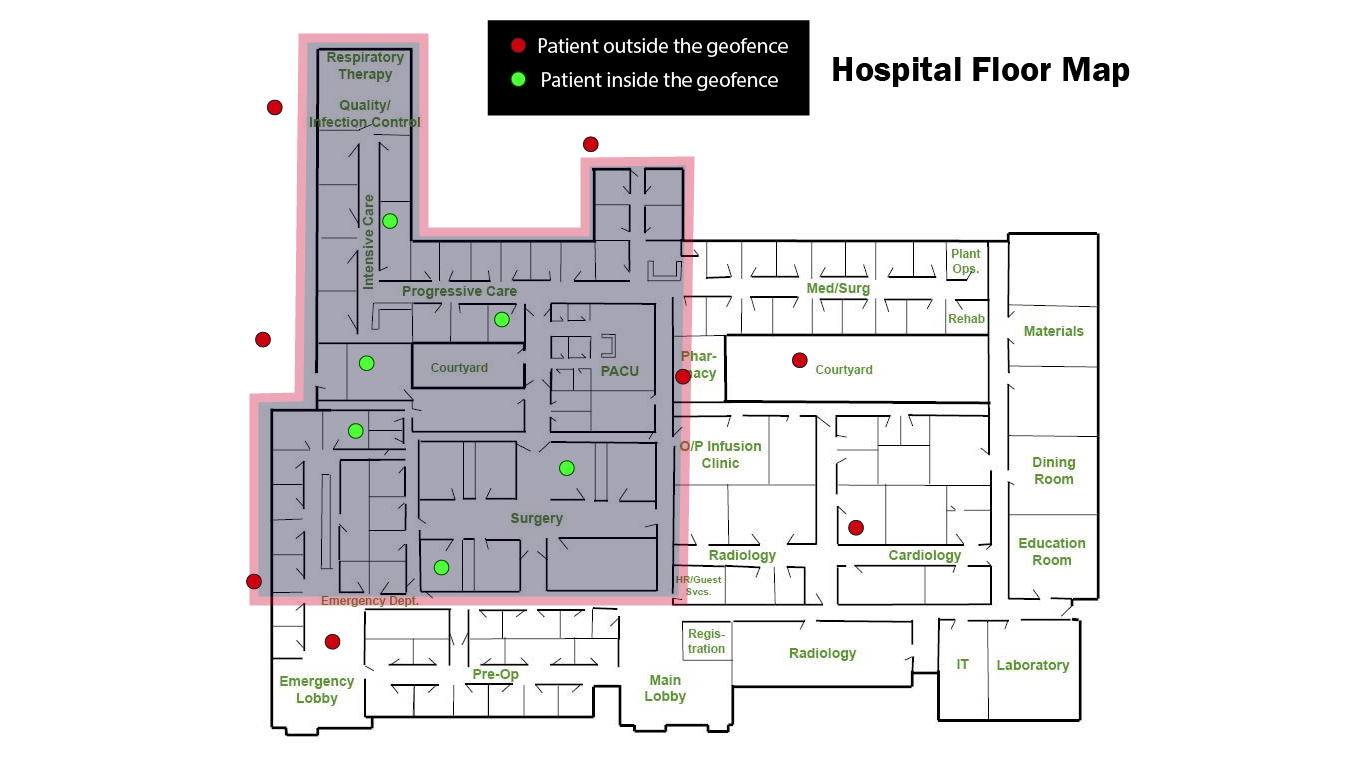
1. **Indoor tracking using trilateration concept :**

Minimum three wi-fi reference nodes are placed across the room. When the patient enters the room, his/her exact co-ordinates are calculated by using the concept of trilateration. In trilateration, the RSSI values depict the signal strength of the reference nodes, thus creating a circular perimeter around each node with the radius equal to the distance calculated using the RSSI values. The intersection of these three circles give the exact co-ordinates of his/her position which are later fed into the system.



1. **Plotting the geofence:**

Geofence is a predefined virtual perimeter for the real-world geographic area. We plan to integrate various python libraries to create an interface where the blueprint of the hospital building can be uploaded, followed by mapping the geographical boundary for geofencing.



1. **Alerting about the breach:**

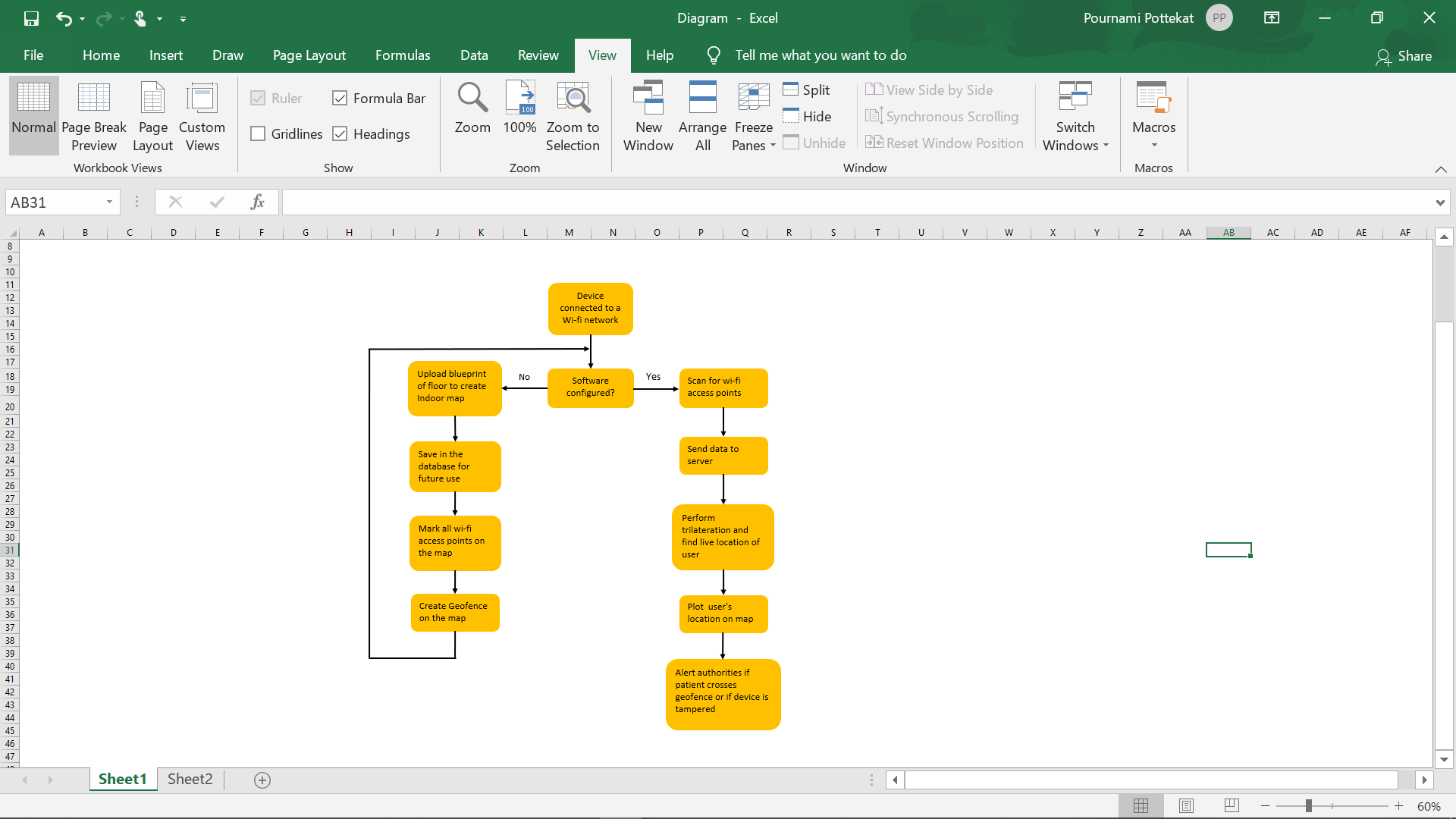
Once the co-ordinates obtained in the trilateration process are fed into the system, it plots the live location of the patient on the screen. Now, whenever any patient attempts to cross the geofence, an alert pops into the system, regarding the breach and the co-ordinates of their last position seconds before the breach, is used to display their last seen location in the premises.

1. **Other alerts:**

**1. Tamper alert:** We have integrated a photodiode sensor in our device(watch) to alert the system when a patient tries to tamper the device. Hence, when the light falls on the sensor, an alert pops on the screen that the patient has removed the watch from his/her wrist.

**2. System down or battery low alert:** The data transfer between the device and the system takes place on a constant basis. Hence, when the transfer is either interrupted or at a standstill, an alert pops up on the screen warning the authorities that the system is down.

**Approach Diagram:**



**Platform/Coding Language/Framework used:**

* Open CV
* Matplotlib
* Numpy
* Shapely.geometry
* Django
* Python
* HTML
* Javascript
* MySQL

**Database:**

The following databases will be required for functioning of the system:

* Floor plans of the hospital
* Patient registration information
* SSID of all the wi-fi access points in the building

**External Tools:** Minimum three wi-fi routers will be needed for testing the device

**Fortnightly targets:**

|  |  |  |
| --- | --- | --- |
| Sr.No. | Work | Week |
| 1 | Assembling the components to make the device (watch) | 1, 2 |
| 2 | Making a system to upload the indoor map + Geofence creation | 3, 4 |
| 3 | Database creation and Data management system in server | 5 |
| 4 | Algorithm implementation for indoor positioning | 6, 7, 8 |
| 5 | Creating the user interface | 9, 10 |
| 6 | Testing and rectifications in our web app | 11, 12 |

**Team Strengths:**

**Previous Projects Undertaken**

We have worked as individuals, with each other as a team and even as competitors for some projects. The participations and achievements of the team members are listed below:

|  |  |  |
| --- | --- | --- |
| **Event Name** | **Team Members** | **Event Details** |
| Technopoly (First Prize) | Member 1  Member 3  Member 4 | IEEE event based on various aspects of electronics and circuit building |
| Promethean-An engineer’s solution | Member 1  Member 2  Member 3  Member 4 | Annual Poster presentation competition |
| Smart India Hackathon | Member 3 | National Level Technical Event |
| Bizence | Member 1 | Business Idea Presentation Competition |

The team is well focused, committed and has a sheer will to complete the target within the given time frame. We have great interpersonal skills. We are very good at communicating within the team. We are also very flexible with backup plans. In any kind of worst-case scenario, we'll definitely find a good solution for it. We also have a keen eye for details.

Most of us are well versed with multiple coding languages, web technologies and IOT. In addition to this, we are curious to learn new technologies and are willing to study more about the different aspects of our problem statement and offer innovative solutions for it.

**Personal Motivation**

Our team is highly motivated and excited to take part in this competition as it would be a great learning experience for us. It will provide a great platform for us to work collaboratively within the team, improve our technical as well as presentation skills and strengthen our personal dynamics.

Members of our team have had a first-hand experience about the effects of carelessness of CoVID patients affecting their localities. Two of our members live near quarantine centres and they have noticed that some patients slip out of these centres to meet their family or just to roam outside to get some fresh air. It is due to this reason that the lives of the people in the neighbouring areas are disrupted. Our project will help to avoid situation like this and will help control the damages done by it.