

Automated Pandemic Fighting

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Abstract—This research paper aims at the efficient ways to automate pandemic fights. The main aim will be to automate the services that are required in a global emergency. Services like a health checkup, disease symptoms, blood test etc. are currently done by the doctors. But in times of world emergency when most of the doctors of the world are busy with the research of vaccines and the cure for diseases, there are very few doctors left for the general checkups and to examine the patient who is suffering from the common know diseases. To efficiently manage this situation, a global pandemic fight system should exist.

Index Terms—COVID-19, Remdesivir, RTPCR

I. INTRODUCTION

On the 31st of December 2019, the first case of COVID-19 was reported from Wuhan, China. For the initial few months, the doctors were able to handle the situation and predict COVID-19 as an upgraded version of “Swine Flu”. But, from the first week of March 2020 COVID-19 cases were increased rapidly, and thousands of deaths were reported each day. The day passes by, and the situation become worse than ever, then the UNO declared “COVID-19” as a global emergency.

In the mid of June 2020, the death toll already reached 4.55 million. This death count includes the deaths that were reported. Highly populated countries like China and India were having so many death cases that were not reported and were not on the worldwide death count list. Also, thousands of people died because of poor resource supply, if they were provided with the proper resources, they can be saved from dying. Primary resources that all the patient of “COVID-19” was seeking for was Oxygen, Patient Bed in the hospital and Remdesivir Drug.

There is one thing more, some of the patients who are having heart stroke, brain hemorrhage at that time have died because there was no doctor to operate on them. The situation was at that time was like that for RTPCR test doctor was present, but there was no doctor for the individual facing the health issue. Everyone was in so much fear, some of the people who were suffering

from some disease lock themselves in the house and were refusing to visit the hospital.

II. LITERATURE REVIEW

A. Example systems

In 2020, Mohd. Javaid [1] provided a solution for the customized requirement of essential healthcare equipment, medicines along with the requirement for advanced information technologies applications. Mr Mohd. Javaid and his teammates have introduced us to the potential of Industry 4.0, which is capable of handling all the requirements of health care during the time of the pandemic. As per this research paper, they have mentioned all the significant technologies of industry 4.0, except DevOps. DevOps is one of the most important technology for Industry 4.0 as it will ensure no downtime and efficient resource management

Ravi Pratap Singh [2] and his team conclude that by using IoT, we can fight pandemics like COVID-19. The article is well written, covering all the necessary points, but stills lack to answer some contradictory points. They mention that implementation of the infrastructure in which multiple IoT devices are connected together is cheap to build. However, the research does not contain any budget approximation. Also, in countries like India IoT devices are not mass-produced yet, so directly jumping to the conclusion interns of the budget will be wrong.

III. PROPOSED WORK

The main objective is to build a system that can be operated worldwide and maintain a global database for each country. The system will further have robotic arms capable of collection and analyzing of the blood. Robotic arm will also able to take the fluid sample from nose and the throat.

Initially, the patient are required to register themselves at the online portal of medical center, displayed in the entrance of medical center. Prior entering to the medical

center, patients are passing through the automated temperature check post. After once patients reached inside the medical center, a robotic arm will do the full body scan and collect the blood sample of a patient and record the observations. Observations are further analyzed as per the conditions declared by the WHO. Final result will be able to prove a patient is suffering from the disease or not.

Also, team should keep below-mentioned points in mind :-

1. This system should be able to capture the data of each, and every patient and that data should not be kept locally for a long duration of time. We can use local storage for short time but after that fixed period, data should be sent to the cloud.

2. The system should be able to process data very fast, as a very large group of people will be using the system each second.

3. System should be very secure, there should be no data breach. For this, a regular surveillance is needed at the data center location and a cyber team which be monitoring all the web activities that are associated with application.

IV. METHODOLOGY

In this section, the methods that are going to be used in this project are described in details.

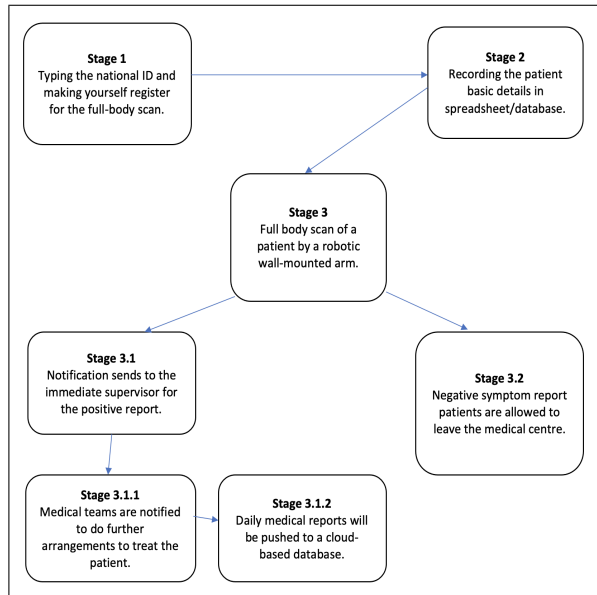


Fig. 1. Flow diagram of the proposed work

This system will work as mentioned below :-

1. An automated temperature scan booth will be the first checkpoints that patient are needed to pass through in order to enter the medical facility. If the temperature is more than the decided limit, the patient will immediately send to the critical ward. Others who are passing the temperature check will be allowed to enter the medical facility.

2. After that, patients will be entering their national ID on interactive portal which is the part of system. This system should be able to capture the basic details of the patients, which are obtained from the national ID digital card.

3. All the basic details as per the national ID will be recorded in the new database/spreadsheet.

4. A robotic arm will start scanning the patient and try to find the symptoms of the pandemic.

5. If the report is negative, the patient is allowed to leave the medical center and the scan reports will be uploaded to the database.

6. If the report is positive, a notification will send to the immediate supervisor.

- The further arrangement will be made, including ventilators and medical rooms with other proper medical equipment's.
- Daily medical reports of the patient will be recorded and stored in the database located on the clouds.

A. Data collection mechanisms

1. Patients will enter the national ID, to register themselves. Data acquired by doing so will be stored in a variable called "p_basic_data".
2. After that, the registered user will be scanned one by the robotic arm. The robotic arm will be capable of detecting cough and high fever or the symptoms related to the pandemic.
3. The sample will be analyzed, with the collected blood of the patient. The data will be stored in the database under fluid_result and sample_B_result columns.
4. Then, patients are asked to wait for fifteen minutes in the hall.
5. If the result is positive, the retrieved data will be printed out and will be hand over to the immediate senior member of the medical center. A tick will be marked in the final_result column of the database. Necessary steps will be taken afterwards.
6. Patient with negative report is asked to leave the medical center. Also, a cross(X) will be marked in the column of final_result.

```

Initialize p_basic_data
Initialize national_ID_check
Initialize correct -> https://nationalid.com

```

Collection of basic details

```

If (national_ID_check == "correct"){
    Store the acquired data in ""p_basic_data"
}
else
    printf("national ID was wrong, try again")

```

Collection of fluids and blood sample

```

If (p_basic_data != ""){
    Initiate the full body scan, collect fluids and blood
    save result to fluid_result and sample_B_result respectively.
}
else
    printf("Patient not register")

```

Final result

```

If (fluid_result == "perfect fluid sample" && sample_B_result == "perfect blood sample"){
    printf("Negative Report")
}
else
    printf("Positive report")

```

B. Algorithms for decision-making and learning

As a matter of fact, everything is getting automated. But, to make sure that automation will work for each and every time, we need to add some intelligence in the processing unit. Intelligent processing unit will tackle all the unexpected and boundary value test cases. This will also increase the reliability of the application, which will further lead to very less downtime. Techniques like

supervised and unsupervised learning can be very helpful when dealing with large amount of data.

C. Quality assurance

After adding all the important resources, we will still need to make sure that everything is working as expected or not. For this, we will require QA's who are going to test the entire application while running every possible type of test cases. There are still some cases left to cover, but percentage of that cases to occur is very low, so they can be easily tackled even the application is live for the end users.

D. Protocols to support C-C-I

As we already know that C-C-I stands for computer-to-computer interaction. So, in my case, multiple sensors are attached to the robotic arm.

- Object detection sensors.
- Posture detection sensors.
- Temperature sensor.
- AI calculation checker

Main unit inside the robotic arm have its system checker agent which will send the signals to the sensors. It will send (0) → to the sensors (If working correctly send '1') else (sends back '0')

- If the system checker receives the ('1') from the Object detection sensors, it will receive an acknowledgement. This will confirm that the main unit can proceed further. In case of break down, it will send notification to the maintenance team.
- After that system checker will send the ("0") to the Posture detection sensors, on receiving ("1"), main unit can proceed further.
- Now the system checker sends the ('0') to the temperature sensor. If it is working, it will send the ('1'), else ('0').
- After it is confirmed by system checker that all the sensors are working. Main unit will ask sensors to collect the data.
- The sensors will send the data to the main unit. In between system checker will send ("0") to the AI calculation checker unit, it will return ("1") if working else it will send ("0") in case of breakdown.
- After it gets confirmed that the AI calculation checker is working, then the main unit will start sending the data and will obtain final result.

E. Protocols to H-C-I communication

When the patients are entering the automated temperature scan booth, then the reading will be read by a human operator. In the booth, a "Human Temperature sensor" is present.

- The sensors will send the readings to the main display unit, this main unit will be monitored by the humans. If they find the patient safe, they will permit him/her/they to enter the medical center.
- Patient having high temperature will be sent to critical ward.

V. RISK MANAGEMENT

A. Incorporating risk assessment into design and testing

- * Change management overcomes security concerns
 - Security concerns are one of the most important things to consider because if the older version of dependencies, files, tools, etc. are used for making applications, then those applications might be open for data leakages and privacy breaches. So, it is always suggested that, whenever you are building an application, the tools you are going to use should be perfectly updated and working. Also, developers are suggested to read the updated release notes.
- * Change management overcomes dependencies issues
 - Sometimes, when we are not using the updated tools and application to build the new application, we generally get an error mentioning that this version of [tool 1] is not compatible with the version of [tool 2], which may further lead to two main problems.
 - Assuming that, if Tool 1 is having a compatibility issue with Tool 2, then a developer is forced to use any alternative of Tool 1 which is compatible with Tool 2. But the thing is, this is not an easy task, because configuring the Tool 1 alternative will be a time-consuming task again.
 - Also, if the developer has already used Tool 1 for many days/months and has completed several modules, then he might need to remove them or modify them as per the new syntax that is followed by the Tool 1 alternative.

B. Exception detection and handling

Exception detection and handling is one of the critical task, but that can be done using the help of some techniques. Below are mentioned some of them:-

- Gather the correct data, which is not having any wrong entries in it.
- Use machine learning and Artificial intelligence to make the system aware of the situation, which was not happened at the time of device creation.
- Also, new data should be added on the regular interval to make system are of the new trends of the virus.

VI. ETHICAL ISSUES

A. Regarding automated / AI systems in general

There are plenty of opportunities for the hacker to hack the systems and steal the data, for bad purposes. Generally, the hackers are selling this huge steal data on the black market for big amount of money.

Also, when it comes to AI. AI is able to make it own decisions if it is synchronized with the neural networks. Although, it is very complex mechanism to develop but still we need to take precaution for the same.

As technology is growing at a very fast pace, it is very much important for the developer to secure the user data

at any cost. As of now, the best practices to make safe automated data collection strategies will be:-

- Hire security engineers. They are the best people who can help the companies, when facing the hacking attacks.
- Secure the parameters of the big data centers, because if a threat is inside the data center, then no one can stop it, or it will be too late to handle the situation.
- Biometric protection should be use when encryption and decryption of data is done.

B. Regarding health care management system in specific

Health care management system is one of the complex creations by the humans. This system will be treating billions of patient in a dedicated period of time. While treating the patients, the system will be analyzing thousands of new viruses every day. Some of them might be friendly, some of them are not. These all observations will be recorded in the databases.

So, the first priority of the developer company should be to keep the data forbidden so that this data can not be misused to create new mutant viruses, which might be more dangerous than the first virus.

VII. FUTURE PREDICTION

In the future, there are many things that can be added or implemented. As of now, it can perform functions that are very mandatory but dangerous to do. As in the time of pandemic, spreading of virus is the main thing, because of spread every one can be the infected.

In the future, we will make this system easy to carry or portable. Also, we will try to make it small as compare to the present one. Making it small, we can add this system in more areas as it will easy to install, and the power consumption will be also less.

This system will also able to update itself as we are going to add neural networks. This will help the system to get prepare for the new virus that might be the combination of the multiple viruses. Robotic arm will keep on scanning patients and send the reports to the medical staff, apart from that it will also send notification to the staff, if it gets some combination or a clue that might be the breaking factor for the virus causing pandemoic.

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