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# Patient Monitoring Through IOT Sensors and Self Assessment Evaluation in Covid-19 Pandemic Situation

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**ABSTRACT :** In the early months of the COVID-19 pandemic with no designated cure, the only way to break the infection chain is self-isolation and physical distancing. With the usage of Internet of Things (IoT) framework, the person's health conditions are displayed and physical distancing notification is given to that user through a smartphone application. The application is integrated with the interconnection of Transceiver, Arduino kit to read inputs, IoT sensor nodes for collecting the user's health parameters continuously and with the help of network or LoRa module (in absence of network) real-time data is sent to the cloud server which is accessible by the hospital management and by the doctor through the hospital's web application. In addition to that the smartphone application enables proximity detection (social radar) using Bluetooth Low Energy (BLE) beacon, which notifies the user to maintain physical distance from others which is a key factor in controlling virus spread.

**KEY WORDS:** Internet of Things, COVID-19, Pandemic Management, Health Monitoring, Smart Healthcare.

## I. INTRODUCTION

While the world still struggles against the devastating effects of the COVID-19 pandemic, governments and organizations are discussing how new technologies can be exploited to relieve its impacts and how future pandemics can be avoided or minimized.

The Internet of Things (IoT) as a network of sensors collecting data both locally and remotely has proved useful in the field of Electronic Health (E-Health) management. A combination of Body Area Networks (BANs) and field monitoring devices have allowed for the collection of patient vitals and the provision of tracking and tracing services, critical for pandemic management. Local based E-Health mechanisms can collect health information such as blood pressure, temperature, heart rate, etc. This information can be stored locally and accessed by a health care professional.

Local systems can also be used to alert the patient when they need to consult medical personnel and when they need to take medication. Remote based E-Health is essential for health care providers in enabling remote access of patients and patient data. Patient vitals and location can be transmitted at regular intervals to nearby or distant medical facilities for monitoring purposes.

In times of a global pandemic such as the 2019 coronavirus (COVID-19), it is critical that social distance guidelines are adhered to and patients are effectively tracked and traced. These two aspects help significantly in controlling the spread of the virus worldwide. The ability of IoT services in providing remote data collection and monitoring of patients in quarantine has made it a critical aspect in fighting the spread of virus pandemics.

**II. RELATED WORKS**

During the last several years, different IoT applications have been proposed to improve healthcare systems. The IoT can be used for remote patient monitoring, e.g., connecting patients who have chronic diseases to doctors and medical resources. This has become even more relevant due to the COVID-19 pandemic, prohibiting patients and doctors to meet for fear of spreading diseases through close contact. In light of this, several solutions have been proposed and some of them are listed below.

A. Ali Imran Y, Iryna Posokhovayz and Haneya published a paper titled "AI4COVID-19: AI Enabled Preliminary Diagnosis for COVID-19 from Cough Samples via an App" which proposes an app used to record the coughs of users and analyzing it with the help of AI.

B. Gauri Deshpande and Bjorn W Schuller published a paper titled "An Overview on Audio, Signal, Speech, & Language Processing for COVID-19" summarizing the efforts undertaken by the research community towards the coronavirus pandemic with the help of speech signal processing.

C. Zaheer Allam and David S Jones surveyed the virus outbreak from an urban standpoint and advances how smart city networks should work towards enhancing standardization protocols for increased data sharing in the event of outbreaks or disasters, leading to better global understanding and management of the same in their paper, "On the Coronavirus (COVID-19) Outbreak and the Smart City Network: Universal Data Sharing Standards Coupled with Artificial Intelligence (AI) to Benefit Urban Health Monitoring and Management".

D. R. A. Calvo, S. Deterding, and R. M. Ryan published a paper titled "Health Surveillance during COVID-19 Pandemic" detailing the methods to handle treatment during a pandemic.

**III. PROPOSED METHODOLOGY**

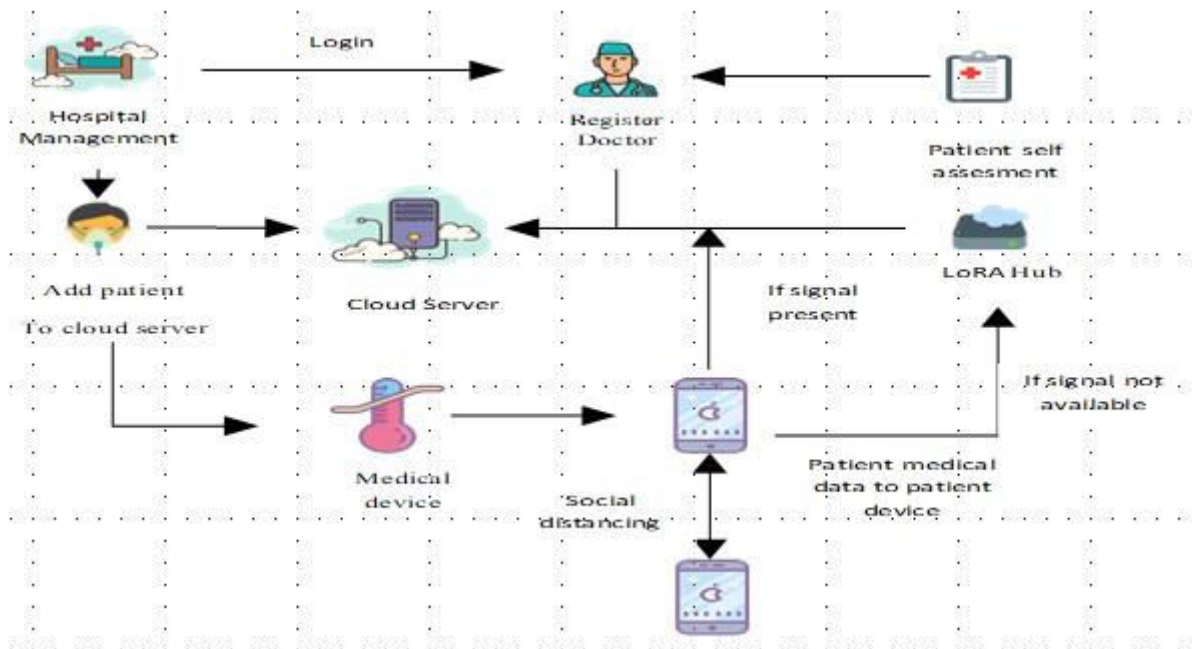


Figure 1: Architecture of the proposed system

### Hospital Management Application

A part of the proposed framework requires the hospital management to login and register the list of doctors in their hospital. Quarantined patients will also be registered by the hospital management along with their medical history and patients will be provided with their respective login credentials and a smart phone application.

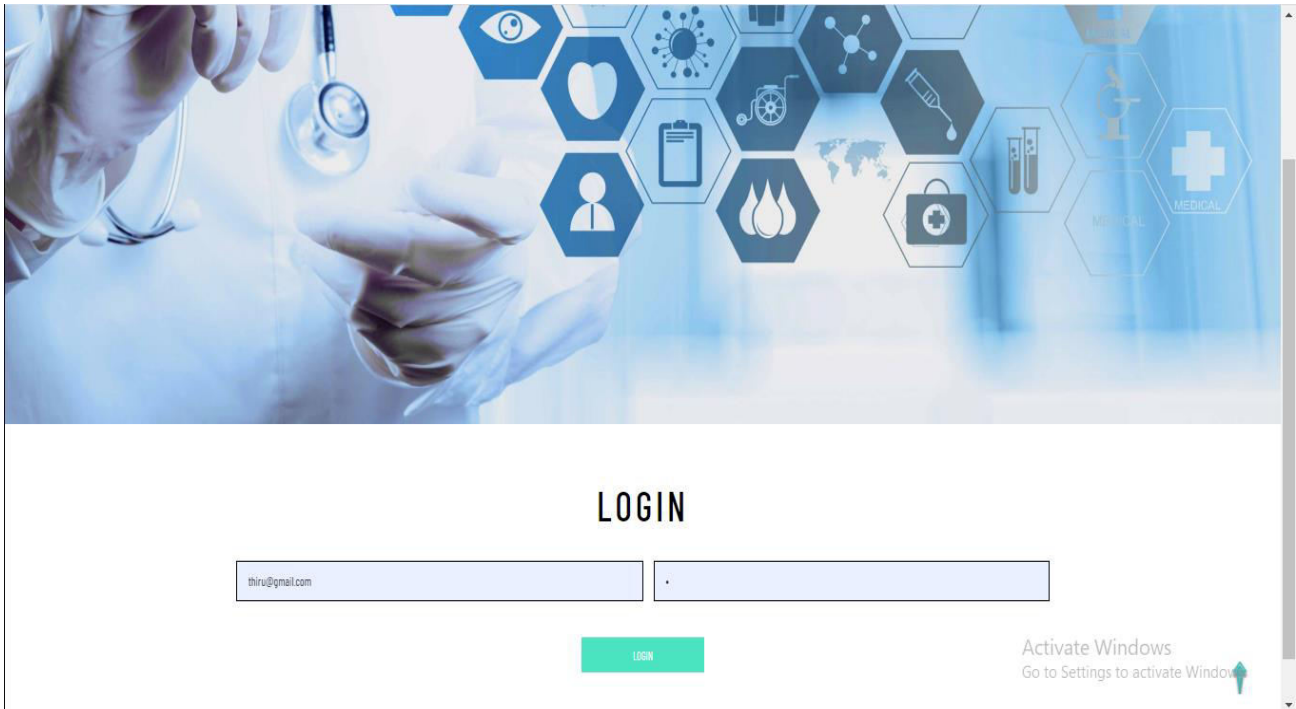


Figure 2: The login screen of the proposed framework.

### Distance Monitoring

Patient can login with the credentials through firebase cloud server patient location will be tracked it will continuously monitor distance between users has been maintained or not, if there is a distance between the user-maintained marker in Google map will be denoted as green color, if a person is nearby it will be denoted in red, they will be intimated.

### Patient Self-assessment

If there is abnormal detection in patient health patient has to take a self-assessment test based on covid19 self-assessment risk of affecting corona will be shown to both doctor and patient and doctor will intimate patient to take covid19 test and result will be updated in server.

### Patient Monitored through sensor kit

The sensor kit contains heart rate, temperature and spo2 will monitor patient health will send the data to patient smart phone based on fuzzy logic patient will be monitored. If there is any abnormal value fog server will identify and send it to a doctor.



IV. RESULTS



Figure 3: Login Page

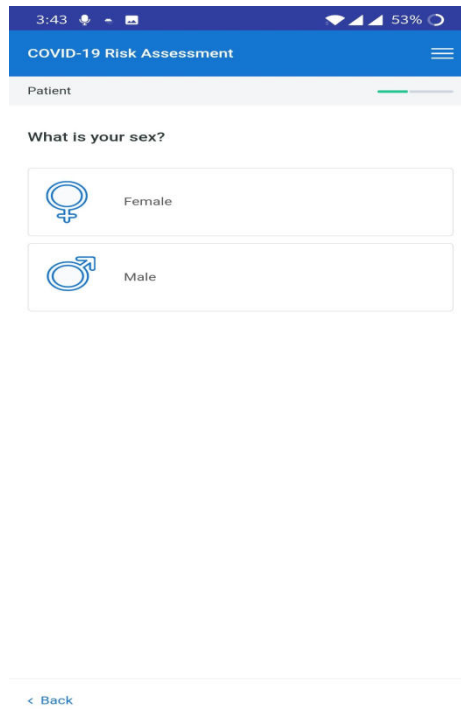
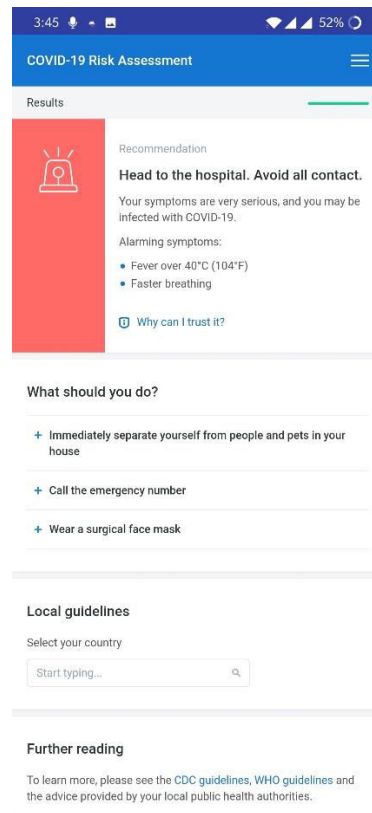


FIG 4: PATIENT SELF-ASSESSMENT QUESTIONNAIRE



**Figure 5: Patient Risk Assessment Result**

## V. CONCLUSION

The proposed system integrates a IoT node with a smart phone app by which the IoT sensor node can collect a user's health parameters, such as temperature and blood oxygen saturation, and the smart phone connects to the network to send the data to the Firebase Cloud server to monitor distance which operates both for indoor and outdoor environments to notify users to maintain the physical distancing.

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