

Certain Investigations on IoT system for COVID-19

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Abstract— Corona Viruses are a group of viruses that can cause diseases such as colds, severe acute respiratory syndrome (SARS) and the Middle East Respiratory Syndrome (MERS). A new type of corona virus has been discovered after it was identified as the cause of the spread of one of the diseases that started in China in 2019. This disease is considered one of the most dangerous things in the world, which directly affected many areas and led to high financial losses. The risk in this disease lies in its wide spread and the difficulty in dealing with and responding to it. So remote control technologies is the best solution for monitoring the patient's condition and monitoring the change of symptoms. The internet of thing one of modern technology which aims to shares files, software, programs and other tools to allow user to uses the devises with each other to apply the communication between them. it includes many devices communication between them by intelligent decisions. building modern IOT system based smart devices and sensors is the best solution to detect the patient of COVID-19 at real time. The study shows how effective device to detect of COVID-19 patient in IOT system.

Keywords— COVID-19, IOT system, healthcare applications, security and EPR.

I. INTRODUCTION

COVID-19 is one of the most diseases that affected the world, it is Viral disease includes various symptoms such as pain and aches, nasal congestion, headache, conjunctivitis, sore throat, diarrhea, loss of taste or smell, rash or discoloration of the fingers or toes. These symptoms are usually mild and begin gradually [1]. Some people become infected without feeling very mild symptoms. COVID-19 is spread in quickly with simple communication ways which make Control and detection of the disease difficult that lead to study effective method to detect the Illness and follow-up of patients Without touching or approaching the patient. remote control in detecting disease and following the COVID-19 cases, the study proposed effective system can get the real time information of the patient. The main idea of the study is related to design effective deceives with high features to detect COVID-19 patient in IOT system [2]. The proposed device includes many sensors connected with each

other in managed circuit. The sensor gets patient information such as temperature, shortness of breath and identify the patient GPS, these information help to Determine the condition of the disease.

IOT system includes many of smart devices which communicate with each other or with members to share files, devices and different information. Remote control services is one of the main aim which used in different applications for monitoring and the controlling the system to receive and send information [3].

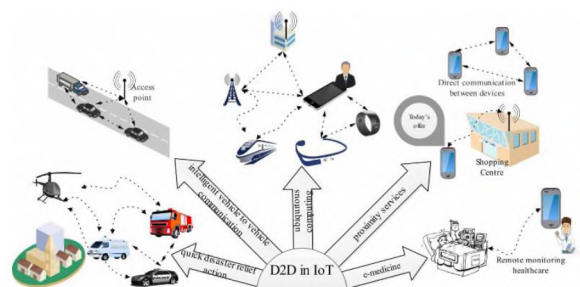


Figure 1: Examples of IOT application [3]

In the recent years, many of researches and studies interested in monitoring the patient [4,5]. Many of modern healthcare applications have been built based IOT systems, these systems include various sensors to follow patient cases and connect the sensors with supervised system to read, save and Process the patient information.

IOT networks includes a huge number of connected devices and the number of users and devices will increase in continuously. each device. a large data and information exchanges in IOT system. that make providing the security in IOT is more important to protect the devices and data. The main challenges in IOT is related to its architecture because each node in the network may be faced hacking, in the IOT architecture when any node failure or attack all the devices may be attacked because the IOT network based on central system [6]. So, in this study we interested in show how providing security in the proposed system.

II. RELATED WORKED

In the present era, the internet network has spread widely in the world, the internet service arrives to each place, the number of Internet users reaches an enormous number every day, the electronic devices are found each field and the smartphone devices are available in a huge amount in our life all that lead to the Internet of Things (IoT).

IOT is a large network includes many of connected things of devices such as printers, phones and any electrical device, also IOT includes users who want to communicate with other for calling or sending files or anything. providing the security for IOT Network is more important to protect each connected devices or users form any attack or penetration.

Healthcare application is one of the most fields which interested in providing the patients at different cases and deal with these cases effectively. The researchers studied how apply the IOT system in the healthcare applications. In the related worked section, we explain the main researches and studies which study the method of apply IOT technologies in health care applications. In [7], the study proposed system consist of smart chair support of sensors can detect and measure the big signals such as BCG, ECG, the proposed healthcare IOT system provides seating position monitoring calculations.

In [8], the study proposed effective healthcare application-based smartphone used various sensors to collect data for the patients at real time, the information of patients is collected and saved in the network server and used it to know the patient's condition continuously.

In [9], the study interested in study the patient's behaviors based on smart house supported with electronic sensors can detect any movement of the patients and analysis it. The main aim of the study provides IOT system to remote monitor of the patient in his/her houses. This type of application suitable for many chronic diseases such as diabetes and blood pressure, which require monitoring the patient continuously and throughout time..

In the hospital, ICU department is the most sensitive sectors which need ongoing monitoring, because the patients in this department suffer from critical conditions in their health. The pressure of hospital care makes following the patient all time is more difficult so need to smart devices to do that. In [10], the study interested in build smart IOT system to monitor the patient in ICU departments according with health care facilities.

In [11], the study implementation effective IOT system based on Intel Galeleo development board, the main process of this system using the data which collected form the board and save it in the database. The doctors can use the stored data to estimate the patient's statues. This system helps patients to get health care without time and effort.

The study proposed [12], security framework consist of multi-layered related to the information for patient which transfer during the Electronic Patient Record (EPR) systems, the system is combination of Biometrics, Public Key Infrastructure and Smartcard technologies. Providing the security of the patients is the main aim of this system.

The study proposed IOT system [13] interested in healthcare services for the disabled people. The study

discusses researches which study how used IOT technology for healthcare services, also discuss researches apply the IOT in healthcare applications. The proposed system combines between these studies to provides the best proposed IOT system related to healthcare application for disabled people.

The study interested in evaluating the patient statues to detect the patient's dangerous condition [14], detection of the severity status depends on the statistical analysis of patient data. If it exceeds the threshold of severity permissible, the patient enters a serious condition. mining the patient data based on put specific weight for each possibility according these weights can identify the degree of severity of the patient.

The study interested in predicting a patient's future condition based on using large cloud system analysis large of patient data for different healthcare management system [15]. Each patient has completed report for his health since the start of treatment, the data of these reports using to monitor the patient's condition and predict his future illness.

The study explains the role of using IOT system in healthcare applications, it proposed effective IOT system to monitor the patient's condition and supervise his treatment, also it interested in providing the security for transfer the patient information [16]. The benefits of this system for the patients and for the doctors; for patients: saving effort and time, for doctors: Reducing the financial costs of treatments and overcoming the shortage of doctors in hospitals.

The study shows the main benefit of using IOT system in the field of medical services [17]. IOT system includes large data for patients which connected in the cloud system at different locations with the medical team, where emergency services are provided easily and conveniently.

III. RESEARCH METHODOLOGY

The study proposed healthcare application based on IOT system to detect of COVID-19 patient. IOT system consist of different devices work with each other to apply the main objectives from the system. IOT system based on different protocol to manage transfer data between different devices and users.

Message Queuing Telemetry Transport (MQTT) is one of the most protocols which used in IOT system. MQTT is Message Transfer Protocol between Server and client in publish / subscribe mode. It is easy to use, open source, and small size that is easy to implement. it is specifically designed for the context of IoT applications in resource-limited environments in the area of energy, data exchange and storage memory [18].

MQTT has three main parts: the broker, the publisher, and the subscriber.

- The server (broker) is responsible for managing the network from clients who are a mix of publishers and subscribers.
- The publisher is the device that sends messages (posted) to the server. These messages are titled / topic.
- A subscriber is the device that listens to a specific topic or topics.

There is no direct contact between the subscriber and the publisher. Rather, the subscriber simply informs the server

that he is interested in specific topics, and the broker will then send messages to subscribers when they become available. The publisher / subscriber model is completely different from the request / response form followed in the HTTP protocol, and this allows one-to-many transfer modes [19].

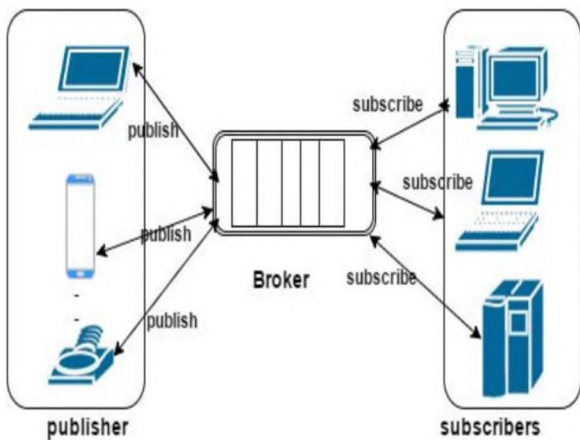


Figure 2:MQTT parts[24]

The MQTT protocol works using TCP / IP, and unlike HTTP it is a binary protocol and not an ASCII protocol, where bits / bits are used to control the protocol's advantages while ASCII protocols use characters, and as a result binary protocols consume less data traffic from the network.

Healthcare application based on IOT system includes of different devices such as sensors, clients, server application (mobile or laptop), GPS, database and Arduino ESP8266. ESP8266 is the name of the microcontroller developed by Espressif Systems, a Shanghai-based company. This microcontroller has the ability to perform activities related to WIFI and is therefore widely used as a WIFI unit [20].



Figure 3:Arduino ESP8266[25]

There are many types of ESP8266 units available ranging from ESP8266-01 to ESP8266-12 [26- 30]. What we use in the tutorial is ESP8266-01 because it is cheaper and readily available. However, all ESPs contain only one type of ESP processor, and what differs is the only type of hack used. The ESP8266-01 side panel will only contain GPIO pins while it will be higher on other boards [21]. Wi-Fi theory basics:

Transport Control Protocol (TCP), Internet Protocol (IP), User Datagram Protocol (UDP), access point (AP), station

(Sta), service set identifier (SSID), application programming interface (API), web server [22].

IV. BLOCK DIAGRAM

the system of proposed study includes three main parts; patient, data collection and data preprocessing. The figure below shows these parts.

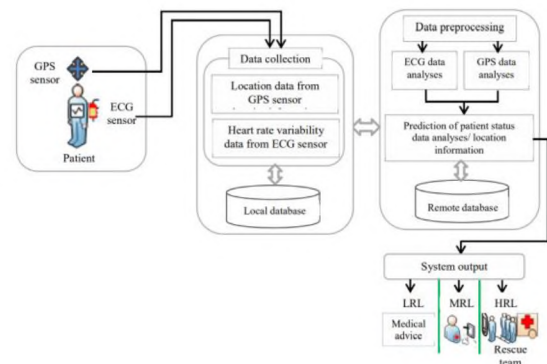


Figure 4:Block diagram[23]

In the first part, GPS sensors and ECG sensors connected with the patient in order to read the patient information such as identify the locations and know the Fever, heartbeat and symptoms indicating corona disease. At the second part, all data will be saved in the local database to used it form the doctors after send data to the main server in the system. At the last part, the data of patient will be analyzed; ECG and GPS analyses. From the result of the results of the statistical analysis of the data are used to determine the patient's condition, that help to identify which patient suffer from COVID-19.

V. CONCLUSION

The proposed approach based on using IOT system, IOT system provides effective services to remote control for the monitoring patients, In the proposed system, data is analyzed and dealt with continuously to monitor any change. Corona patients suffer from symptoms that change continuously and vary by impact from one person to another, the proposed system provides the ability to follow a large number of disease and follow their condition and transfer information to the main supervisor in the system where the data is analyzed and dealt with accurately. That making the proposed system more efficiency and strong to cover the main aims in detecting the of COVID-19 patient in IOT system.

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