SMART HOSPITAL
(Simple Medical Advisory Report through IOT)

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Abstract

Now-a-days we see various technologies rise up to sky. Every object in this world is becoming advanced. So according to the advent of smart homes,smart cities and smart everything ,the Internet Of Things (IOT) has emerged as an area of incredible impact, potential and growth ,with Cisco Inc. predicting to have 50 billion connected devices by 2021. Here we have proposed an architecture and a scheme of SMART HOSPITAL based on Internet OF Things (IOT) in or- der to overcome the problem regarding COVID-19. For example, the temperature sensor will signi_cantly help automate the checking pro- cedure and also reshape the workow with with minimal contact with the patients providing best protection to the technicians. In this re- view, we thus cover the entire pipeline of analysis techniques involved with COVID-19, including temperature checking ,smart torch and SD camera.

Key Words –*Internet of Things, Real time Monitoring Arduiono Uno , Data Transmission , Sensors.*

I.   INTRODUCTION

In this project we will mainly see that how the patients can be treated by following the social distancing so the one who is treating will be safe. This project is focused on the monitoring patient's health status and receiving doctor's prescription without physical contact with patient. We can make use of number of sensors in order to precisely detect whether particular person is COVID positive or not. An advanced system can be built that can detect temperature, oxygen level, heart beat and also can take throat picture of a person that will enable doctor to check patient's health condition without physical contact with patient. The person can check that whether he/she has COVID- 19 symptoms or not through a IoT application. IoT application can compare symptomatic parameters with its normal value followed by generating report and prescription via a web application. The idea to develop a smart device for patients in this COVID pandemics is that it's completely comfortable and easy to handle while maintaining social distancing. Sensors integrated with web application can help to a person from being aware of COVID-19 virus.

II.   LITERATURE SURVEY

In this section different Literature Review and the system architecture are discussed. It consist of different reference paper and their respective proposed system.
Excepting the proposed system the literature review of other system has been taken.

1. Oksana Ilyashenko1 , Igor Ilin1, and Dmitry Kurapeev proposed the system" Smart Hospital concept and its implementation capabilities based on the incentive extension" The paper considers the medical concepts that require the support of actual digital technologies, justifies the feasibility of creating the reference model of the Smart Hospital architectural solution. The model building proposes a preliminary description of the relevant requirements and limits. A methodology for creating the incentive extension proposed by M. Lankhorst was used as a method for creating the upper-level requirements and limits for the reference model of the Smart Hospital architectural solution. In the future, it is planned to propose the reference Smart Hospital architectural solution taking into account the identified requirements and limits.

2. M J Jayashree , Aju Sam Sunny, Anu John, Ashley Anna Sunny, Sruthi Susan Sam. proposed the system " Smart Hospital 4SMART HOSPITALS Technology"It provides continuous monitoring of patient and allows automatic data transfer. The system facilitates equitable access to the specialists for all patients regardless of their location. It provides opportunities for patients and relatives to contact their specialist. The system can completely automate the medical emergency conditions happening in an ICU.

3. Lei Yu, Yang Lu, XiaoJuan Zhu " Smart Hospital Based on Internet of Things" In this paper, based on the sufficient analysis of smarthospital's connotation, architecture, key technology and construction, combined with the implementation

about smart hospital project of First Affiliated Hospital of Anhui University of Traditional Chinese Medicine, we propose a concrete application scheme and it changes the existing hospital clinic model, having achieved satisfactory result. Next , based on the perfection and integration of original application system in HIS, with the breakthrough point of embedded mobile electronic medical records application platform, we will have related research on the marking format and data format in embedded mobile electronic medical record, so as to lay the solid foundation for overall implementation and extension of smart hospital. 4. Feng Shi , Jun Wang , Jun Shi , Ziyan Wu, Qian Wang, Zhenyu Tang, Kelei He, Yinghuan Shi, Dinggang Shen " Review of Artificial Intelligence Techniques in Imaging Data Acquisition, Segmentation and Diagnosis for COVID-19 " This paper discusses how AI provides safe, accurate and efficient imaging solutions in COVID-19 applications. The intelligent imaging platforms, clinical diagnosis, and pioneering research are reviewed in detail, which covers the entire pipeline of AI-empowered imaging applications in COVID-19.

III.   OBJECTIVES

The aim of the project is to check and treat the patient by following social distancing and generating the report and prescription automatically.
- Contact less checking of patients
- Prediction of prescription for patient
- To control the increasing number of patient due to COVID-19
- Achievable
- Less time required for report generation
- Relevant.
- Measurable.

IV.   APPLICATIONS

IOT Applications and Applications of this project This is an important sensor based project which has the latest technology implemented in it.

1) IOT Healthcare is the most demanding field in the medical area. This project is for, elderly people in our home. Also for the senior citizen living alone or living with 1 or 2 members. This project really proves helpful when family members need to go out for some emergency work.

2) Disable patients can use this project. Disable patients who find it really difficult to go to doctors on a daily basis or for those patients who need continuous monitoring from the doctor.

3)IOT monitoring proves really helpful when we need to monitor and record and keep track of changes in the health parameters of the patient over a period of time. So with the IOT health Monitoring, we can have the database of this changes in the health parameters, Doctors can take the reference of these changes or the history of the patient while suggesting the treatment or the medicines to the patient.

4)Hospital stays are minimized due to remote patient monitoring

5)Hospital visits for normal routine checkup's are minimized

V.   METHODOLOGY AND WORKING

The aim of the project is to check and treat the patient by following social distancing and generating the report and prescription automatically.
- **Requirement gathering and analysis:** In this step of waterfall we identify what arevarious   requirements are need for our project such are software and hardware required,database, and interfaces
- **System Design:** In this system design phase we design the system which is easily understood for end user i.e. user friendly. We design some UML diagrams and data flow diagram to understand the system flow and system module and sequence of execution.
- **Implementation:** In implementation phase of our project we have implemented various module required of successfully getting expected outcome at the different module levels. With inputs from system design, the system is first developed in small programs called units, which are integrated in the next phase
- **Testing:** The different test cases are performed to test whether the project module are giving expected outcome in assumed time.
- **Deployment of System:** Once the functional and non-functional testing is done, the product is deployed in the customer environment or released into the market.

• **Maintenance:** There are some issues which come up in the client environment. To fix those issues patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment.

Hardware Requirement :

1. **Arduino**

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED.
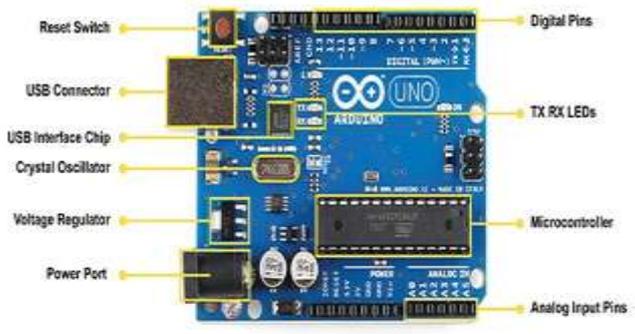
Fig. Arduino Kit

2. **Temperature Sensor**

MLX90614 is a contactless temperature sensor used to measure temperature without touching the object using Infrared Rays. MLX90614 non-contact infrared temperature sensor can measure temperature in the range of -40°C to 380°C. MLX90614 Sensor can measure the temperature of an object which is 2-5 cm for from the sensor.

Fig. Temperature Sensor

3. **Pulse Rate Sensor**

Pulse Sensor is a low cost, very small size a plug-and-play heart rate sensor for Arduino and Arduino compatible boards. Pulse Sensor works with either a 3V or 5V Arduino.

Fig. Pulse Rate Sensor

4. **O2 Sensor**

MAX30100 is an integrated pulse oximeter and heart-rate monitor sensor solution. It's an optical sensor that derives its readings from emitting two wavelengths of light from two LEDs – a red and an infrared one – then measuring the absorbance of pulsing blood through a photodetector

Fig. O2 Sensor

5. **Camera Sensor**

Camera sensor is used to take picture of patients tongue.Which will be later monitored by using machine learning.It will monitor red spots on patients tongue late which will be compared with normal values.

Fig. Camera Sensor

Software Requirement :

1. Arduino IDE

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board. The new major release of the Arduino IDE is faster and even more powerful! In addition to a more modern editor and a more responsive interface it features autocompletion, code navigation, and even a live debugger.It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Fig. Arduino UNO

2. Python 3.9.0

Python is an interpreted high-level general-purpose programming language. Python's design philosophy emphasizes code readability with its notable use of significant indentation. Python is a general-purpose programming language, so it can be used for many things. Python is used for web development, AI, machine learning, operating systems, mobile application development.

Fig. Python 3.9.0

VI.   PROPOSED METHOD

Traditional days peoples directly to the hospital and meet the doctors. But now most of the peoples have no time to consult the doctor and take care of other family members. Communications technology is also one of the important factors that affect the entire people's life. Many devices are available in the market to monitor the patients continuously in home or hospitals. This research article describes about a new patient healthcare monitoring system using GSM and IoT module. The following figure 1 shows the block diagram of proposed system.

Figure 1 Block Diagram of Proposed Healthcare Monitoring System
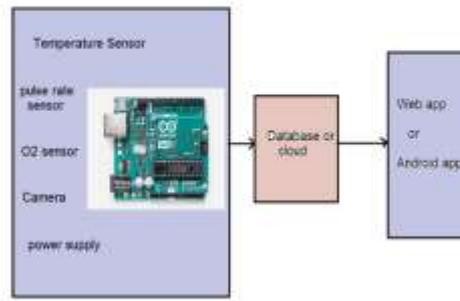
Fig. System Architecture

The proposed system consists of various sensors, GSM module and Arduino UNO. Temperature sensor, ECG sensor and Pressure sensors are used to sense the values from the human body. A GSM module is used to send the message to the doctor or caretakers from the family. Arduino UNO controls the entire function of the device.

GSM Module: It may be a mobile phone device or GSM modem module. It can be used to create the communication between other devices through internet. Each GSM device contains own unique SIM card provided by the service provider. The GSM module used in various applications like send SMS, transfer the data and control devices from remote location.

Temperature sensor: It is the device used to collect the temperature value from the patients and convert the sensed data into the observer understandable form.

O2 Sensor - O2 sensor are used to measure the oxygen level (oxygen saturation) of the blood.

Pulse rate Sensor: An optical heart rate sensor measures pulse waves, which are changes in the volume of a blood vessel that occur when the heart pumps blood. Pulse waves are detected by measuring the change in volume using an optical sensor and green LED.

VII.   DESIGN

In these components are the system process, the data use by the process, an external entity that interacts with the system and the information owns in the system. DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information ow and the transformations that are applied as data moves from input to output.
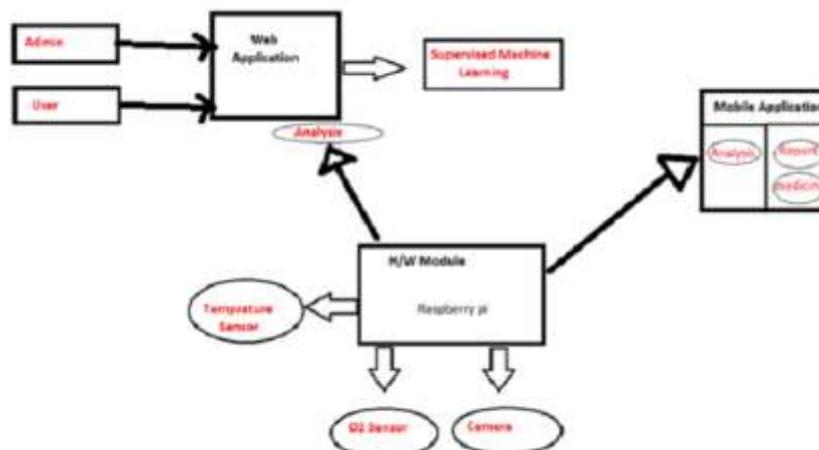

Fig. Data Flow Diagram

VIII.   RESULT AND DISCUSSION

The system introduced Smart Hospital to monitor the basic important signs of patients like pulse rate, body temperature, and oxygen level.Authentic medical staff can view and track the data in real-time even though the patients perform the tests outside of the hosipital,The system can also benefit nurses and doctors on situatios of epidemics or crises as raw medical data can be analyzed in a short time. The developed prototype is very simple to design and use. The system is very useful in the case of infectious disease like a novel coronavirus (COVID-19) treatment. The developed system will improve the current healthcare system that may protect lots of lives from death.

Although the system looks somewhat bulky, it will be a tiny device by proper manufacturing in the near future. The video feature can be added for face to face consultation between the doctors and patients. Some more measures which are very significant to determine a patient's condition like the level of diabetes, respiration monitoring, etc. can be addressed as future work.

IX.   LIMITATIONS OF THE SYSTEM AND THEIR POSSIBLE SOLUTIONS

1.   Servicing and Maintenance Cost

Of late, there are rapid technological advancements that would require continuous upgradation of the HIoT-based devices from time to time. Every IoT-based system involves a large number of connected medical devices and sensors. This involves high maintenance, servicing, and upgradation costs that may impact the financials of not only the company but also the end-users. Hence, the inclusion of sensors that can be operated with a lower maintenance cost is required.

2. Power Consumption

Most of the IoT devices run on battery. Once a sensor is put on, the replacement of the battery is not easy. Hence, a high-power battery was used to power such a system. However, currently, researchers worldwide are trying to design healthcare devices that can generate power for themselves.

3. Identification

Healthcare professionals deal with multiple patients and caregivers at the same time. Similarly, when a patient deals with multiple health issues, he interacts with multiple doctors. Thus, it is crucial to exchange the identity of the patient, caregiver, and doctors among each other during a single treatment process to avoid confusion and maintain the smooth functioning of the healthcare system.

4. Continuous Monitoring

Many healthcare situations demand long-term monitoring of the patient during treatment as in the case of chronic diseases, heart diseases, etc. In such situations, the IoT device must be able to perform real-time monitoring efficiently.

X.   FUTURE ENHANCEMENTS

We can add a GPS module in IOT patient monitoring using the Arduino Uno and the WiFi module project. This GPS module will find out the position or the location of the patient using the longitude and latitude received. Then it will send this location to the cloud that is the IOT using the Wi-Fi module. Then doctors can find out the position of the patient in case they have to take some preventive action.

XI.   CONCLUSIONS

The pandemic of coronavirus disease 2019 (COVID-19) is spreading all over the world,hence persons health status becomes one of the top priorities.Using the proposed system, we will be able to monitor the patients health status remotely without physical contact with ones. The proposed SMART(Simple Medical Advisory Report through IoT)Hospital helps to

overcomes the drawbacks of the social distancing issues. The paper has shown that a sensor can help us in may ways. We can generate report ad prescription by collecting the data through the sensor. It gives the report fast and is helpful in many ways.

XII.   ACKNOWLEDGMENT

X.   REFERENCES

[1] Federal State Statistics Service [online] Available at: www.gks.ru/freedoc/2017/demo/t33.xls(2018).

[2] Lai Khin Wee, Yeo KeeJiar, EkoSupriyanto "Electrocardiogram Data Capturing System and   Computerized Digitization using Image Processing Techniques" International Journal of Biology and Biomedical Engineering Issue 3, Volume 3, 2009 .

[3] Yu Lei, Lu Yang, Zhu XiaoLing etc., Research advances on the technology of internet of things in medical domain [J], Applications and Research of Computer, 2012, 29 (1) , pp. 1-7