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Design and Implementation of an Improved Patient Management System in COVID-19 using IoT

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ABSTRACT: Coronavirus has spread rapidly, and many countries have been affected by this pandemic. While some countries are recovering, other countries are still in lockdown, and some are suffering from the second wave of coronavirus. We can curb the spread of coronavirus by taking these two crucial factors into account. Practice social distancing and to prevent touching a contaminated surface and then our eyes, nose or mouth. One such main area where people are not following such is at hospital areas. This project introduces an innovative way of practising social distancing with an automatic door control system that avoids overcrowding and a secure database to keep the information of the existing customers. Here people are supposed to stand in the appropriate positions at least 1 metre away from each other. An LED module can be used to indicate the vacancy in the queue. An alarm system could also be added to this project to set off an alarm when social distancing is observed. Before entering the queue or the premises, the people must be encouraged to wash hands or use hand sanitisers, and thermal sensors. With the help of ultrasonic sensor along with servo motor the door opens automatically which serves the purpose of avoiding unnecessary touches of the door handle's surface or the door to enter the building.

KEYWORDS: Queuing Management Systems; Ultrasonic sensor, IR sensors. PHP and server computing

I. INTRODUCTION

In this pandemic situation, the living has been uneasy with a virus worldwide, and the chance of getting infected is much high. The origin of this virus is from the city of WUHAN in China. Rapidly this has spread all over the world, and the death rate is very high. Even though scientists worldwide are in search of finding a cure for this virus, the wild spread of the virus causing an increase in Death Toll. The critical factors for the spreading of the virus are transmitted via surface and air. For an immediate solution, respective nations imposed a lockdown for a particular period to reduce the maximum spread of the virus. Even after such efforts, the virus was rapidly spreading, and the death rate was high. Awareness among the people was also put into work so that self-care would stop the virus spread. The incubation period of this virus is, on average, 5-6 days, but it could also be up to 2 weeks. During this period, the person may not experience any symptoms but could still be contagious. The person will be a virus carrier and quickly spread it when he/ she does not take any precautionary measures.

After some time the lockdown was lifted as the economy of the countries were at a downfall. Now again, the social distancing and self-care for the prevention of the virus were reduced. Nowadays, people are not bothering about such precautions and carrying on. As things are back to normal but the virus is not; hence we should keep that in mind and continue to do the things we used to do but with precautions. Even though we impose any such restrictions, people tend to forget and break such limits. We can notice such incidents where the social distancing norms are violated. One such place where such norms are mandatory but still not followed is at the hospital. As the appointment and reception centre takes time and people usually don't have such patience.

Our proposed method provides a simple yet effective way to follow social distancing is by implementing a smart monitoring system using IOT. An Arduino UNO board is used as a central unit to control queue automation, and an

automatic door along with a Raspberry pi board to store and retrieve the customer's data for the appointment and medical record. We have introduced an innovative way of practising social distancing with an automatic door control system in this project. People are supposed to stand in the appropriate positions at least 1 metre away from each other. This distance can be changed according to your preferences, but it has to be more than 1 metre.

If the person does not stand in the proper place, the person will be notified, and he/she can follow social distancing properly. With the help of an LED module, we have indicated the vacancy inside the queue and the occupied slots. If a place is not occupied, that GREEN light blinks and a RED light if there is no vacancy. An alarm system is added to this project to set off an alarm when the appropriate slot is not occupied, and the person could then occupy the place. In such a way, the overcrowding can be reduced. If any existing patient has an appointment with the doctor, he can directly proceed to the waiting room by checking the token details displayed. As each patient is provided with a unique patient ID by the hospital, simple details are stored in the cloud. The data can be used for appropriate appointment details. This way maximum overcrowding is eliminated and a hassle-free check-up with doctors is carried out.

II. BACKGROUND

Most of the places where people accumulate more are shopping malls, cinema theatres and hospitals. These places generally use a token/ ticket issuing system which is done either by hand or by token vending machine. Both the way people get too close to each other. In such areas maintaining social distancing is not at all remembered as their attention is more towards the tokens/tickets rather than the social distancing.

III. METHODOLOGY

The methodology shows a systematic way to do work. It is the standard process of describing the process, how it is done in the simplest manner. The design consists of the application of scientific principles, technical information, and imagination for the implementation of an improved patient management system during the covid crisis.

IV. PROPOSED SYSTEM

The proposed system targets reduction of extended waiting time that clients of service are subjected to daily. In the proposed system depicted, the client approaches the registration unit on the premises of the service outlet. The unit registers the patient details to their web services and issues token based on their appointments. Before making it to the registration desk all the doors can be the main source of the spread of the virus which is why the automatic doors are used based on an ultrasonic sensor. The door opens only when the queue is empty which can be indicated by the help of LED's and this is known by the help of Infrared technology. After successful completion of doctor's appointments, the prescribed medicines are issued at the pharmacy without any paper used to promote e-paper and save the environment.

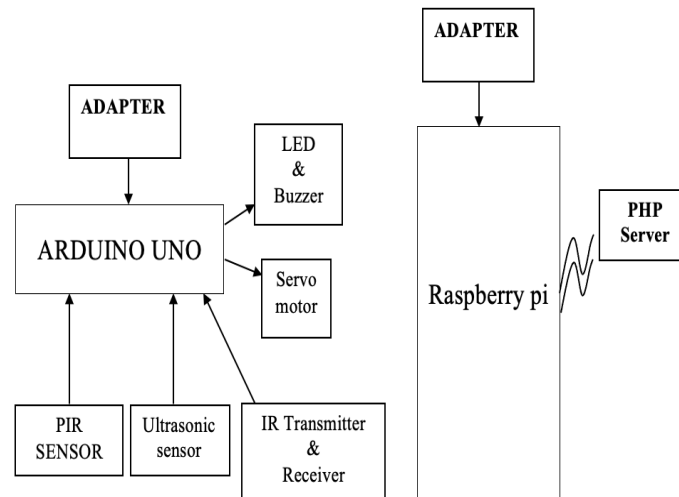


Figure 1:- Block Diagram For Smart Queue management system.

A. Implementation flow:

Stage 1:

Considering the problems of existing methods and giving a solution to that problem by considering the basic requirements for our proposed system.

Stage 2:

The proposed system has the following components :

1. Microcontroller
2. Inputs for the proposed system (ex: sensors, drivers etc..)
3. Outputs (ex: Buzzer, LED, Speaker)

Stage 3:

Based on the microcontroller we select the software for coding, compiling, debugging. After completing all the requirements of software and hardware we need to bring both together to work our system. For this, we need to burn our source code into the microcontroller, after burning our source code to the microcontroller then connect all input and output modules as per the requirement.

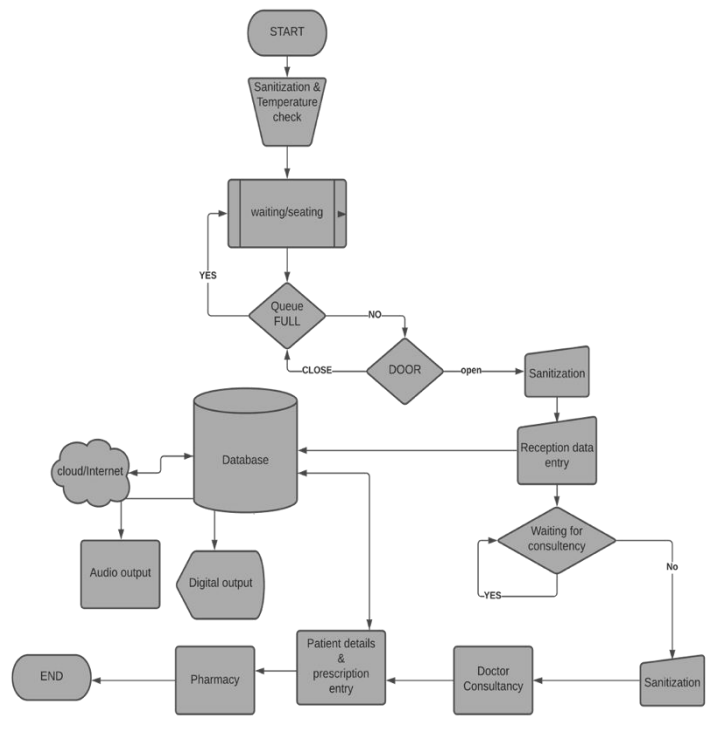


Figure 2:- Proposed system workflow.

B. Queue processing and filling

For the queue filling, we have used the IR Transmitter and receiver for the proper management of the queue. If the particular slot not occupied in front of the registration desk the LED will turn GREEN indicating vacancy and need to be filled. This will activate the ultrasonic sensor which will allow automatic opening of doors with the help of a motor as the sensor value pick the radius. A buzzer alarm is enabled for alerting to maintain the social distancing. If the slots are all occupied then the LED turns RED.

C. Registration and Appointment booking.

At the registration front, the patient details are taken and entered into the system which stores the information in the servers. This information is registered with a unique client ID for each new entry so that they can access



the data easily for the next time. The desired booking of an appointment can be done in two ways; either by online web portal anywhere or at the registration desk. The appointment booking is at an ease of access.

D. Token generation.

The token is generated automatically by the system based on the appointment booked. The fixed time slots have been used as the base to generate the tokens for the consultation. If the client booked via online mode and failed to report on time the scheduled tokens move ahead for one slot, this way the unaccounted time can be utilised properly and when the client report at other’s time he/she would be given preference at the next slot for consultation.

E. Prescription and Pharmacy

After successful Consultation with the doctor, the patient’s would be prescribed for. Medicines which would be via online mode (i.e.; E-Paper), and by telling the Id at the counter of pharmacy can collect the dispensed medicine. This prescription is always available at the user dashboard in the web portal.

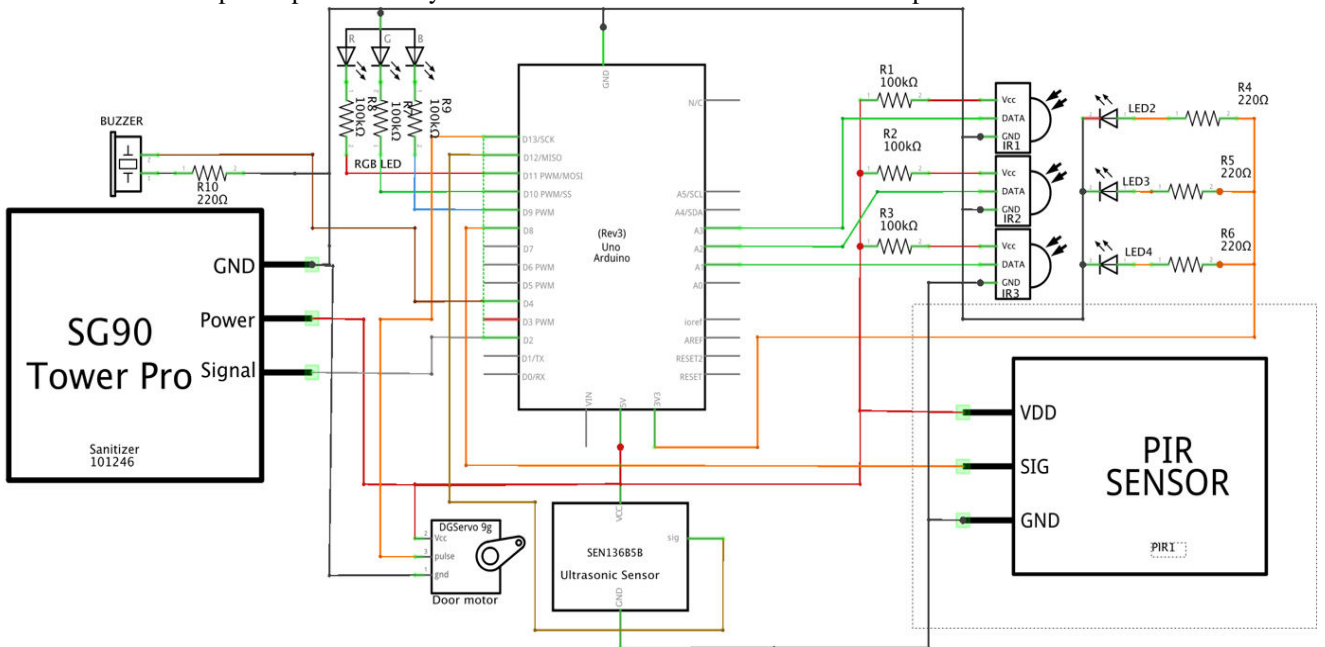


Figure 3:- Proposed slave schematic and realization.

V. RESULT:

All the sensors are connected to the Arduino Uno board, Raspberry pi setup is used for storing the data. The IR receiver maps the slots every time, if any slot is empty will indicate Vacancy. The ultrasonic sensor operates if there is any vacancy in the slot, it detects motion allowing the motor to rotate at the programmed time. An LED blinking RED indicating all slots occupied, GREEN indicating slots are empty. A buzzer is provided if the social distance is not observed properly. The data entered at the reception is updated to the PHP server. The PHP server archives all the client data for future references and processing. And finally, the consultation of the doctor is completed.

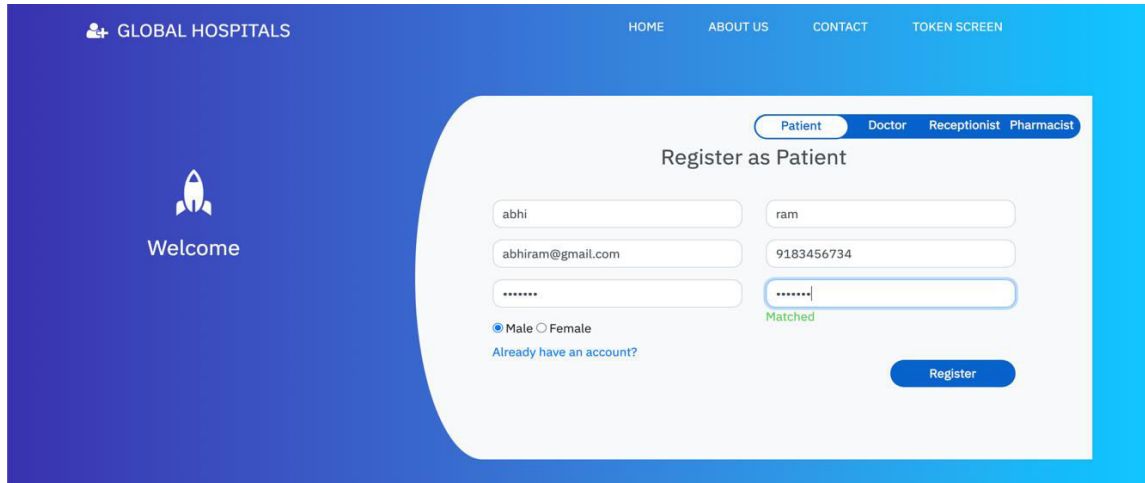


Figure 4:- Client registration portal.

Thus, the result of our prototype is everyone shows interest in Pre-booking their appointment instead of long waiting periods. We have been implemented the Web application for quick access anywhere. In this system, the information of clients can be accessed by the user/authorities from anywhere by using PHP SERVER. Our model

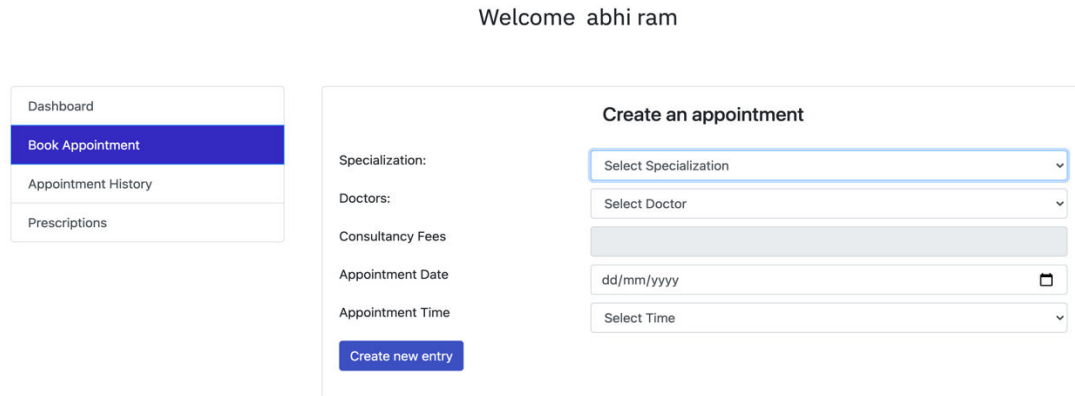


Figure 5:- Client portal for appointment booking

designed with low cost, high accuracy sensors, cloud database to get the data with high accuracy and we used raspberry pi to give the constant internet connection to the system to update the data in cloud database and PHP Server will give the details of clients from a cloud database.

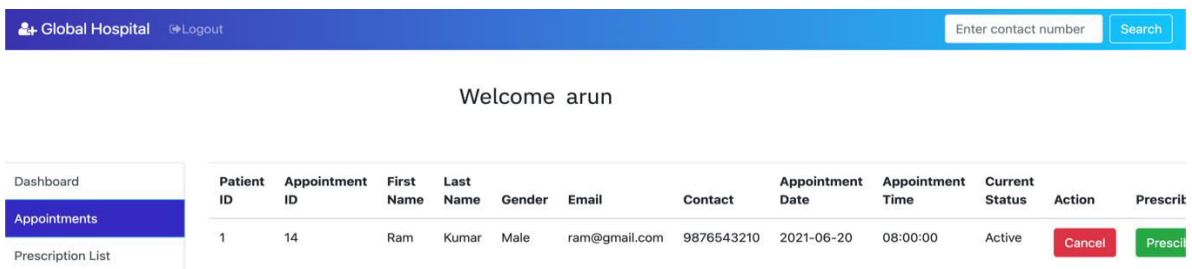


Figure 6:- doctor dashboard

Doctor	Patient ID	Appointment ID	First Name	Last Name	Appointment Date	Appointment Time	Disease	Allergy	Prescription
Dinesh	4	11	Kishan	Lal	2020-03-27	15:00:00	Cough	Nothing	Just take a teaspoon of Benadryl every night
Ganesh	2	8	Alia	Bhatt	2020-03-21	10:00:00	Severe Fever	Nothing	Take bed rest
Kumar	9	12	William	Blake	2020-03-26	12:00:00	Sever fever	nothing	Paracetamol -> 1 every morning and night
Tiwary	9	13	William	Blake	2020-03-26	14:00:00	Cough	Skin dryness	Intake fruits with more water content

Figure 7:- Prescription at pharmacy view.

VI. CONCLUSION

With this real-time patient management system, the information of clients can be accessed only by users/authorities from anywhere by using PHP SERVER. When the scheduled appointment is booked, the client is given 10 minutes as buffer time to manage his appointment and details of such will be sent to the authorities via message and this system as a result this will reduce others waiting periods. Our model designed with low cost, high accuracy sensors, a cloud database to get the data with high accuracy and we used raspberry pi hear to give the constant internet connection to the system to update the data in the cloud database and PHP Server will give the details of clients from a cloud database. And Everyone shows the interest to manage their appointment for an easy transition and hassle-free consultation.

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