“We Care”: An IOT enabled tracking system for COVID affected patients

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Abstract. In this crisis of deadly worldwide pandemic of COVID – 19, thousands of people are getting admitted in the hospitals, with the hope of getting cured. In this point of time, doctors, nurses, and the other medical staff have a lot to pressure and stress to deal with such a large number of patients. Once admitted, family members of the patients don’t get regular updates about the patient. After considering all these problems, we have proposed an idea entitled, “WeCare”, which can suitably be a solution to mitigate such problems. This will be basically, a tracker worn by a patient once admitted in the hospital. This tracker has sensors to sense various vital body parameters such as body temperature, heart rate, pulse rate and most importantly, the oxygen level in the body of the patient. The entire information is stored in the database of the hospital. Trained machines will be there to give an alert when the condition of the patient deteriorates, and immediately help will be arranged. Adequate provisions and arrangements are also made which will help the family members of the patients to keep a track of the health of the patient through a mobile app.

1. Introduction

By and by the numbers of COVID cases are progressing at a sharper rate and the doctors, medical staffs are doing commendable job to treat the COVID patients by keeping their life at stake. But, there are many questions arising regarding the security and care about the COVID patients as they are not allowed to meet their family members. The family members do not get proper information about their admitted patients and always stays in a dilemma considering their health. We have come up with a solution which will address these problems.

This paper mainly focuses on making a wearable monitoring device which will be worn by each and every patient’s and will have different parameters embedded on it to keep a check on the patient’s health condition. Along with this there will be a mobile-based app in which the real time health status of patients will be updated through which his or her family member can keep a track of their health condition.

2. Literature review

SMART IOT DEVICE FOR CHILD SAFETY AND TRACKING: This paper deals with proposal of system or device which will track children’s activity and will update constantly with the help of internet of things (IOT). IoT devices are smart and advanced devices, which are able to take decisions by sensing the environment surrounding the device. IOT connects billions of devices together with the help of internet connections and it has the ability to transfer large number of data over a network.
without requiring human-to-human or human-to-computer interaction. IOT is an emerging field now and it is gaining a lot of popularity also. The proposed system has the facility of camera, GPS system, hear beat sensor and touch sensor which can monitor and track their children’s activity and they can keep a record of them.

3. Proposed idea
In this situation of worldwide pandemic, when the number of active corona cases are surging, there is a huge number of patients being admitted in the hospitals and nursing homes everyday. It is becoming almost a very tedious task for the doctors, nurses, and other medical staff to attend such a huge number of patients at a same time. Moreover, the family members of the patients don’t even get proper information about the patient’s health periodically, and are left in the dark.

This device will be capable of addressing these issues and resolve them to the maximum level. This device will be monitoring each and every patient’s health throughout the day. The entire data will be fed in a server, which will be visible from the control room. Usually patients are dying, when affected by corona, owing to the less amount of oxygen supply in the body.

This device will be having facilities that of a pulse oximeter which will continuously detect the oxygen level of a patient. If the oxygen level drops when compared to a preset threshold value, an alert will be generated indicating that the condition of the patient is critical. Therefore, immediately medical team can look after the patient. Specially trained machines will be installed in the server room, which will be doing the job of alert detection. This will ensure no patient is left unattended and immediate help and support can be provided to those who actually need them.

An app will be available, in which the patient’s name will be registered once he/she is admitted in the hospital or nursing home. The app will give the real time health status of the patient. If the patient’s oxygen level is in the critical level, an automatic alert message will be generated and sent to one of the family members of the patient. And they can contact the hospital authorities for further clarifications.

4. Hardware requirements

4.1. Arduino UNO microcontroller
Arduino UNO is a type of microcontroller board. It is based on ATmega328P. It contains 14 digital input/output pins. It is an open-source electronics platform button.

4.2. Oximeter
A pulse oximeter is a tiny device that fits over the fingertips or clips on ear lobe. It is used to measure the oxygen level of the body, using infrared refraction.
4.3. Heart Rate Sensor
An optical heart rate sensor measures pulse waves. It is the change in volume of blood when the heart pumps blood.

4.4. Switch
It connects two points in a circuit when it is pressed. An Arduino UNO switch connects 3 wires to the micro controller board.

5. Methodology
In present scenario, where it has become a tedious task for the doctors and other medical staffs to attend to all the patients at a particular time, there are several instances, where a patient needing actual intense care, is not taken care of. Thus, this device will help to resolve this problem.

Once a patient is being admitted to a hospital or a nursing home, he/she will be given a device, in which the name of the patient and the doctor in-charge will be registered along with the mobile number of a family member. The patient will wear the device, and it will give real time updates regarding the health of the patient. Each device will have an exclusive registration number logged in the database of the hospital or nursing home.

Thus, in the database, along side of a device number, the details of the patient will be updated which include the patient’s name, his or her bed number, and the name of the doctor in-charge. From this database, the health of a patient can be continuously monitored. Vital body parameters, such as the pulse rate, oxygen level in the body of the can be monitored.
There will be control room, where all the information can be seen on a screen. If the oxygen level of a patient drops below the predefined threshold value, then immediately a buzzer in the control room will buzz to draw the attentions of the staff. And a red light will glow, and in the screen the patient’s name, his/her bed number, oxygen level in the body and other vital body parameters will be visible, and immediately, that particular patient will be taken care of.

It so happens that the family members of the patients are kept in the dark, and they do not get real time updates and correct updates, regarding the health of the patient. So to solve this problem, a mobile app will be available. In this app, if the patient’s name is fed, then will give real time updates regarding the health of the patient after looking into the database. As soon as one will open the app, there will be a green dot, implying that the health of the patient is good. In addition, the oxygen content in the body of the patient along with pulse rate will be visible.
When an alert is generated in a hospital/nursing home regarding the health of a patient, another alert notification will be generated and sent to the registered mobile number of the family member of that particular patient, and also a notification will be sent through the app displaying – “Patient is being taken care of. Do not worry, WeCare.” At that point of time, if someone opens the app, a yellow dot will be displayed, implying the patient’s condition is not good. And the family members can contact the hospital or nursing home. If a patient expires, then a red dot will be visible. Hence, the hospitals and nursing homes will not be able to fake the process of treatment and increase the bills for their business.

After each patient is released, the device will be reset and again when another patient takes admission his/her data will be registered for that particular device. There will be specially trained machines, which will detect the anomalies and will give regular updates, based on the data. Therefore, faster response from the medical team can be assured.

6. Methodology
The IoT enabled tracker will be highly beneficial for the patients, doctors, medical staffs and also the family members of the patients. Through this device, a good care of the admitted patients can be assured. Continuous health monitoring will be done, so as to reduce the chances of death caused by the virus attack or any other internal problems. A proper treatment can save life of many; taking this as the main concern, a quality treatment will be provided to all the patients.

The patients who are undergoing treatment will wear this device. A machine will be trained with some threshold values of the body parameters, like, pulse rate, blood pressure, oxygen level of a normal human being. Thus, in case of any variation of these values indicate an abnormality in the patient’s body. Immediate support from doctors will be arranged and the health status in the mobile app will also be updated accordingly, to notify the family, this mobile app is of great importance, since it simultaneously reflects the health status of the patient and creates a virtual link between the patients, doctors and the family members, thereby keeping them updated.

Figure 8. Working principle of the system
We have performed a simulation, where we connected an Arduino UNO microcontroller with oximeter, pulse monitor and heart rate sensor to measure the oxygen level, pulse rate and heart rate of the admitted patients respectively. In the virtual monitor we get the output where the location of the patient, the vital body parameters is shown. And, as soon as the heart rate decreases below the normal range, an alert is generated which will notify the medical staffs that the patient needs immediate support.

7. Conclusion

The IoT enabled location tracker for Covid affected patients will be of great help for the society. It can not only track the patients’ bed number or location but also assures to deliver quick medical help in case of emergency. A threshold value for oxygen level, pulse rate and heart rate are already provided to the machine. As soon as these parameters see a visible change from the threshold values, the machine will start computing that the patient needs treatment, and without any delay the medical staff can take due care. Thus, this helps in proper monitoring of the patients, without any hustle and ensures that each patient gets the optimum care needed. The device can be implemented not only to Covid affected patients, but also to all the patients whoever takes admission in hospital with any difficulty. With this device, the maintenance and providing services will become an ease.

Here, the main aim is to reduce the rate of deaths which often occurs due to not attending the patient in prior time. Thus, a timely treatment can reduce such threats. In near future, this tracker can also be given a shape to take appointments from the doctors in prior time, which often takes a longer duration to confirm an appointment at times of need. This will help each segment of the society and it is very much user-friendly. So it can be used by all and can find an extensive use in the medical industry in near future.

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Figure 9. Expected result as obtained from simulation (normal body parameters are monitored)

Figure 10. Expected result as obtained from simulation (an alert message is generated)
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