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Article

A Study on Smart ICU

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A B S T R A C T

Intensive care Unit or ICU is where the patients who are critically ill are admitted for treatment. For such critical conditions the Doctors need to have an all- time update patient's health related parameters like their blood pressure, heart pulse and temperature, feet detection, oxygen level. To do manually, this is too tedious a task and also for multiple patients it becomes close to impossible. Intended for this type of conditions this IoT based system can convey about an automation that can preserve the doctors reorganized all time over internet. IoT based ICU patient Monitoring System is IoT based system which collect patient's information to the internet. There is admin can add ICU supervisor and doctor. The ICU supervisor can add patient and assign kit and specific doctor for patient and stay update of that patient. The ICU supervisor can only view the current sensor value of patient who admitted in ICU. The Doctor can view patient with their profile and all medical history. Sensor can sense and get statistics graph according to age group and disease wise which is show by doctor. According to statistics graph the doctor can predict the health of patient based on sensor value and history. Doctor can view the current value of sensor valve and doctor can also get auto MSG on patient health seriousness (threshold). Thus, the doctor can get access from anywhere over the world. In this way IoT Based ICU Patient Monitoring System is improved system that supports in monitoring ICU Patients deprived of any physical intervention.

Keywords: Smart Health System, Internet of Things (IoT), Medical Sensor Networks, Patient monitoring in Intensive Care Unit (ICU)

Introduction

Information and Communication Technologies solutions for modern healthcare systems unceasingly produce universal. New years have seen an increasing attention in wearable sensors and currently several devices are commercially accessible for personal healthcare, fitness, and commotion cognizance. In addition to current smart medical devices, researchers have also measured presentations of such know-hows in clinical applications is remote health monitoring systems for long term soundtrack, management and clinical access to patients physiological information. Constructed on current technical trends, one be able to eagerly visualize a time in the close upcoming when your routine physical examination is preceded by a two- three day historical of incessant physiological monitoring using inexpensive wearable sensors. The work industrialized in this paper focuses on the study and the development of an intelligent patient monitoring system in medical environment. Indeed, one of the specialized sections of a hospital that are Intensive Care Unit (ICU) are of great importance because of the seriousness of the health status of patients staying and consequently essential distinct attention. Due to the severity of patients treated in intensive care Units, these units are frequently prepared by variety

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medical- equipment that is handled a multidisciplinary medical team in order to monitor ICU's patients in real time. In addition, we find, nursing staff, the monitoring and life support devices necessary to provide continuous care to patients that are severely ill and medically unstable. The later receive special care and are monitored in real time by the medical team through a breathing assistance system and the decision-making support that is, for instance the ECG. To help the patient to stay alive, a partial or total ventilator support that is obligatory reliant on on the severity of the condition in which the patient is located. It appears of course that, the respiratory support justifies a significant monitoring system in IICUs that is very particular and intricate. Faced with these requirements, the limits of the performance of these systems are obvious. The shortcomings of the current patients monitoring system in ICU are well recognized. They were the subject of a thorough study well supplied in the state of the art. In the middle of many boundaries, we have a very alarmist monitoring system with a significant rate of false alarms that hinder the tranquility of the patient. In order to attempt answer those identified issues, a review will be performed on the prominence of smart and connected health care using internet of things. This review will be carried out in order to identify the causes of the inefficiency of health care in ICU to propose appropriate solutions for improving the ability of a better decision making, which should result in a better overall treatment. We designed an intelligent and ubiquitous system for the patient monitoring in ICUs. This system called ADSA (Automatic Detection of risk Situations and alert) is based on IoT- architecture including cooperating medical sensors network. The main contribution of this work is the application of a novel uniting architecture of several wireless technologies. In addition, we have set up a decision support tool to store and interpret the data collected. A physical organization as well as the logical architecture is proposed for the novel patient monitoring system.

Purpose: The determination of this system is too current a novel NFV enabled IoT architecture targeted for a state- of – the art operating room situation. Network virtualization (NFV) make obtainable the scale and suppleness the scale and flexibility necessary for IoT repaired by permitting the mechanical control, organization and instrumentation of network resources.

Features: Intelligence, connectivity, Dynamic nature, Enormous scale, sensing and security.

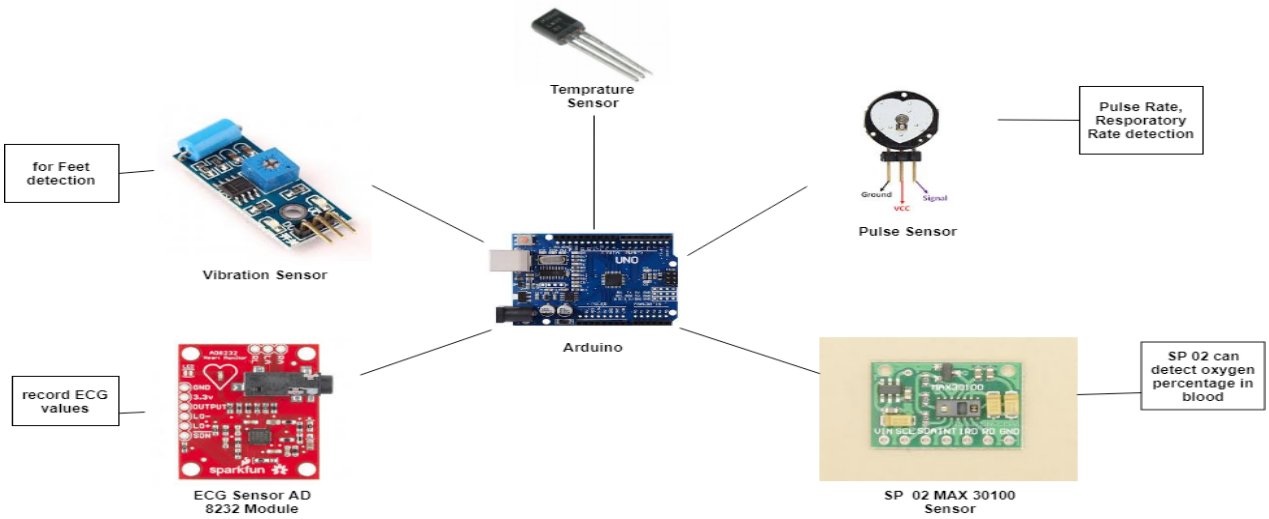
Literature Survey: Furthermost studies on the ICU have focused on clinical and financial outcomes. Numerous studies have reported that employment of an ICU telemedicine program can progress clinical care outcomes (e.g., reduced length of stay, reduced mortality, reduced complications) and decrease healthcare costs. Though, other studies have failed to confirm some of these positive outcomes.

The study by Anders and colleagues focuses on the functions of the ICU. The researchers performed hours of observation of eight ICU nurses and one ICU physician in one ICU. Consequence showed that the ICU fulfills three functions: (1) anomaly response: ICU nurses processed information related to alters and alarms and contacted other staff in the ICU or the ICU if they perceived the need for follow-up or action; (2) access to specialized expertise: experienced ICU nurses were perceived to mentor junior ICU nurses; ICU nurses had access to expertise and experience of the ICU nurses thus supplementing their information base; and (3) sense- making: ICU nurses can make sense of what is happening with patients because they have access to many sources of data and have the resources (time, expertise) to synthesize the data. Research on ICUs is limited; in particular nursing issues related to ICU have been overlooked.

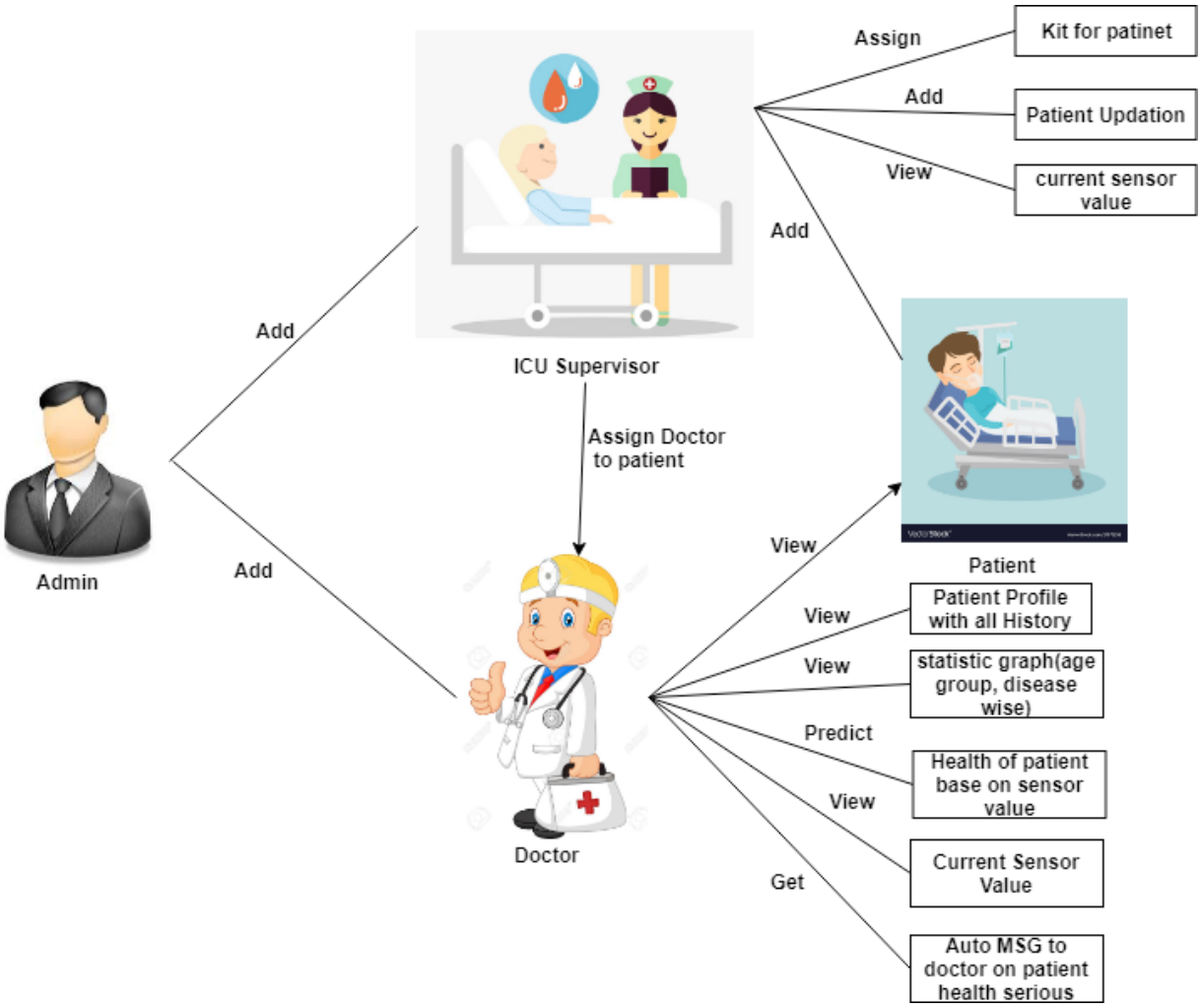
Objective and Scope: The health monitoring sensors are used to collect health related data i.e. for sensor value data acquisition. Communication can be done by controller for sending data on internet wirelessly. Data processing has been done at server. All data collected and aggregated at server point. To get ICU patient health related information in sensor value format it can be shown on MSG i.e. data management. The results collected from sensor are analyzed i.e. if abnormal behavior has been detected, then emergency plan activated to inform the Doctor about ICU patient's health. So it reduces critical conditions in Hospital.

The objective of this project is to monitor and improve the quality of care of people in remote location and to provide continuous information about the patient for making better healthcare decisions in critical situation and to reduce the emergency checkup of the ICU`s patients. It helps the doctor to monitor their patients at any time apart from their consulting hours. It improves patients care and safety by reduction in overall costs for care.

Block Diagram



System Architecture



In this paper connotation of smart ICU system is analyzed. And based on the introduction of existing system architectures of IoT, combined with the features of hospital ICU scene, the system architecture self-possessed of sensing, network layer and submission layer in smart ICU is also deliberated in detail. Then, from the features of gathering of information stipulations and standards, building of the united network platform and embedded mobile electronic ICU patient records presentation platform, the key skill and gratified in the construction of smart ICU is sufficiently studied. Application scheme of smart ICU is given, providing meaningful reference forth over all implementation and extension.

In this planned system;

Admin

In the proposed system admin can add ICU supervisor and add doctor for patient treatment.

ICU Supervisor

The supervisor can Add the patient in ICU section and assign a kit and specific doctor for him to give proper attention and treatment of ICU patient. Supervisor can do any update of patient record who already added by him in ICU section and get treatment from assigned doctor from supervisor. There are various sensors are built in ICU section, that sensor can change their value according to the ICU section and patient condition. That all record of patient with current records are viewed and monitored by the ICU supervisor.

Doctor

ICU supervisor can assign doctor for a patient who admitted in ICU section. That doctor can view patient with their profile and all previous medical history. According the patient age group and disease wise statistic graph will be created that is viewed by doctor. Doctor also can predict the health of patient based on the updated sensor value and current value. This current sensor values also viewed by both ICU supervisor and patients assigned doctor. If assigned doctor is not near to patient then also he continuously watch on ICU patient health according to the sensor value. Doctor can get auto MSG if patient health get serious or patients critical condition.

System Necessity

Hardware

- Arduino
- Temperature Sensor
- Vibration Sensor
- Pulse Sensor
- SP02 MAX 30100 Sensor
- ECG Sensor AD 8232 module

Software

Technology: Java

Domain: IoT, Machine Learning

Front End: HTML, CSS

Back End: MYSQL

Technology Necessity

Internet of Things (IoT) Enable humans to get higher level of automate by emerging system using sensors, interrelated devices and Internet. In ICU, patient monitoring is critical and most imperative activity, as small delay in decision related to patient's treatment may cause permanent disability or even death. Furthermost of ICU devices are prepared with numerous sensors to measure health parameters, but to monitor it all the time is still stimulating job. We are suggesting IoT based system, which can assistance to fast communication and classifying emergency and recruit communication with healthcare doctor and also helps to initiate proactive and quick treatment. This health care system reduces possibility of human errors, delay in communication and helps doctor to spare more time in decision with accurate observations.

Advantage

The proposed system for improving medial service in intensive care units is a new and original idea that plugs into the current growing need world with increasingly intelligent systems. The role of wireless technology in healthcare applications is expected to become more important with an increase in deployment of mobile devices and wireless networks. This new technology has potential to provide many ad-vantages to patients, medical staff, and societies at large through continues monitoring of various physiological vital signs and provide real- time feedback to the user and the medical staff. Smart ICU can enhance care in many directions:

- Facilitate an evolution in the practice of intensive medicine to proactive framework for prognosis of diseases at an incipient stage, coupled with prevention, cure, and overall management of health instead of critical condition in ICU.
- Enable personalization of treatment and management options targeted predominantly to the specific environments and wants of the separate
- Help reduce the cost of health care while simultaneously improving outcomes and improve significantly the monitoring system in ICU.

Disadvantage

The only difficulty is that the sensors should not fail when there is an opposing condition.

So there must be a system incorporated which will detect sensor failure.

Conclusion

In this paper, we highlight the opportunities and challenges for IoT in realizing this vision of the future of health care. Indeed, the intensive care unit is a great example whose need for smart system becoming inevitable. In this paper, we succinctly reviewed the current state and projected future directions for integration of intelligent remote health monitoring in patient admitted in ICU technologies into the clinical practice of medicine. In this sense, we proposed a smart and pervasive ICU using an architecture based on wireless sensor Based – IoT for educating Intensive medical Care. This hybrid architecture of wireless technology has the advantage of uniting in a platform for converged data transmission services for the efficient transport of medical data. Noted that there are several benefits of smart process Applications can have for patient monitoring in ICU like:

- Smart functions provide accurate, transparent data processes.
- Smart functions, collect, process and consolidate information and analyses, simplifying records and reporting processes and integrating all decision- making processes.
- Smart functions help optimizing patient monitoring system in ICU, thereby increasing medical care quality and reducing costs.

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