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An IoT-Aware Architecture for Smart Healthcare Systems

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ABSTRACT

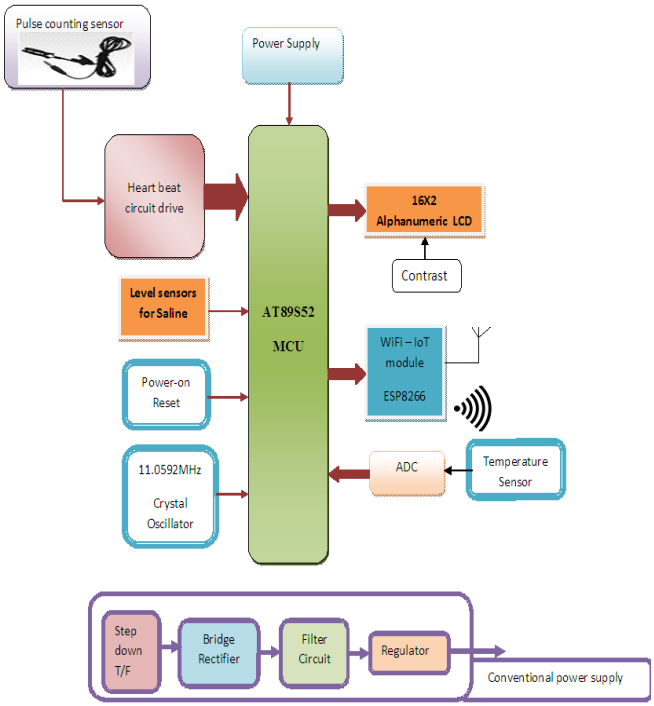
This project describes the design of a simple, low-cost controller based patient health monitoring system. Heart rate of the subject is measured from the thumb finger using IRD (Infra Red Device sensors).This instrument employs a simple Opto electronic sensor, conveniently strapped on the finger, to give continuous indication of the pulse digits. The Pulse monitor works both on battery or mains supply.

It is ideal for continuous monitoring in operation theatres, I.C. units, biomedical/human engineering studies and sports medicine. Here level sensors are also used to detect the saline level. This project uses AT89S52 MCU as its controller. By reading all the values of temperature and heart rate will be displayed on LCD.

Temperature and heart beat values will be taken and updated in the web server about the condition of the patient using IoT module interfaced to the controller.

This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

Block Diagram



Improving the efficiency of healthcare infrastructures and biomedical systems is one of the most challenging goals of modern day society. In fact, the need of delivering quality care to patients while reducing the healthcare costs and, at the same time, tackling the nursing staff shortage problem is a primary issue. As highlighted in [1], in fact, current procedures for patient monitoring, care, management, and supervision

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are often manually executed by nursing staff. This represents, de facto, an efficiency bottleneck, which could be a cause of even tragic errors in practices. Recent advances in the design of Internet-of-Things (IoT) technologies are spurring the development of smart systems to support and improve healthcare-and biomedical-related processes [2]. Automatic identification and tracking of people and biomedical devices in hospitals, correct drug–patient associations, real-time monitoring of patients' physiological parameters for early detection of clinical deterioration are only a few of the possible examples.

Among others, ultra -high-frequency (UHF) radio frequency identification (RFID), wireless sensor network (WSN), and smart mobile represent three of the most promising technologies enabling the implementation of smart healthcare systems. RFID is a low-cost, low-power technology consisting of passive and/or battery-assisted passive (BAP) devices, named tags, which are able to transmit data when powered by the electromagnetic field generated by an interrogator, named reader. Since passive RFID tags do not need a source of energy to operate, their lifetime can be measured in decades, thus making the RFID technology well suited in a variety of application scenarios, including the healthcare one [3]–[5]. The recent availability of UHF RFID tags with increased capabilities, e.g., sensing and computation [6]–[8], represents a further added value

II. RELATED WORK

Recent advances in micro electro mechanical systems (MEMS) have opened up great opportunities for the implementation of smart environments. Especially in the medical field, several sensors to evaluate different types of vital signs (i.e. ,heartbeat, body pressure and temperature, ECG, and motion) have been developed, thus enabling the design of innovative services able to substantially improve citizens' healthcare. In this field, among the several research activities already presented in the literature, those related on the use of the UHF RFID technology are mainly focused on tracking patients in hospitals and nursing institutes. In [3], authors combine together wearable tags and ambient tags to develop a fully passive RFID system, named NIGHT-Care, for monitoring the state of disabled and elderly people during the night. Specifically, NIGHT-Care relies on an ambient intelligence platform which is capable to estimate sleep parameters, classify the human activity, and identify abnormal events that require immediate assistance.

In [7], the 6LoWPAN standard and smart mobile communication techniques are combined to monitor the health condition of patients and provide several effective healthcare services. More in detail, the proposed solution makes use of WSN devices to measure photo plethysmo gram (PPG) signals and deliver them to a server through the Internet. An Android device is used to provide a mobile healthcare service by means of a customized application. Unlike the UHF RFID technology, the use of WSN allows the patients to be monitored in a more efficient manner at the cost of complex algorithms required for their precise tracking.

III.EXISTINGSYSTEM

Patient and environment monitoring would be considered as a individual application system in healthcare automation environment. Integration of environment and patient monitoring does not exist. Doctor has to generate the patient report in a hospital.
In case of any emergency the doctor must be in hospital to generate a prescription. If a doctor in some other location apart from hospital, doctor may send report via messages or by call may lead to conflicts. So a mobile based application of a patient is mandatory to the doctor, so that a doctor can provide prescription from any location.

IV PROBLEM DEFINITION:

- Redundancy of data in existing sensor network.
- Communication and Data management issues in sensor Network.

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- Increasing the traffic overhead and bandwidth requirements of the sensor networks.
- In case of any emergency for the patient, doctor must be in hospital to generate prescription.

V.PROPOSED SYSTEM

Our proposed system is to implement an IoT Smart Healthcare System. Smart Healthcare Systems for automatic monitoring environmental conditions of a hospital and monitoring health conditions of a patient. Sensors are used to sense the environmental condi tions i.e.(temperature, humidity, ambient light,etc..) The local staffs in the hospital are responsible for tracking the ward environmental conditions. Radio Frequency Identification Technique (RFID),which is used to identify the sensors. By using a RFID reader sensor identity can be verified to ensure Authenticity and Integrity.

The Nurse is responsible for tracking or monitoring the patient health condition. Based on the patient Description the patient id will be updated to the nurse. The monitoring data of the patients are a temperature and a heart rate. The Nurse starts monitoring the patient details i. e (temperature and heart rate) are updated in the nurse page and based on the temperature and a heart value will be displayed in a dynamic graphical chart. After that monitored details will be sent to the doctor. Based on the patient details doctor will generate a graphical chart and give the prescription. The graphical chart and the prescription will be created as a PDF File and send to that patient.

CONCLUSION

IoT-aware, SHS architecture for automatic monitoring and tracking of patients, personnel, and biomedical devices within hospitals and nursing institutes has been proposed. With the IoT vision in mind, a complex network infrastructure relying on a CoAP, 6LoWPAN, and REST paradigms has been implemented so as to allow the interoperation among UHF RFID Gen2, WSN, and smart mobile technologies. In particular, taking advantage of the zero - power RFID - based data transmission, an ultra – low - power HSN has been implemented. It is able to collect the real - time variation of any critical patients' physiological parameter as well as of the environmental conditions.

The sensed parameters are delivered to a control center where they are made easily accessible by both local and remote users via a customized REST web service. Two different use cases have been implemented to validate the proposed SHS. The former deals with patients monitoring, the latter with the management of an emergency situation caused by patient falls promptly detected by three –axis acceleration measure ements. The achieved results demonstrate the appropri ateness of the proposed system to perform not only identification and tracking of patients, nursing staff, and biomedical devices within hospitals and nursing institutes, but also to provide power effective remote patient monitoring and immediate handling of emergencies

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