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Baby Incubator using Zigbee Technology

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A B S T R A C T

Infants who were born before 37 weeks of the gestation period are known as preterm or premature babies. Preterm baby requires surrounding exactly similar as in the womb to cope with the external environment. In fact, mammals have the advantage of being homoeothermic, i.e., they have a nearly uniform body temperature, regulated independent of the environmental temperature. Vital organs or enzymes of premature babies grow to the very lesser extent and thus requires special attention to cope with external physical condition like temperature, humidity, light and oxygen level. The infant has several disadvantages in terms of thermal regulation. An infant has a relatively large surface area, poor thermal insulation, and a small amount of mass to act as a heat sink. The Infants have little ability to conserve heat by changing posture and no ability to adjust their own clothing in a response to thermal stress. To provide the similar environment as in the womb infants have to be kept in a device known as incubator. The incubator consists of MAX30100 sensor, LM35 sensor to measure the pulse rate, spo2, temperature of the infant respectively on transmitter side and display it using LCD display on receiver side. HC-12 communication module is used to transmit the information from transmitter to receiver.

Keywords: Zigbee Module, MAX30100 Sensor, LM35 Sensor, DHT11 Sensor.

1. Introduction

There are four million babies worldwide who die in the first month of life, one million die on their first day. Preterm birth is attributed, either directly or indirectly, to at least 25% of neonatal deaths, and low birth weight (LBW) newly born are at the greatest risk. About half of the worldwide total, or 1.8 million babies each year, die for lack of a consistent heat until they have the body fat and metabolic rate to stay warm. This paper helps to prevent the death of such babies. The microcontroller based baby incubator helps to all peoples, the cost this project is very less than today's baby incubator which are used in big hospital. So, everyone which belongs to economical backward also use of it. This project not only used for monitoring and controlling the temperature but also provide number of advantages such as controlling humidity, pressure etc. The flow of information from transmitter to receiver is done using Zigbee module. ZigBee is the most popular industry wireless mesh networking standard for connecting sensors, instrumentation and control systems. ZigBee, a specification for communication in a wireless personal area network (WPAN), has been called the "Internet of things." Theoretically, your ZigBee-enabled coffee maker can communicate with your ZigBee-enabled toaster. ZigBee is an open, global, packet-based protocol designed to provide an easy-to-use architecture for secure, reliable, low power wireless networks. ZigBee and IEEE 802.15.4 are low data rate wireless networking standards that can eliminate the costly and damage prone wiring in industrial control applications. Flow or process control equipment can be place anywhere and still communicate with the rest of the system. It can also be moved, since the network doesn't care about the physical location of a sensor, pump or valve.

2. Literature Survey

First Infant incubator was invented in the year 1860.Tanier, a Frenchman, observed premature babies dying within couple of days after birth. He realized that the world needed a way to prevent babies from death. Infant Incubators are now used in all hospitals in the In 1985, Infants are nursed in incubators using either air mode control or skin temperature servo control. Data are collected continuously using a computer linked monitoring system. In 1998, Water permeability of the infant's skin is an important factor in the maintenance of a controlled water and heat balance. Radiant warmers and incubators are used to maintain the body temperature of new born infants. Incubators provide a heated environment to reduce body heat losses. The heat production is performed by forced circulation of air warmed by electrical heater, controlled manually. In this paper an active humidification system is proposed to control ambient humidity in incubator. In 2000, the observation that the relative importance of Pico-phytoplankton is greatest in warm and nutrient-poor waters was tested here based on a comprehensive review of the data available in the literature from oceanic and coastal estuarine areas.

In 2002, relative humidity levels of an incubator were measured and controlled. An integrated circuit-type humidity sensor was used to measure the humidity level of the incubator environment. Measurement and control processes were achieved by a PIC microcontroller. The high-performance and high-speed PIC provided the exibility of the system.

In 2005, the aim is to compare, in a prospective clinical trial, oxygen delivery on intermittent positive pressure with nasal cannulae versus facial mask in primary resuscitation of the newborn with moderate asphyxia. In a direct comparison of nasal versus oral mask ventilation, however, Segedinet all showed that artificial ventilation in infants can be better performed via the nasal route.

In 2007; sophisticated electronics are within reach of average users. Cooperation between wireless sensor networks and existing consumer electronic infrastructures can assist in the areas of health care and patient monitoring. This will improve the quality of life of patients, provide early detection for certain ailments, and improve doctor-patient efficiency.

In 2008 ,the main objectives of this study were to: 1) determine practical field methods to monitor oral temperature (OT), heart rate (HR), and respiration rate (RR) of captured manatees; 2) establish normal OT, HR, RR parameters with correlations to blood chemistry; 3) provide an easy to reference OT, HR, RR monitoring field guide for manatee researchers.

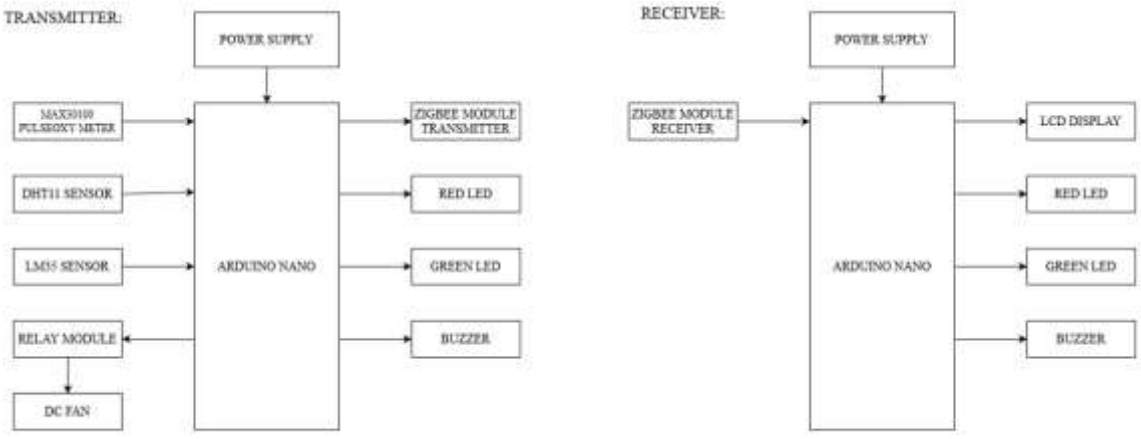
In 2009, Application of wireless transmission technology for neonatal monitoring at NICU. Software is developed for ensure the correct data transmission, detection and display. The system is designed to be suitable for integration into a non-invasive monitoring platform such as a smart neonatal jacket.

In 2016, in this article, they define and discuss some of the major challenges in the healthcare systems which can be effectively tackled by the recent advancement in ICT technologies. In particular, they focus on sensing technologies, cloud of computing, internet- of-things and big data analytics systems as emerging technologies which are made possible by the remarkable progress in various aspects including network communication speed, computational capabilities and data storage capacities that provide various advantages and characteristics that can contribute towards improving the efficiency and effectiveness of healthcare services.

Recent years, wireless communication technology at home and abroad medical market has obtained using widely, and wireless medical equipment is used rapid growth.Have report to point out, the wireless medical equipment sales volume in Europe is from 4.458 hundred million dollars of being increased to 2008 of 9,800 ten thousand dollars in 2003.The U.S. medical WiFi market in 2003 reaches 4.95 hundred million dollars, and U.S. medical treatment WiFi market was up to 2,000,000,000 dollars in 2010.

3. Proposed System

The main aim of the proposed baby incubator is to maintain the baby with same environmental conditions that is available in its mother's womb. The temperature is maintained to few degrees of Fahrenheit depending on the age of the baby. When the temperature inside the incubator decreases than the required temperature then the temperature of the incubator is raised using a heater which is indicated using an LED. When the baby's body temperature increases then the temperature inside the incubator also rises which is continuously being sensed and after a particular set value, the fan gets turned on to decrease the temperature inside the incubator. The humidity level inside the incubator is also sensed. To maintain proper hygiene inside the incubator sweating of the baby during inappropriate conditions is also noted. Respiration is one of the important aspects, where some of the babies breathe on their own while some of them require external help for breathing. There are three methods to provide breathing externally with nasal cannulas, CPAP, ventilators. We have made use of an oxygen hood to measure the breathing rate of the baby. The heart beat rate of the baby is also continuously monitored. The baby movement is also detected by using a sensor.



Transmitter side: The Baby incubator system is developed to monitor various parameters of a Baby and take the required measurements accordingly in order of emergencies. The system is developed in two parts, the Transmitter side and the Receiver side. The transmitter side is situated at the baby reading the vital parameters such as the Heart rate and spo2 level, as well as the Temperature using the Max30100 pulse-oxy meter and LM35 sensor respectively. The DHT11 Sensor is used for measuring the Temperature and humidity of the incubator. The LED lights and buzzers are attached for alarming. A DC fan and a Relay are also used for emergency purpose to allow the hot air inside the incubator to flow through.

Receiver side: The Receiver side of the system consists of an LCD to display the readings of the pulse-oxy meter and Temperature of the baby which helps in monitoring the baby effectively and also the humidity of the incubator. The receiver side is designed as a portable device which helps in

monitoring the baby from a distance. The information from the transmitter is passed to the receiver with the help of HC12 zigbee module. Hence, the system designed is wireless with accurate readings. The LED lights and buzzers are used for alarming purpose.

4. Conclusion and Future Scope

The proposed system monitors heartbeat of the infant and heart rate and oxygen level surrounding. Temperature monitoring is done in order to keep the environment suitable for neonate Temperature monitoring of the infant's body will help to detect many other internal diseases like infections, common cold, and pneumonia have a common symptom of fever as the heart rate and oxygen level measure values also help in detecting of having Internal problems like cold, dehydration. Continuous heart beat monitoring helps to detect cardiovascular disorder in the infant. It also helps to detect arrhythmia or irregular heartbeats. A Relay acts as a switch for the DC fan to work. The DC fan is used for letting the hot air inside the incubator to flow outside. By checking the humidity and temperature of the incubator frequently the baby is safely monitored. The future work is focused on the implementation of the monitoring system to monitor all the pathological parameters of infants in all the hospitals with common physician/consultant. This paper aim is to monitoring and controlling temperature within the incubator and checking the infant's heartbeat continuously Oral temperature will show a time dependent increase in value after capture; heart rate and respiration rate will stabilize over time. A positive correlation exists between heart rate, potassium, and lactate concentration among healthy captured manatees. In future there is many implementation can take place like ECG monitoring ,proper oxygen supply controlling and above all the controlling system will automatically on or off. As there will given an particular set point for different parameters the controller will automatically on if the measuring value goes below the set value and the controller will automatically off if the measuring value goes high compare to the set value.

References

1. Karan Kolla, Rakesha R, Tejus S, Narendra Kumar G and Alice Abraham, Real Time Incubator Monitoring System Using Wireless Sensor Network, Dept. of Electronics & Communication, UVCE,Bangalore University, INDIA.
2. Sowmyasudhan S, Manjunath S, A Wireless Based Real-time Patient Monitoring System, Volume 2, Issue 11, International Journal of Scientific & Engineering Research, November- 2011.
3. D A Ducker, A J Lyon, R Ross Russel, C A Bass and N McIntosh, "Incubator temperature control: effects on the very low birth weight infant", Department of Child Health, St George's Hospital Medical School, London, 60, 902-907,1985.
4. H Blencowe, S Cousens, M Z Oestergaard, D Chou, A.-B. Moller, R Narwal, A Adler, C V Garcia, S Rohde and L Say, "National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications", The Lancet, vol. 379, no. 9832, pp. 2162–2172, 2012.
5. N S Joshi, R K Kamat and P K Gaikwad, "Development of Wireless Monitoring System for Neonatal Intensive Care Unit(NICU)", International Journal of Advanced Computer Research,Volume-3, Number-3, Issue-11, September-2013.
6. M V Narayana, K Dusarlapudi, K Uday Kiran and B Sakthi Kumar, "IoT based real time neonate monitoring system using Arduino", J. Adv. Res. Dyn. Control Syst., vol. 9, no. Special issue 14, pp. 1764 1772, 2017.
7. Chandra sekar.G, Assistant Professor, Dept. of ECE, SRM University, Ramapuram, Chennai, India, Design and Development of an Infant Incubator for Controlling Multiple Parameters.
8. Wei Chen, Son Tung Nguyen, Roland Coops, Wireless transmission design for health monitoring at neonatal intensive care units, Conference Paper, December 2009
9. Djaaffar Bouattoura, Pierre Villon, and Gilbert Farges,Dynamic Programming Approach for Newborn's Incubator Humidity Control IEEE Transactions on Biomedical Engineering, VOL. 45, NO. 1, January 1998.
10. Amit M. Mathur & Jeffrey J. Neil & Robert C. McKinstry & Terrie E. Inder, A Service Based Perspective on Neonatal Critical Care.