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IMPLEMENTATION OF IOT BASED SMART INCUBATOR UNIT IN LABVIEW ENVIRONMENT

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Abstract: Child birth is so tough nowadays and safeguarding the born child is more difficult. By birth some of the children's are being born with less weight and early birth so there is a necessity to keep the children's in incubator at the temperature of 32 to 37˚C. Hence smart incubator system is needed to monitor and control the physical and real time parameters. Even then it is needed to continuously monitor neonatal unit too because of the fire accidents due to excessive voltage or fluctuations. To overcome all these difficulties and safeguard the children's a new system is proposed in LabVIEW environment.

The proposed system is designed to monitor and control the temperature, Humidity level inside the incubator and temperature, pulse rate of the baby. But this is not the only function of an incubator, but also it protects the premature babies from infection, allergens or excessive noise or light levels that can cause harm. It can regulate air humidity to maintain the integrity of the skin and may be equipped in the future with special lights to treat neonatal jaundice common in newborns. The overall performance of the system is monitored through IoT and data's are stored in Arduino board.

Keywords: Include at least 4 keywords or phrases

I. INTRODUCTION

There are four million babies worldwide who die in the first month of life one million dies on their first day. Majority of premature babies are born between 32 to 37 weeks of gestation period and die due to lack of warmth, and they have died reportedly after a short circuit sparked a blaze in an incubator at a hospital. , the smart Incubator is proposed to prevent the death of babies and developed to provide an environment where new-born babies can healthily grow in.

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II. LITERATURE SURVEY

Many papers discussed about the system structure, hardware circuits, control algorithms, and software program of the incubator for premature infant based on LabVIEW. The main advantages of this device are that preheating is less time than others, the capability of meeting of emergency is provided, control track of temperature and humidity are visible, operation is easy to clinical practice, and maintainability is possessed. Implementation of a real time web-based system for monitoring Temperature, Humidity, Weight and Physical condition of infant and also to control temperature and humidity. Redundant Sensing for the critical parameter, temperature has been incorporated using Triple Modular Redundancy. Continuous Oxygen supply is ensured. The algorithm is written such that the data is acquired continuously and compared with the Lower and Upper Limits in case of temperature and window comparison technique is used for Humidity. The proposed design model is simulated using LabVIEW 2011 software and hardware implementation was done with Compact Field Point Acquisition module for monitoring and controlling with sensors and actuators.

Neonate activities in Incubator and Incubator parameters were monitored using Camera and Vision Assistant software with the help of Web Publishing tool of LabVIEW 2011 software which helps to monitor and control Incubator parameters from remote location also. The incubator is considered as an air conditioned room with special specification which we can control it with respect to the condition of baby in incubator Incubators are designed to provide an optimal environment for newborn babies with growth problems (premature baby) or with illness problems. The incubator is an isolated area environment with no dust, bacteria, and has the ability to control temperature, humidity, and

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oxygen to remain them in acceptable levels such as (36°C-38°C) for temperature,(70%-75%) for humidity . Newborn babies with growth problems usually have a net body area greater than normal babies from the same age. This in turn makes their heat loss greater than normal babies. Moreover, their net mass is less than the normal babies and makes them unable to keep their body temperature to the required level. With regard to sick babies, they usually can't control their body temperature without an external aid. The newborn will be put in the incubator for about 28 days.

Implemented a real time web-based system for monitoring temperature, humidity, weight and physical condition of infant. Redundant Sensing for the critical parameter, temperature has been incorporated using Triple Modular Redundancy. Continuous Oxygen supply is ensured. The algorithm is written such that the data is acquired continuously and compared with the lower and upper limits in case of temperature and window comparison technique is used for humidity. The proposed design model is simulated using Lab VIEW 2011 software and hardware implementation was done with Compact Field Point Acquisition module for monitoring and controlling with sensors and actuators. Neonate activities in Incubator and Incubator parameters were monitored using Camera and Vision Assistant software with the help of Web Publishing tool of LabVIEW 2011 software which helps to monitor and control incubator parameters from remote location.

III. OVERALL SYSTEM DESIGN

The system consists of accruing, processing and controlling sections. The various sensors used to sense the parameters associated with the monitoring and control of an incubator are integrated through IoT to the LabVIEW environment. The Arduino programmed to obtain the readings of these sensors and display it thus enabling in the monitoring of the readings. The values of these sensors are updated in the cloud.

The temperature and humidity sensor senses the surrounding temperature and the humidity present in the surrounding environment of the neonate. Similarly, the gas sensor and light sensor detects the presence of any gas leak and extra light penetrating the interior area of the incubator. If the temperature and humidity values exceed the specified range

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(36.5-37.2°C) or if the presence of gas or light is detected by the respective sensors monitored by a computer then, a alarm, message or an email is sent to the baby's doctor and nurse with the help of IoT platform. Also, it is programmed to get the analog readings from the pulse sensor to monitor the heartbeat of the infant.

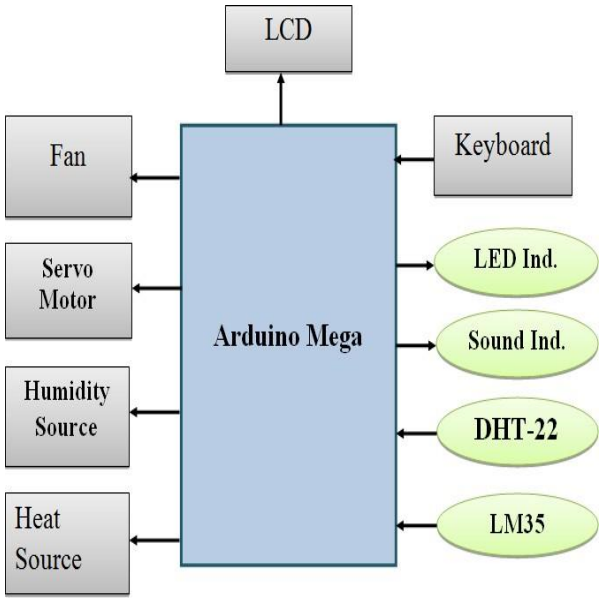

Fig.1 The schematic diagram of the proposed incubator

If the temperature and humidity values exceed the specified range (36.5-37.2°C) or if the presence of gas or light is detected by the respective sensors monitored by a computer then, a alarm, message or an email is sent to the baby's doctor and nurse with the help of IoT platform. Also, it is programmed to get the analog readings from the pulse sensor to monitor the heartbeat of the infant.

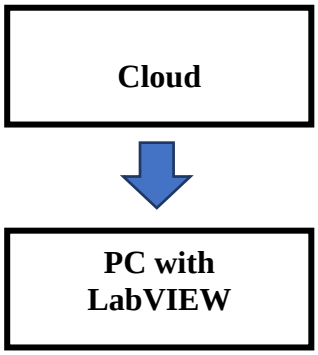

Fig.2 Block Diagram – Receiver [Controlling] Section

The last part is the monitoring and execution system. In this part, the environment can be gotten by the sensors and the images and videos of the baby can be seen from the monitor. Overall Framework of the Intelligent System considering the above requirement, the infant incubator intelligent system can be divided into three parts: the terminal device, the network and the baby monitoring and executive system. And the second part is used to route and transmit the collected information and the control com-mand, which includes the Internet and the local gateway.

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The relevant information in the process is stored in the data-base. For example, if the baby's body condition shows that the bad trends through the display of the intelligent system, the execution system will start to work and to change the bad condition. At the same time, the danger signal is infant incubator intelligent system can be divided into three parts: the terminal device, the network and the baby monitoring and executive system. And the second part is used to route and transmit the collected information and the control command, which includes the Internet and the local gateway.

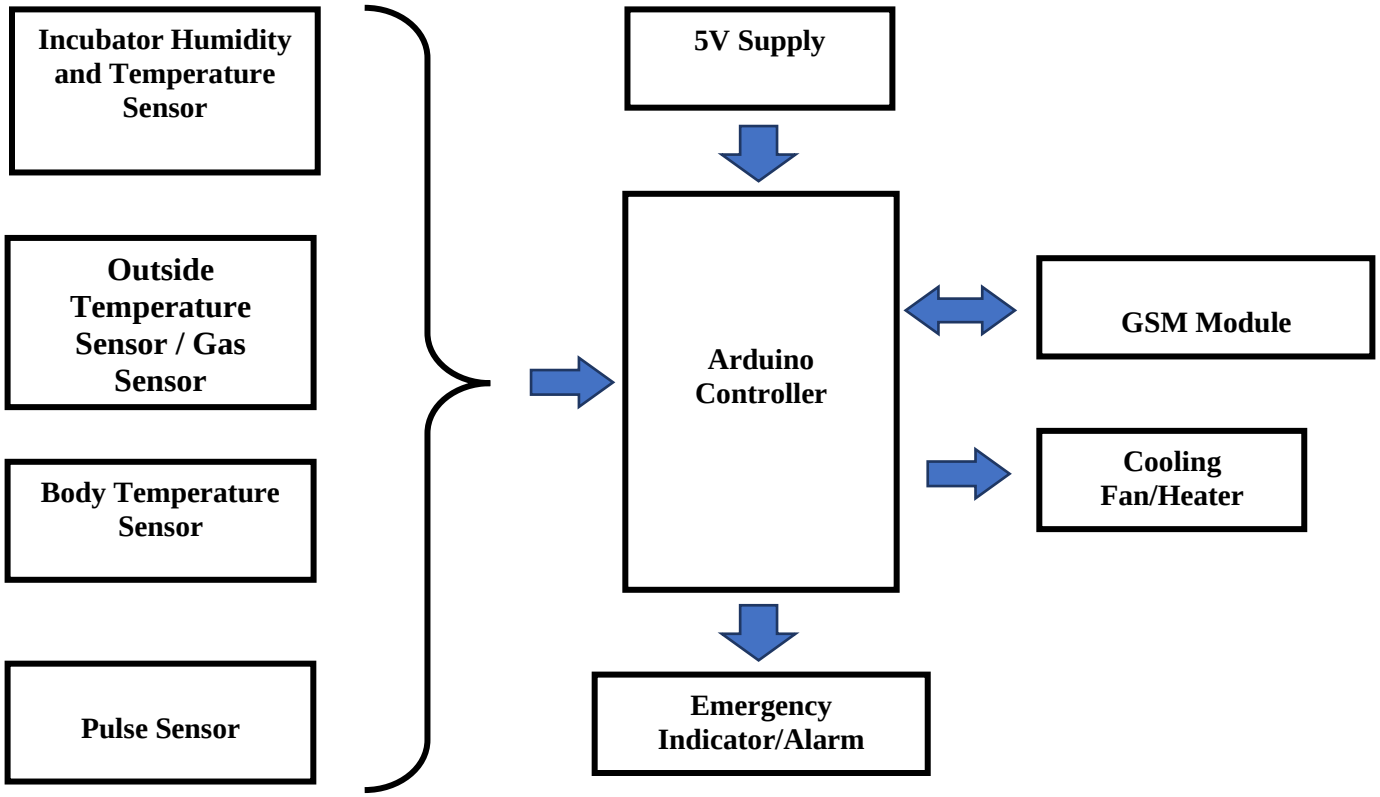

Fig.3 Block Diagram – Transmitter (Processing) Section

Overall Framework of the Intelligent System considering the above requirement, the

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For example, if the baby's body condition shows that the bad trends through the display of the intelligent system, the execution system will start to work and to change the bad condition.

At the same time, the danger signal is delivered to the host computer and the mobile phone of their parents by the alarm system and the system network.

IV. OUTPUT DESCRIPTION

Introduction of the System Architecture Referring to the layer framework of the IoT, the proposed system is nearly divided into four layers.

The layers will be explained as follows: The sensing layer is the lowest level of the whole structure.

The temperature and humidity will be gotten by the corresponding sensors. And the real-time images and videos can be shown in the screen by the monitors or cameras. The sensors include the environmental sensors, GPS, cameras

Furthermore, the controlling commands, such as turning up the air condition, can be controlled directly by the control module according to the real-time sensing values.

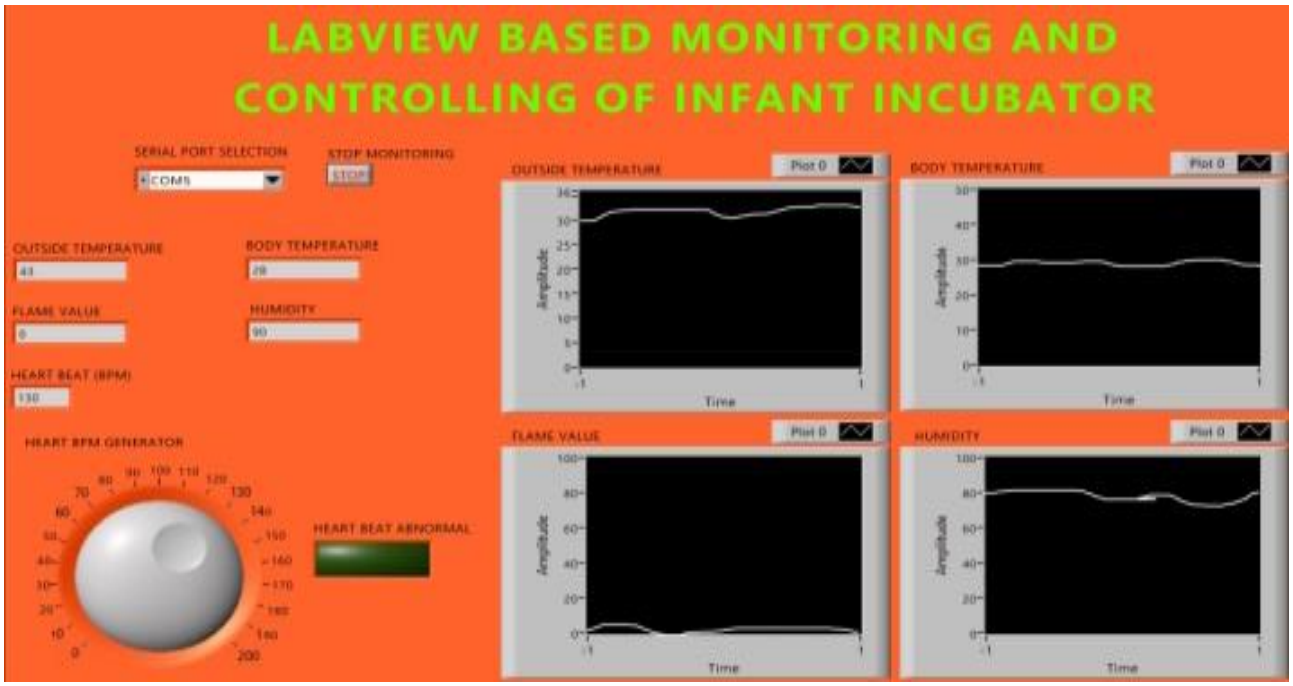

Fig.4 Output of Smart Incubator system

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The network layer may include the ADSL, 3G or 4G mo-bile networks and Zigbee and the intelligent local gateway will connect the network layer and the sensing layer. Specially, the technology of Zigbee is taken into account. By this device, the whole sensing network will be connected into the local gateway, and the Asymmetric Digital Sub-scriber Line (ADSL) is used to connect the system server to the local gateway, and the mobile network will be also used to pass the real-time information to the users or the host server.

V. CONCLUSION

Proposed Infant Monitoring and controlling system simple and accurate to use. This system expressively provides the parents with the feeling of assurance. The constant capturing of multiple biological parameters of the baby and analysis of the overall health helps mother to understand the internal status of the baby. As GSM technology is used which makes the users to communicate for longer distances. This is a convenient system to monitor the baby's health condition from any distance. The entire setup is demonstrated and validated through LabVIEW environment.

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BIOGRAPHY

Dr.D.Sengeni has completed her Ph.D in Annamalai University, Chidambaram and currently working as Associate Professor in the department of Electronics and Communication Engineering at CK college of Engineering and Technology. She has published 10 national and 15 International Journals.