Sensor Based Automatic Neonate Respiration Monitoring System

E.Sujatha, S.Soundararajan, J.Sathiya Jeba Sundar, G.Indumathi

Abstract: *This research work aims to create awareness and monitor the breath rate of a neonate using the air flow sensors and to reduce the number of infants' death. It is designed based on the Arduino which is open-source electronics platform for hardware and software use. This prototype is developed for reliable and efficient baby monitoring system and play as infant care and monitoring system.A cardio respiratory system is used to monitor the infant's heart rate, rhythm, breathing rate and other relevant and useful medical information using Electro Cardio Graph (ECG) and other IoT (Internet of Things) devices.This research work proved that the respiration monitoring system for infants can be implemented at low cost and also can prevent the respiration failure deaths.*

Keywords: Monitoring System, Neonatal Care, Respiration, Sensor.

I. INTRODUCTION

This research work can be applied to neonate care based medical applications for identifying any abnormal breathe rate and if it found then it issues alarming sound in order to make awareness about the seriousness of infants[1][3][4]. By the alarming sound produced, it is easily noticed that the patient has irregular breathing and must be notified to the doctor. The main advantage of this proposed method is no care taker and physical attention is required[3][9]; it implements the automatic monitoring procedure very easily and effectively[10][11] using hardwares.

This project considers the performance metrics such as temperature of the body, pulse rate of heart, moisture in the air and baby's movement for evaluation [2][13]. These statistics datas are provided by devices and analyzed for further response. The system consists of sensors for monitoring the parameters using Liquid Crystal Display (LCD) screen and controlled by the microcontroller.

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Neonatal Intensive Care Unit (NICU) consists of premature babies which is to be taken utmost care when in critical condition and special attention and care to be taken against them [14][15] for continuous monitoring.

II. MOTIVATION

Due to several tragedies happened because of minor negligence in continuous monitoring and not taken proper care of the babies in NICU in the past 2 decades. The recent scenario of Gorakhpur tragedy which killed 61 children due to low oxygen levels within 3 days [12][14].

In existing system, equipments monitor the rhythm of heart beat, breathe rate and other vital information through one who is taking care manually for looking after the infant continuously [14][15] are found inefficient it is not robust system for reducing the number of infants death. Breathing rate impacts the weight of the baby. So this is considered to be most important. In some situations, the babies have to be continuously monitored and enough care must be taken care entirely in order to avoid the risk of the babies' life [5][6]. A respiration system is used to monitor the breathing rate continuously to identify easily about abnormal breathing and to take subsequent and adequate remedial measures to be taken. Monitoring infant's health is important for every parent and their beloved ones[7][8].

The following challenges faced by the existing system are handled in the proposed system are

- Low access time
- Manual monitoring
- Consumption of time
- Not economic, expensive

III. PROPOSED SYSTEM

In the proposed system, the health condition will automatically monitor and integrated with alert system in order to efficiently automate the system. By issuing the alarming sound the infants' irregular breathing is monitored by the doctor. The main advantage of this proposed research work is that manual care taker is not required and automatically it will make the monitoring procedure very easily and effectively. And it is trust worthy, easy to implement, more economic, less time consumption and with quick response it proves that the system is more robust.

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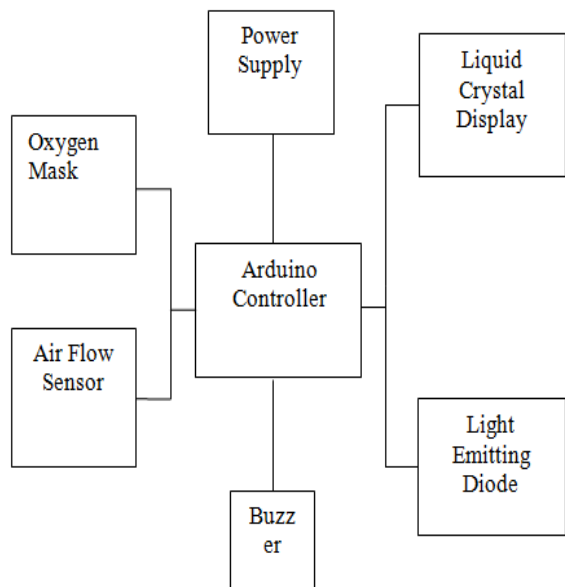# Sensor Based Automatic Neonate Respiration Monitoring System

Fig.1 Architecture diagram of the proposed system

The system is used to monitor the baby's health using sensors automatically. The controller automatically produces the alarm signal to intimate the baby's condition without any time delay for any abnormal breathing happens. The Personal Computer (PC) is used to register and monitor the entire information regularly.

IV. RESULTS AND DISCUSSIONS

A. Monitoring System

Monitoring is done through temperature, pulse rate, moisture and the movement of infant.
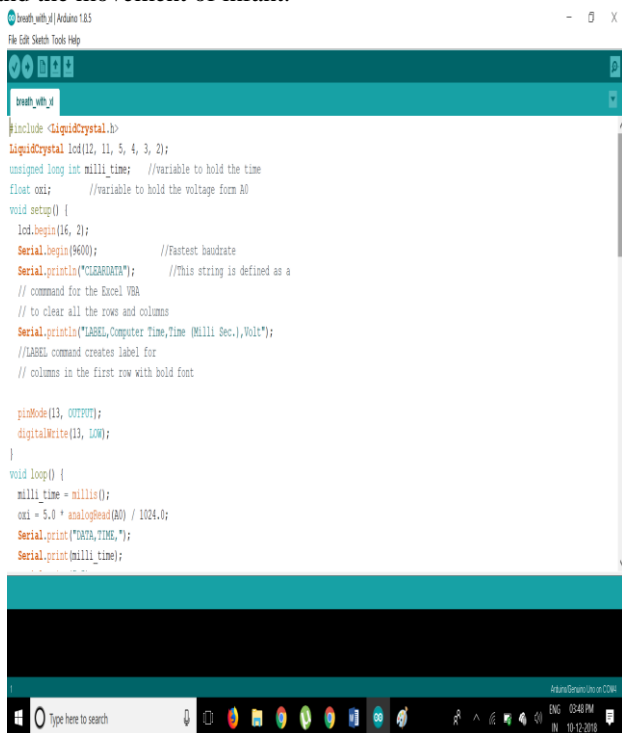

Fig.2 Monitoring System

B. Measuring for abnormal data

In order to measure for abnormal data all parameters are evaluated and verified with their threshold otherwise it must be noticed by sensor and notified by the buzzer and glow through Light Emitting Diode (LED).
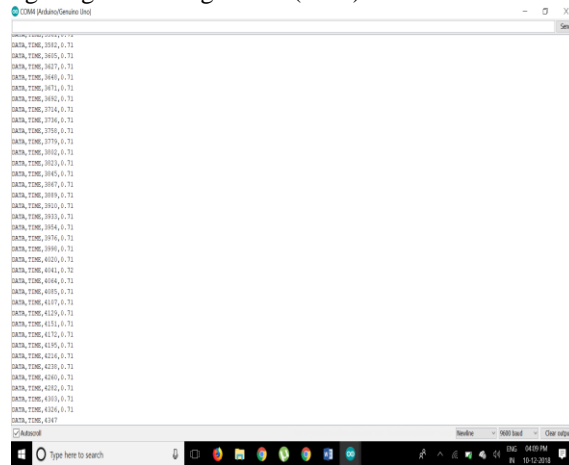

Fig.3 Measuring the abnormal data

C. Hardware circuit of monitoring system

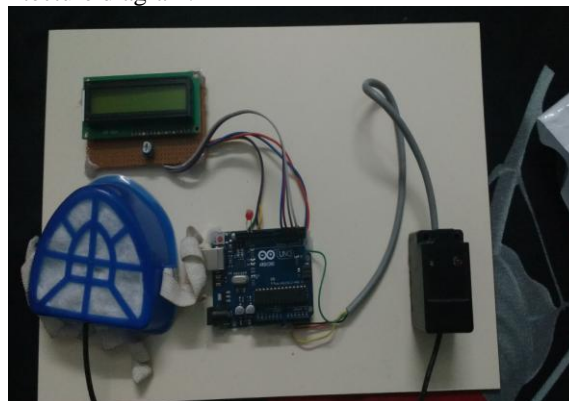All the hardware devices are connected according to the architecture diagram.

Fig.4 Hardware circuit of monitoring system

D. Arduino device

A single board micro controller kit which is used to interact physical objects and controls the digital devices.
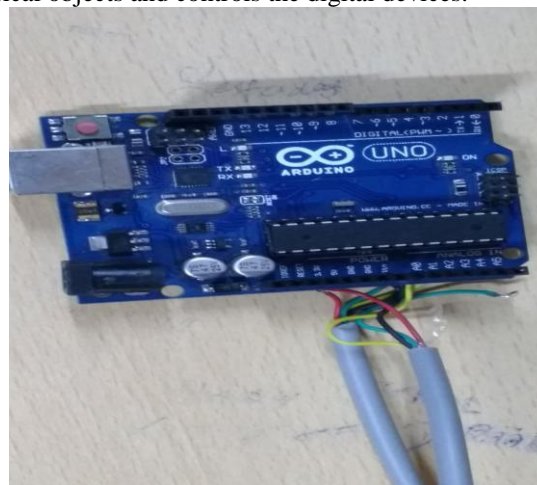

Fig.5 Arduino device

Fig.6 Alarm signal device

E. Alarm Signal

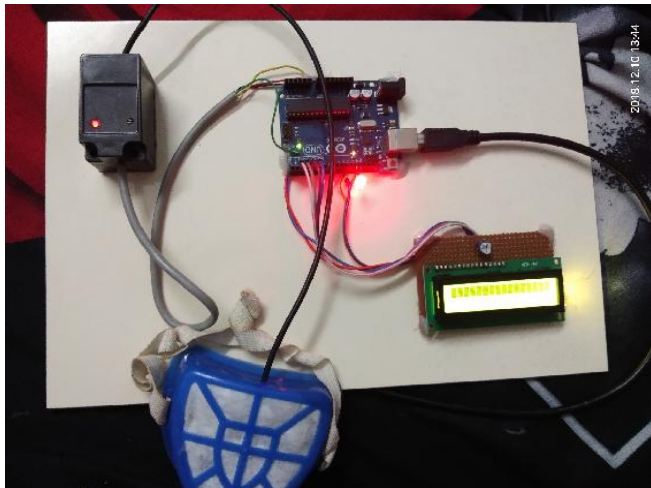Indicates that the pediatric has breathing problem and alarm sound is raised.

Figure 7. Alarm signal

V. CONCLUSION AND FUTURE WORK

Every lives are important and from the first breathe of the baby, can be monitored and ensure a secured breathe inside the incubation. The experimental results reported that health planning and policy development are cost effective.
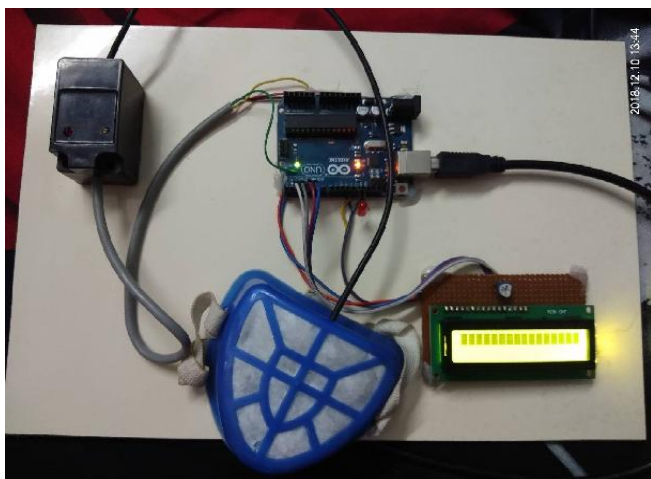

Fig.8 Alarm signal

In future, it can be extended into monitoring the scalable systems and large devices. It is implemented as a portable device.

It can also be applied to various monitoring systems irrespective of diseases.

A. Why this Study adds?

This research work ensures the powerful health care system by monitoring continuously without human intervention and more reliable.

VI. ACKNOWLEDGEMENT

VII. STATEMENT OF ETHICS

No conflict of interest.

VIII. DISCLOSURE STATEMENT

I disclose that no financial support and technical support lend from other organizations or persons.

IX. FUNDING RESOURCES

X. AUTHOR CONTRIBUTIONS

I am the corresponding author of this research paper and the project. Each module is implemented by Dr.S.Soundararajan, Mr.J.Sathiya Jeba Sundar and Mrs.G.Indumathi.

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