HOME MONITORING SYSTEM FOR SIDS

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Abstract -*Children are the most precious gift that everyone possess in their life .Due to uncertain situations, children below 1year of age has been died. The industries and technologies are making efforts to safeguard the children by wearable one. The system we proposed is made to reduce the death rate of the children. This could be avoided by our monitoring system which helps to watch day to day activity of the children and their corresponding data is available in the form of cloud. The respiration, pulse, temperature and smoke can be detected in our proposed system. This system is more efficient and economical so that it could easily available in market.*

Key Words*: SIDS (Sudden Infant Death Syndrome), passive smokers, asphyxiation, knitted conductive thread, wearable and washable.*

1. INTRODUCTION

Sudden Infant Death Syndrome also known as crib death or cot death is the primary factor for infant death under 1year of age. It is an unexplained immediate death which motivates us to design a wireless wearable clothing to safeguard the children. The major loss occurs in male when compared with females. Infants are more vulnerable between the age of 2 to 3 months [1].

Doctors suggested that children should sleep on their back and exposed due to asphyxiation [2]. The main factors that cause, SIDS, are suffocation while babies sleeping under stomach, swaddling, entrapment, mothers who smoke during pregnancy, premature or low birth weight babies, mother married below the age of 20 and also due to overheating while sleeping. The risks of SIDS also doubles due to exposure to passive smoke from smoking by mothers, fathers and others in the household.

The monitoring system we introduced is a composition of technologies include smart wireless connections, active wear devices, e-textiles and cloud based applications for continuous record of an infant. This monitoring track of infant is crucial to warn and aware parents to the dangerous effect of SIDS. With the help of advancement technologies, we implemented a monitoring system for sensing heartbeat rate, pulse rate, smoke and temperature of an infants. The collected data is stored in the cloud based technology. It is displayed in cellular phones via Wi-Fi technology. For Infants under 1 year of age, normal heart rate is about 100-160 beats per minute, pulse rate is about 70-190 beats per minute for 0-1 month old and 80-160 beats per minute for 1 – 11 month old, temperature is about 36.4 C(97.5F).Through the utilization of e-textile material, knitted of dedicated stretchable conductive thread in order to measure the respiratory rate and for measuring temperature, thermistor type large connecting pads are used and the presence of smoke can be identified by smoke sensor. We introduced a complexity free algorithm which is revealed to be easily fixed to the body and provides comfort to infant's body.

2. RELATED WORKS

Contact less sensing elements are helpful for providing the convenience at localized and non-hospitalized areas[3].The launched project technologies forwards the measurement of biological activities in a non-invasive way, low power consuming ,activated mobile communications allows the utilization of new creation of sensor materials. The existed introduced system in 2016 by Andre G. Ferreira's "Baby Night Watch" proposed with many sensing parameters and detects rate of about 35 bytes per minute with Zig Bee protocol which is very expensive and hence it is not affordable to everyone.
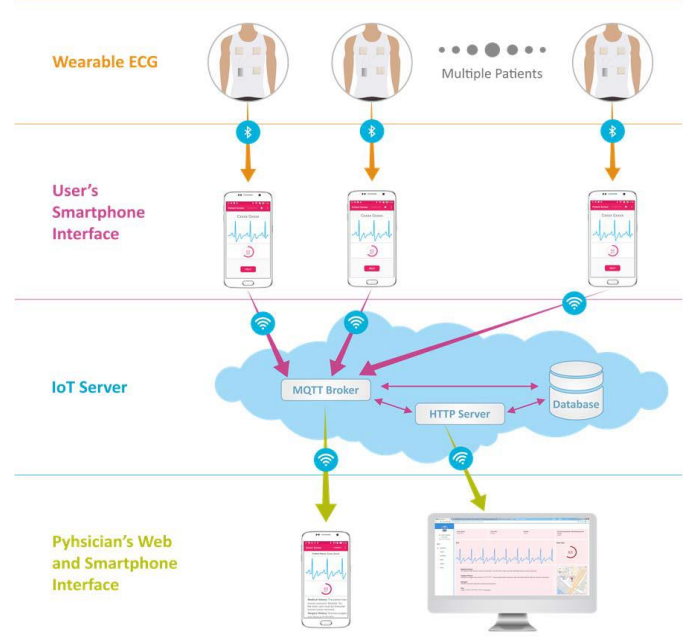
In already existing system, the vibration level is detected and if it increases, the heart beat rate also rises which is responsible for parents or doctor has to avoid SIDS. The main aim is to develop an analytical model for reducing SIDS and the values of heartbeat, vibration, SpO2 of infants are predicted which creates a prototype model [4]. The theoretical value is stimulated and it is found to be time-consuming.
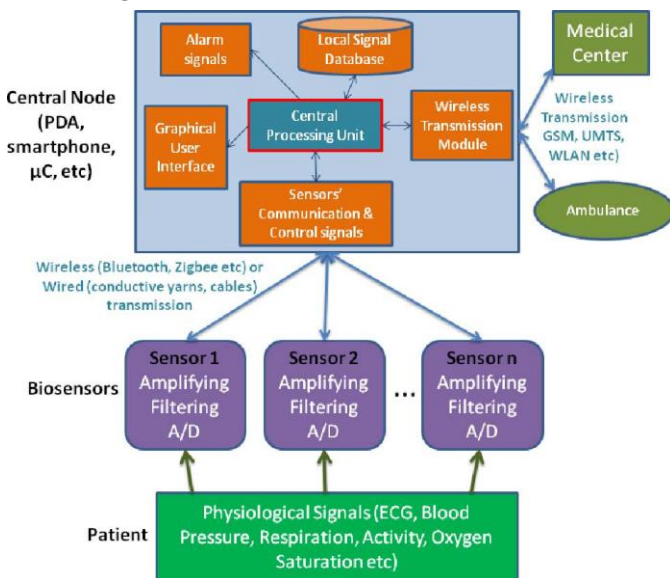
3. PROPOSED SYSTEM

The proposed system we introduce consists of both the hardware and software to monitor each and every movements of children. The main aim of the project is to incorporate the multiple sensory functions in a very small piece of cloth near the baby's vest without making it awkward, unhandy, warm. It should not hinder the loving interaction towards the infant or making the child looks with diseased appearance.

The introduced sensing baby vest is provided to monitor the respiration, smoke, temperature and pulse rate. Under home conditions, the baby should feel free and the track of baby's activities should not be affected. This system allows the advanced alert for the protective life as well as the identification of changes of body condition or development of diseases in the early stage. A various types of sensing elements and technologies have been utilized for the parameters measurement and assessed for the integration into the garment.

2.1. DEVICE REQUIREMENTS

All the device requirements including both hardware and software components are listed as below,

2.1.1. TEMPERATURE SENSOR

Detecting temperature has never been easier. The temperature of children body should be normal since overheating of body leads to discomfort. The normal temperature of children is about 97.5 F. The sensor we utilized is Lilypad Temperature sensor. The type is MCP9700. It is wearable and even washable. This sensor will show output 0.5V at 0 degrees C, 0.75V at 25C and 10mV per degree C. It provides comfort to children's body.
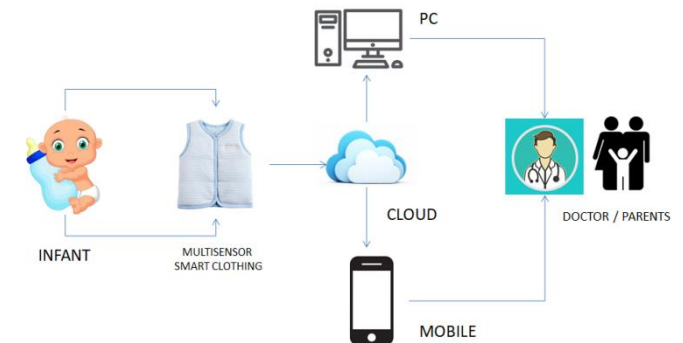
Block Diagram of Home Monitoring System for SIDS

2.1.2. PULSE SENSOR

The normal heart beat for a children ranges from 100-160 beats per minute [5]. The heartbeat should be maintained properly in order to maintain the normal lifestyle of the children. The sensing element used here is Pulse sensor. This sensor adds amplification and noise cancellation circuitry to the hardware. Plug is connected straight to the Arduino. It works either with 3V or 5V.

2.1.3. RESPIRATION

Knitted Stretch Sensor is used to measure the respiration of infant. It is made by knitting both conductive thread and elastic thread. The principle behind knitted stretch sensor is that when it is fixed around the abdomen, the contraction and expansion will result in varying resistor value. This resistive value is used to determine the respiration.

2.1.4. SMOKE SENSOR

The presence of smoke around the children causes suffocation. The smoke can be detected by using MQ2 sensor. It is helpful in detecting in flammable gas and smoke. This is very easy to use and low cost semiconductor module with analog and digital output. This sensor can be easily interface with microcontroller being used.

2.2. METHODOLOGY

The development of the system is mainly based on three factors which includes size, weight and power consumption.

The basic methodology of our proposed system is based on the heart beat sensor, pulse sensor, smoke detection sensor and cloud based technology module. All the sensors and modules are interfaced using the Arduino UNO microcontroller board which is based on the Atmega328p microcontroller. The hardware part is selected as per the analysis and requirements. The software part is being embedded with the mobile phones. The Arduino we used is programmed with C language written on the Arduino. After the introduction of the prototype, Arduino reacts to the data that is being received from the sensors. The Arduino we used serves as an immediate response between the sensing electronic device and the mobile phones Information is being processed with the help of interface and stored in cloud for future use. The interfacing diagram we introduced gives the transmission medium and wiring connections for data recording [6]. The accuracy of the system is found to be more when compared with previous existing systems.
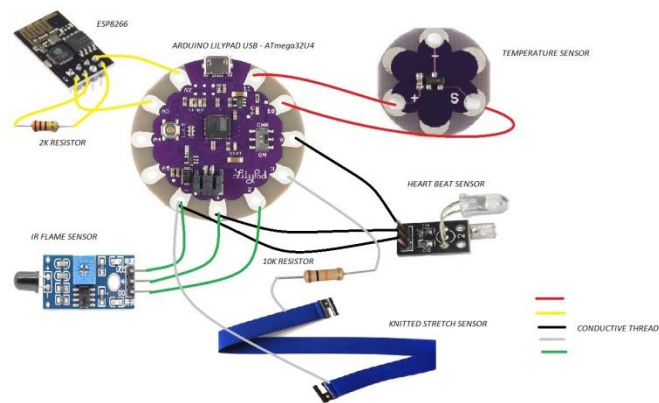
Interfacing Diagram

The parameters mentioned as adequate information us with an aid to investigation which is implementation of our home monitoring system of vital signs, which reduces the death rate. This methodology is one of the convenient ways that shows the process taking pace inside the clothing. The electronic monitoring system provided with sensory interface where the data processing and transmission is fabricated inside the clothing.

4. RESULT AND STIMULATED OUTPUT

The introduced system is found to be in the form of wearable. The temperature changes in child's body is found to be unpredictable. The variation in temperature

can be alerted immediately to mobile phones. The moisture content in the baby should make it feel uneasy and difficult for it to sleep. So it should be reduced by using the sensing interface with the microcontroller.


Temperature and Humidity Graph

The heart beat signal graph we obtained has signal to noise ratio found to be less when compared with other types of sensors. The quality of the signal is enough to detect the accurate beat rate of the children. The heartbeat should be in the given limit and the following graph shows the range of heart beats in a minute.
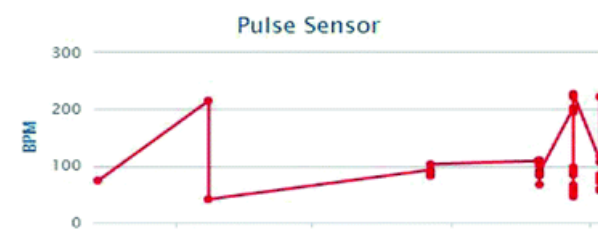

Heart Beat Graph

Smoke sensor is mainly used to detect the smoke that is being surrounded around the baby. The smoke from cigarettes usually affects the babies in larger scale. Smoke in the environment makes them difficult to inhale and causes serious diseases which includes lung damage.
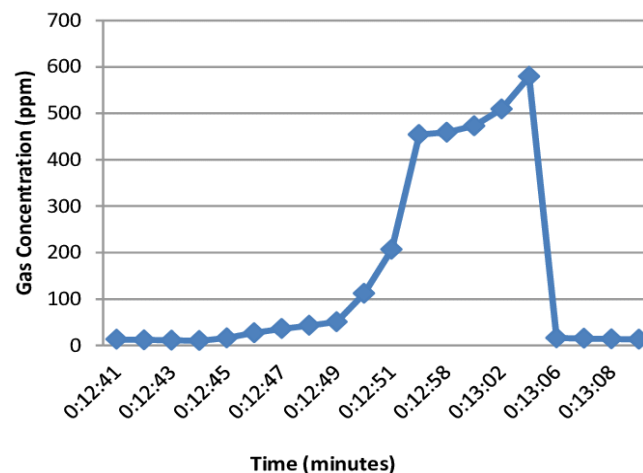
Smoke Concentration Graph

The respiration of the baby should not affected for comfort life of baby. *The sensing device is provided with high durability elastic band fixed with length adjustable wearing belt. The rate should be measured when the baby is at rest position. The respiration may increases due to fever or any other illness which affects the normal lifestyle of the baby. The introduced graph shows the respiration rate with respect to that of strain and it helps in improving the mental conditions of the children.*
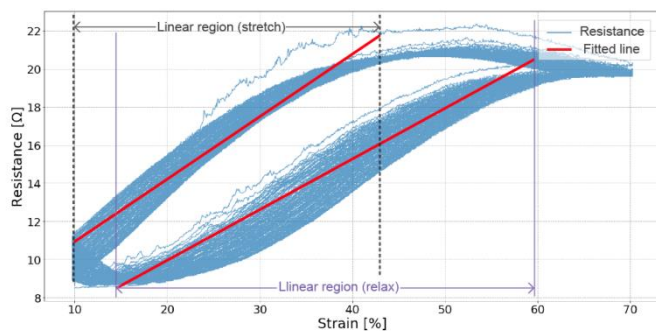
Respiration Graph

It is easy to fabricate since the elements are very light in weight and they provide comfort to the baby's body. It can be worn like a normal clothing and can be monitored continuously by the user.

5. CONCLUSION

Our proposed Monitoring system is the powerful tool in the healthcare industry technologies. It provides a perfect solution for momentary progress of the children. It helps parent and doctors to check the movements of babies and it provides security. These real time sensors provides us the most promising way to illuminate the medical conditions of the children. The presence of smoke near to the babies can also be detected. The data is stored in the cloud and it can be viewed through mobile phones via Wi-Fi technology. It mainly reduces the unusual death of children and enhances the life support for parents. The sweating rate in children's body can also be predicted.

The proposed system is designed with textile oriented basis which is found to be wearable, washable, flexible, environment friendly, reliable and easily adaptable. It works in the most efficient way. It is easily affordable and operates in any kind of environment.

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