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Smart Cradle For Baby Using FN-M16P Module

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Abstract: ***The paper cites the Infant Monitoring System with Real-Time Alerts to Parents using GSM. Activity Monitoring includes Infant's cry detection which makes the cradle swing with pre-recorded voice play and alert to parents for their intimidation. This type of cradle is useful for mothers who are highly educated and insisting to go for work and has no time to take care of their infants. Cry detector system which detects the baby cry and swings the cradle until the baby stops crying. The swinging action is due to DC motor. The user can control the speed of the cradle as per his need. FN-M16P module will have recorded voice input of the mother and plays it whenever the baby cries for a long time. The ultrasonic and accelerometer sensors are used for detecting respiratory and non respiratory movements of the baby.***

Keywords: Accelerometer; Cry Detector; FN-M16P Module; GSM; Ultrasonic Sensor

I. INTRODUCTION

The idea of cry detection is based upon the voice detection of infant's cry as they do not have any other communications which is done using an Electret Condenser Microphone (ECM). ECM consists of a diaphragm and a back plate opposite to it. Diaphragm's motion by Infant cry (audio input) is detected as variation in capacitance between the diaphragm and back plate hence generating time varying electrical signals which is again sampled and quantized to obtain digital data sequence of voice and then analyzed by the microcontroller. Frequency of Infant's cry is typically reported to lie between 200 to 500 Hz, which is detected by the ECM and when the output voltage reaches above 2.4V it's detected as infant cry, making it immune to other noises around reducing false detection rate. Infants recovering from surgery and anaesthesia are at increased risk of life threatening postoperative apnea (POA), a clinical entity associated with respiratory pauses in excess of 15 s. It's handled using Ultrasound Sensor that squeeze the amplitude, frequency and phase information from the ribcage and abdomen signals obtained from respiratory inductive plethysmography (RIP) . Whenever the module do not get the reading for an interval greater than 35 s the alert immediately goes to the parent. The Infant's movements are monitored using Accelerometer, a dynamic sensor capable of a vast range of sensing. Accelerometers are available that can measure acceleration in one, two, or three orthogonal axes.

There has been report of babysitters carrying infants without parent's consent for their own benefits (begging, medical experiments). To avoid such cases we are adapting new method in this system, GSM based infant presence monitoring in cradle.

II. METHODS

Proposed approach is effective for parents to reduce the effort for taking care of infant. Basically it consists of modules which are respect to the infant cry, infant movement, and infant security. Renesas micro-controller is the heart of the system which will interface with all other modules. Microcontroller receives the information from all the modules and processes the data for further uses. Whenever infant face's any problem it will give the alerts to the parent regarding respective issues. LCD use to display the ongoing activity. Details of all modules used in the model are:

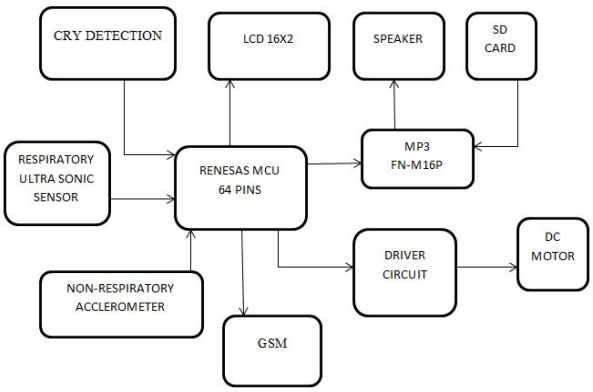

Fig 1. Proposed Block Diagram

A. Cry Detection

M213 sound sensor based on ECM is used to detect the cry and sends the information to the microcontroller. It analyzes the input , makes cradle to swing automatically using motor with the driver circuit after a time interval of 3 counts, if infant cry continues mother voice will be played after 5 counts .Now if the cry doesn't stop, an alert will be sent to parents.

B. Movements Of Infant

We have think about two types of movement respiratory movement and non-respiratory movement.

i) Respiratory movement: An ultrasonic sensor is used which is to detect the breathing of infant. When baby suffer from apnea information will be sent to parent by micro-controller via GSM.

ii) Non-respiratory movement: It is a secondary process which plays a major role, if the respiratory part doesn't work properly. Accelerometer is connected to the wrist or ankle of the infant which will help to detect the infant movement with respect to the x-axis and y-axis. When there will be no movement it will be detected and alert will be sent.

C. Microcontroller

Renesas micro-controller has been used in this project. ROM: 512 KB, RAM: 32 KB, Data flash memory: 8 KB

On-chip high-speed on-chip oscillator.On-chip single-power-supply flash memory.RL78 Family is a 16- and 8-bit CPU core-for embedded microcontrollers of Renesas Electronics introduced in 2010. On-chip debugging functions

D. Flow Diagram

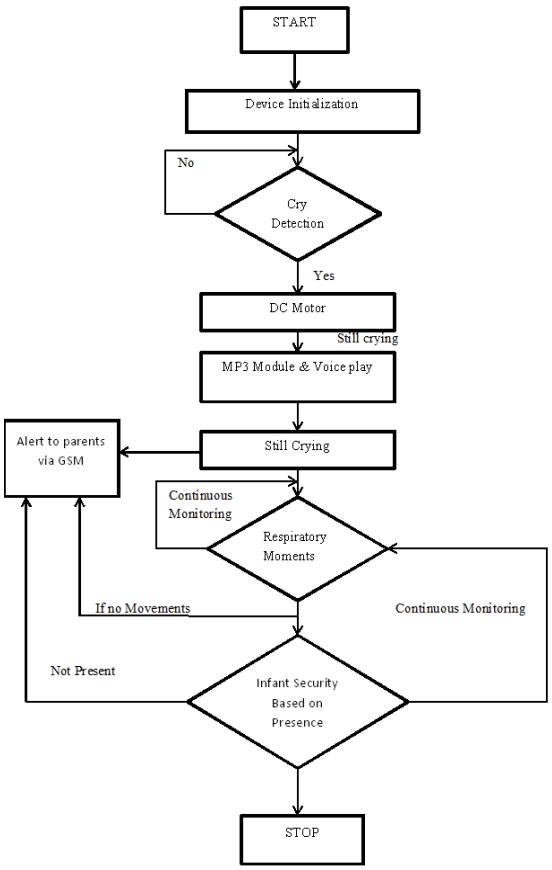

Fig 2. Proposed Flow Chart

III. LITERATURE SURVEY

For development of Infant Care Security system, The movement of infant parts (such as leg ,hand movement) and frequency of infant cry is more important parameter as compared to others as it has crucial role in infant growth mechanism and to detect health condition of infant. Hence frequency of the infant cry has high priority while controlling the infant's movement.

In early choke Infant Monitoring Scheme. Infant behavior recognition is based on neural network. Face region is segmented based on component analysis.

Study of infant expression, features namely mean, variance, skewness and kurtosis are calculated based on the information present from the infant face. Recognition expression includes angry, pain, sadness. The infant face region is then segmented based on the skin color information and then the eight features are extracted from the face region and calculated. By this way we would be able to judge the infant is suffering from choke.

In Pharyngeal and Esophageal pressure measurements to Evaluate Respiratory mechanics infants, on high flow nasal cannula: A feasibility study the aim of this work was to test the feasibility of measuring pharyngeal and esophageal pressure in young children with ARI treated with HFNC and to use these measures to monitor respiratory mechanics in this population. We specifically designed a new system of monitoring acquisition elaboration (MAES) and used it in a series of young children hospitalized. By this method we believe that HFNC decreases breathing effort and to set optimal flow rate for each infant.

Evaluation of ultrasound-based sensor to monitor respiratory and non-respiratory movements and timing in infants. In this we are going to explain and validate a non-contacting sensor that used to reflect ultrasound to separately keep a watch on respiratory, non-respiratory movements of infants. The electrical activity of the diaphragm obtained from an infant. The non-respiratory movement output was compared to movement detected by miniature accelerometer attached in the recording.

Further we have added extra feature GSM based presence monitoring. When infant is moved out of the cradle more than the count we specified the information going to mother through GSM, that infant is missing. If infant continue to cry more than the count specified, that time mother voice is being played which is recorded and stored in SD card of MP3 module.

So, this project reduces the efforts of working women to take care of infant and help them to know status of infant at each particular time.

IV. PROPOSED SYSTEM

The purpose of this project is to reduce the physical interface of the working class parents with greater reliability, efficiency, better adaptability, security and cost effectiveness. The entire system works with the sole purpose of providing convenience by continuously monitoring every activity of the infant and thereby providing real time details and updates to the parents. The project has been successfully monitoring the activities which include conditions like movements of infants, Apnea detection, Care taking through recorded voice, Automatic Cradle Swing and Alerts to parents. However

this project has been in the initial stages but can be optimized in near future with enhanced features and better quality communications between the parents and the E-Cradle which reduces their intimidation and responsibilities only to the extent of upbringing an infant at the initial stages while they were working.

V. CONCLUSION

The project is developed and designed with intuition of assisting the working class parents by providing a model capable of monitoring details of the infant which include Movements of the infants, Apnea Detection, Provides security by monitoring Infant's presence and Alerts to the parents. The model would decrease the existing complex methods of monitoring where typically involves (Electroencephalogram) EEG, Electro oculo gram (EOG), two or three lead chest Electrocardiogram (ECG) were used to monitor are intrusive procedures and not well tolerated by infants and elderly.

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