International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 05 | May 2019 www.irjet.net p-ISSN: 2395-0072

SMART CRADLE BY USING MESSAGING & SENSING TECHNOLOGY

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Abstract- Parents in the present world are busy in their professional life so they do not get sufficient time to take care of their babies. Today's woman has to manage home along with their office work simultaneously. They may not get enough time to swing the cradle manually and sooth the baby. This product can be used from birth to twelve months of babies to detect the infant's cry immediately and e-baby cradle that swings automatically with soft music. The speed of the cradle can be controlled as per the user's need. The system has an alarm and GSM module and indicates two conditions, first when the mattress is wet, it is an important parameter to keep the baby in hygienic condition, second when baby does not stop crying within a stipulated time which intimated the baby needs attention. This product is useful for working parents and hearing impaired parents.

Keywords - Cradle, GSM, Alarm, Attention, and Hearing impaired

1. INTRODUCTION

Infant cry is the first verbal communication of new born baby with the world. The crying of the infant is a common phenomenon and probably one of the most difficult problems which parents have to face when taking care of a baby. The cry of an infant is a biological siren to alert for the care giving environment about their needs to motivate the listener to respond. Most of the times, caretaker's advocate's follow strict routines to train the child for regular feeding, waking and sleeping pattern without considering their emotional and physical needs. Researchers have found babies whose cries are usually ignored will not develop healthy intellectual and social skills .On the other hand, leaving a distressed baby to cry on a regular basis could damage the brain development.

2. LITERATURE SURVEY

A Detection System of Infant's Cry Using Fuzzy Classification from Theory to Practice

Nowadays, it is inconvenient for housekeeper parents to constantly watch over their newborn baby while doing their work or chores. This paper proposes a simple voice recognition system which can be applied practically for designing a device with capability to detect a baby's cry and informing the parents automatically. There are a lot of similar projects and experiments which have been performed recently, but most of them are about recognizing and classifying different types of crying (like for hunger, etc.) and have used complex methods of implementation such as neural network. But in this paper our aim is to merely detect infant's crying, and our solution is to use a fuzzy classifier which is easy to implement and fast to execute. The overall algorithm is to evaluate the resemblance of the infant's voice signal with the data stored in a database, which is already prepared by recording some cry and laughter samples, using an automatic fuzzy classifier system which can lead to detection of cry or laughter. This algorithm can serve as a reliable foundation on which the future creation of a portable real-time, automatic voice detection device can be based. It is a pretty formidable task to implement complex algorithms, such as neural networks, on common available microcontrollers, however we proposed a much simpler algorithm which enables us to develop a real-time and low cost device. To evaluate the algorithm, we have created a database of sample cry and laughter signals and developed a sample Matlab program for carrying out the real-time frequency-domaincalculations and a sample visual program in Labview programming environment for interfacing with user.

Automatic Cradle System with Measurement of Baby's Vital Biological Parameters

There is a need to develop a new low cost indigenous electronic cradle because the existing cradles are imported and costly. This paper presents the design and implementation of a new indigenous low cost E-Baby Cradle that swings automatically when baby cries, for this it has a cry analyzing system which detects the baby cry voice and accordingly the cradle swings till the baby stops crying. The speed of the cradle can be controlled as per the user need. The system has inbuilt alarm that indicates the condition - when baby does not stop crying with in a stipulated time, which intimated that

baby needs attention. This system helps parents and nurses to take care of babies without physical attention by already recorded voice input to FN-M16P model and at this same time Cradle also moves according to the user need.

Auto baby Cry Detector Sleep Music Player

Parents in the present world are busy in their professional life, so they do not get sufficient time to take care of their babies. It is inconvenient for parents to constantly watch over their newborn baby while doing their work or chores. So we have designed an simple system which helps parents in taking care of baby. This system proposes a simple voice detection system which can be applied practically for designing a device with capability to detect a baby's cry and automatically turning on a Baby sleep music. The system is based on PIC microcontroller. Whenever the baby cries it is detected by the controller with the help of Mic and in order to that turns on the music and sleep mechanism which creates soothing sound as well as dim lights which makes baby sleep again gently. In this project a program is implemented to detect an infant's crying. It can detect baby's cry while ignoring other sounds like clap, sneeze, fan, sudden sounds, environment sounds etc.

Design and Fabrication of Automatic Baby Cradle

Cradle is an appliance which use to carry a baby and oscillate automatically with certain speed for comfort sleep of a baby. Babies sleeps sound in mosses baskets or cradle, as they afford a limited sleeping atmosphere which helps them feel secure. B-Care is a novel concept, which enables the movements of a carriage, to raise the cradle, to move the machine from one place to another, automatic movement of cradle when baby is disturbed and much more. The equipment Baby care includes a dc motor, link, and an oscillating bed and sensors. The electric powered motor will actuate the links by shaft. Links actuates the rod attached to the bed at constant speed. The carriage is attached to the metal rod through springs which will provide a vibratory motion. It will also ensure the cradle motion even when the baby cries or moves using sensors. Motor, link and sensors are attached to the side of the cradle frame. High strength, light weight material is used for the manufacturing of Baby care. Baby care is the most cost effective, user friendly, automated mechanism for baby care in the modern nuclear family.

Automated Cradle

The project idea develops from the very fact that a woman finds it difficult to concentrate on her child owing to her busy schedule of house life. The situation aggravates when she has a job or has some household business, since she can neither compromise with her work nor she can ignore her child's needs. Many devices are available to ease her task and help her to balance between her work and the needs of her child. Our Automated Cradle proposes to be one of them. Unlike some of the existing designs, which uses a microprocessor as the controlling unit, the proposed model uses IR wireless technology for less complexity and easy access and the slider crank mechanism used for the swing makes the transition smooth. The user can control the swinging speed of cradle by a remote. The model here has two variable speeds for the cradle swing, which is advantageous in many ways. Once the baby is asleep, the cradle can be brought to low power mode with normal swing.

Baby Cry Detection in Domestic Environment Using Deep Learning

Automatic detection of a baby cry in audio signals is an essential step in applications such as remote baby monitoring. It is also important for researchers, who study the relation between baby cry patterns and various health or developmental parameters. In this paper, we propose two machine-learning algorithms for automatic detection of baby cry in audio recordings. The first algorithm is a low-complexity logistic regression classifier, used as a reference. To train this classifier, we extract features such as Mel-frequency cepstrum coefficients, pitch and formants from the recordings. The second algorithm uses a dedicated convolutional neural network (CNN), operating on log Mel-filter bank representation of the recordings. Performance evaluation of the algorithms is carried out using an annotated database containing recordings of babies (0-6 months old) in domestic environments. In addition to baby cry, these recordings contain various types of domestic sounds, such as parents talking and door opening. The CNN classifier is shown to yield considerably better results compared to the logistic regression classifier, demonstrating the power of deep learning when applied to audio processing.

Smart Cradle Gear to Ensure Safety of Baby in the Cradle

In today's world we see that most of the families consist of mainly the parents and children. When a baby is born in a family there has to be someone to look after the baby. Some parents have to do a double task of keeping a check on the baby as well as do the household work. Keeping a nanny could be an option but not all can afford nannies and also it is

always difficult for parents to rely on some strangers to look after their baby. So to help such parents we have decided to come up with a smart cradle gear which will help a mother or a father have a track of their child and do some household work simultaneously. The idea is to design a smart cradle alarming system that will signal the parents of the baby's activities. The gear will be such that it will fit most of the common cradles or cribs. The system will comprise of sensors, which will detect the baby's activities and alarm their parents.

Development of Smart Safety Cradle Sensor

The title of this project is Smart Safety Cradle Sensor. This project is designed to provide maximum comfort to the baby in addition to maintaining their health. The main objective of this project is to design the Smart Safety Cradle Sensor which this cradle can rock on automatically when any movement of baby detected. This is because; experiments found that using electric cradle are 2-4 minutes lesser than the traditional manual cradle for babies to fall asleep. The experts confirmed that the traditional manual swing size and speed are not stable. Unbalanced swing can make babies' brain not regulate smoothly, and then can affect their health for entire life. Besides that, this baby's cradle also is safe and comfortable for baby with the timer that make a smooth rock on and not continuously that can affect the babies' health.

A Fully Automated Approach for Baby Cry Signal Segmentation and Boundary Detection of Expiratory and Inspiratory Episodes

The detection of cry sounds is generally an important pre-processing step for various applications involving cry analysis such as diagnostic systems, electronic monitoring systems, emotion detection, and robotics for baby caregivers. Given its complexity, an automatic cry segmentation system is a rather challenging topic. In this paper, a framework for automatic cry sound segmentation for application in a cry-based diagnostic system has been proposed. The contribution of various additional time- and frequency-domain features to increase the robustness of a Gaussian mixture model/hidden Markov model (GMM/HMM)-based cry segmentation system in noisy environments is studied. A fully automated segmentation algorithm to extract cry sound components, namely, audible expiration and inspiration, is introduced and is grounded on two approaches: statistical analysis based on GMMs or HMMs classifiers and a post-processing method based on intensity, zero crossing rate, and fundamental frequency feature extraction. The main focus of this paper is to extend the systems developed in previous works to include a post-processing stage with a set of corrective and enhancing tools to improve the classification performance. This full approach allows to precisely determine the start and end points of the expiratory and inspiratory components of a cry signal, EXP and INSV, respectively, in any given sound signal. Experimental results have indicated the effectiveness of the proposed solution. EXP and INSV detection rates of approximately 94.29% and 92.16%, respectively, were achieved by applying a tenfold cross-validation technique to avoid over-fitting.

Automatic E-Baby Cradle Swing Based On Baby Cry

There is a need to develop a new low cost indigenous electronic cradle because the existing cradles are imported and costly. This paper presents the design and implementation of a new indigenous low cost E-Baby Cradle that swings automatically when baby cries, for this it has a cry analyzing system which detects the baby cry voice and accordingly the cradle swings till the baby stops crying. The speed of the cradle can be controlled as per the user need. The system has inbuilt alarm that indicates two conditions – first when the mattress is wet, which is an important parameter to keep the baby in hygienic condition, second when baby does not stop crying with in a stipulated time, which intimated that baby needs attention. This system helps parents and nurses to take care of babies without physical attention.

3. SYSTEM ARCHITECTURE

The block diagram of the proposed system is shown in the figure below. The system consists of two units, child unit and parent unit. The child unit consists of microcontroller (Arduino Uno) which interfaces with audio sensor, temperature and wet sensor and self-soothing mechanism with GSM module. The parental unit consists of a smart phone and alarm.

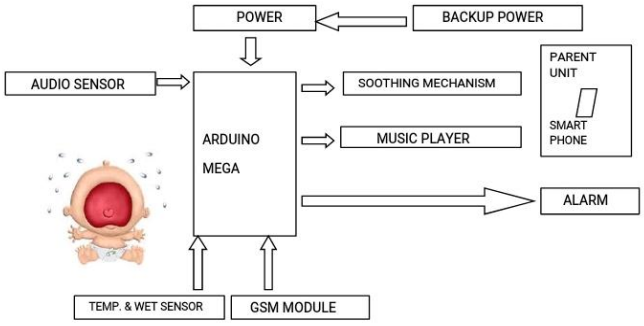


Fig 3.1 System architecture

3.1 Block Diagram Description

When the baby starts crying, it is detected by the audio sensor and is given to the microcontroller. At the same time, soothing mechanism gets activated. The microcontroller is embedded with the programme for detecting the reason for the cry. If the cry is due to temperature variation or wet condition, a message is forwarded to the parent through GSM module and alarm starts. The above process is repeated when the baby continuously cries. After a particular time, if the baby stops crying, only soothing mechanism is required and it stops when the baby settles down.

4. FLOW CHART

Fig 4.1 shows the flow chart of the proposed system.

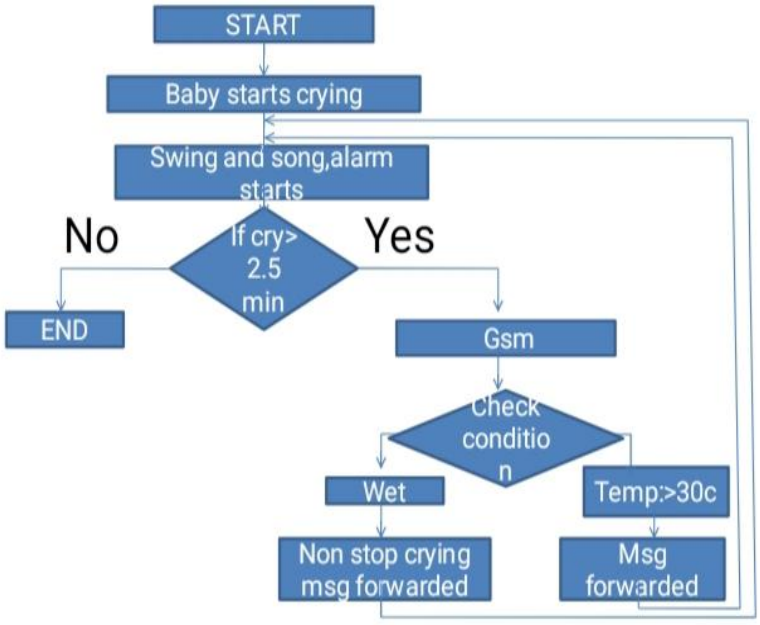
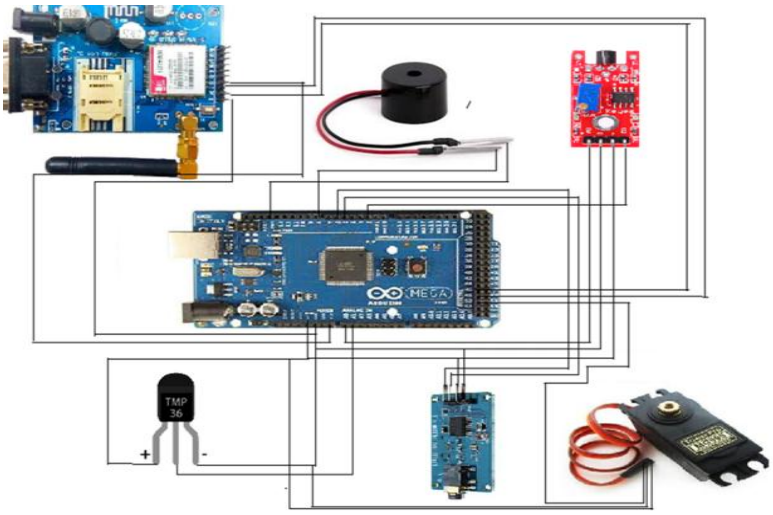


Fig 4.1 Flow Chart

When baby starts crying it is detected by audio sensor, after 4 seconds the cradle starts swinging, music starts & an alarm also starts ringing. If the duration of the cry is below 2.5 minute, only a soothing mechanism is needed. If the duration of the cry is above 2.5 minute, the system checks the reason for the cry i.e whether the cry is due to any wet condition or due to temperature variation. The wet condition is sensed by using two electrodes. The presence of urine indicates a small current flow using the electrodes & and if the baby is continuously crying, a message is forwarded to the corresponding number through GSM module. If the reason for the cry is due to baby's body temperature variation (threshold temperature here is 30 degree C) above 30 degree C, a message is forwarded to the corresponding number.

After sending message, the system again checks the condition of the baby. If the baby stops crying, the system stops. If the baby does not stops crying, the above process repeats.

5. CIRCUIT DIAGRAM



The arduino mega board is connected to the sensors particularly TMP36, KY-038 sound sensor, MG995 towerpro servo motor which is connected to make the cradle swing. The output parts are AE GSM modem, alarm & YX5300 serial music player connected to the arduino for informing the condition of the baby to the parents & provide a music for the baby respectively.

6. RESULT

The individual devices were assembled and was observed to be working efficiently at the time of baby's cry detected by the sound sensor and swing the cradle automatically. When bed is wet and hyperthermia conditions were simulated individually. The developed device was able to send SMS to the users.

Fig 6.1 Assembled Device

7. CONCLUSION

By using the proposed system, we can give a great attention to the child when the baby cries. The message is forwarded to the corresponding number through GSM & alarm starts to indicate the condition of the baby whether there is any temperature variation or any wet condition. These implies that we need to keep the baby in a hygienic condition. Thus we can protect the baby from many health issues. This product is mainly useful for working parents, hearing impaired & blind parents.

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