ISSN: 2454-9940

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

E-Mail :
editor.ijasem@gmail.com
editor@ijasem.org

www.ijasem.org

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

ISSN2454-9940
www.ijsem.org
Vol 18, Issue.2 April 2024

Baby Cradle monitoring And Controlling System using IoT

Mrs.S.Thirumala Devi[1]
[1]Asst.professor, Department of Electronics & Communication Engineering
KKR & KSR Institute of Technology and Sciences
Guntur , India

Pisupati VSSR Adithya, U.Dinesh,
P. Sai Lokesh, U. Balamanikanta [2]
[2]Student., Department of Electronics &communication Engineering
KKR & KSR Institute of Technology and Sciences
Guntur , India

***Abstract*— Availability of high speed internet and wide use of mobile phones leads to gain the popularity to IoT. One such important concept of the same is the use of mobile phones by working parents to watch the activities of baby while babysitting. This paper presents the design of Smart Cradle which supports such video monitoring. This cradle swings automatically on detection of baby cry sound. Also it activates buzzer and gives alerts on phone if –first, baby cry continues tillspecific time which means now cradle cannot handle baby and baby needs personal attention and second, if the mattress in thecradle is wet. This cradle has an automatic rotating toy for baby's entertainment which will reduce the baby cry possibility.**

***Keywords*— Cloud, Cradle, Remote Video Monitoring, Smartphone.**

I. INTRODUCTION

Today's lifestyle is fast paced. Most of the working parents find a bit difficult to manage work along with babysitting. They cannot keep an eye on their child all the time and is hard after long working hours. To sooth the baby by manually swinging the cradle might not be possible in such case. If they have taken help of babysitter for it then also baby's safety related thoughts keep going in their minds.Hence there is need of product which bridges this gap between parents and baby. This cradle system is proposed to help these parents, so that they can take good care of their baby. This cradle system consists of following points.

1. Automatic swinging of cradle starts on the detection of baby cry sound.
2. Sounds an alarm and sends an alert on the smartphone when baby does not stop crying after specific time.
3. Sounds an alarm and sends an alert if mattress is wet.

The bed wet alarm is useful to keep healthy environment near baby and the second alarm is useful to give attention whenever baby needs. [10] This information can be transmitted to Android smartphone through cloud server withthe help of an App. The benefit of such alert is that the parentcan get to know baby status anywhere, anytime because of internet.

Some existing health monitoring systems send an alert onthe mobile phone using GSM module in the form of SMS. [2][9]

B. Survey of Cradle

The first safe and automatically rocking cradle was invented by Marie R. Harper. The spring-loaded motor was used to give oscillatory motion to rock the crib as it would berocked by the mother. [4]

Further the conventional crib is attached with the electronic device and is electronically actuated for rocking. It consistsof sensitivity control so that the baby cry voice detected by the microphone can actuate rocking action for some time using timer. [5]

Later a device is invented to detect the baby cry voice. Soundsignal is amplified with an amplifier and further the pulse signal is generated by a pulse generator circuit. This pulse signal is input to a signal recognition circuit which indicates baby cry detection as an output. [6]

An automatic baby rocker having noise sensor to detect baby cry is proposed where the preamplifier amplifies the inputted sound signal and is fed to Arduino atmega328 microcontroller to control dc motor for rocking. To entertain the baby while rocking, few colourful LED lights are used. [7]

An algorithm is proposed by Yang Hu to adjust crib's swaying extent by signals of sensors. To measure baby status, three pressure sensors are used in sensor network

Nowadays, the use of android smartphone is common in people. Hence system is designed using android technology.

II. RELATED WORK

A. Survey of Existing Monitoring System

The existing system of smart health monitoring uses android mobile phone and is designed in such a way, where raw data is collected from wearable sensors and given to the microcontroller for the processing. Processed output is then sent to android smart phone using Bluetooth technology. [1] [3]

ISSN2454-9940
www.ijsem.org
Vol 18, Issue.2 April 2024

among which one is located at centre and others at left and right of it at the bottom of the bassinet. According to baby status, swaying rhythm can be adjusted. [8]

III. SYSTEM OVERVIEW

A. *Principle behind auto-swing action*

The basic principle behind automatic swinging cradle is as follows. The baby cry sound which is measured in decibel X and compared with preset value Y. The input signal i.e. baby cry sound is amplified and then converted to digital signal to get sound level X.

Sound level(X)= 20 log (V_{in}/V_0)dB

Where,

V_{in}= Voltage when baby is crying.

V_0= Average reference voltage when baby is calm.

The preset value Y can be considered as threshold value. It can be set by taking least value from sample set of baby cry sound. [10]

B. *Algorithm*

The proposed algorithm is as follows:

1) Algorithm 1: For setting threshold values:

```
1. Set_Threshold(){
2. THvalueS1        user input
3. THvalueS2        user input
4. ThvalueS3        user input
5. Update_to_DB(V1,V2,V3)
6. }
```

//The above functions allow user to set Thvalue for each sensor. Then values are saved in database.

2) Algorithm 2: Alert Generation

```
1. Alert_Generation(){
2. ScanValue(channelNo)  //Current Input Value
   //Scanning channel value
3. For(i=0: total_channel){
4. CurrentValue[i]=ScanValue(i);
5. }
6. For(i=0: total_channel){
7. If(CurrentValue[i] > Thvalue[i]){
   //send command to hardware to start buzzer
8. Start_buzzer();
9. Start timer();
10. If t>5min{
11. Send_alert();}
12. Else{
13. Goto 3;
13. } }
```

3) Algorithm 3: for remote monitoring

1. Check if video monitoring requested by client, if true then goto 2 else 7.
2. Check if camera is on, if true goto 3 else goto 4.
3. Display camera connection success message and goto step 5.
4. Display camera connection error message and goto 7.
5. Start video recording and send live feed through cloud server to requesting client.
6. Repeat from 1.
7. stop.

As shown in above algorithms, algorithm 1 is used to set preset value which is used to compare input values from sensors to find whether an alert generation condition is satisfied or not.

In algorithm 2, input value (i.e. ScanValue) from different sensors such as noise sensor and moisture sensor is taken and compared with threshold value. If ScanValue is greater than threshold value, it means baby cry sound detected in case of Noise sensor or it means the bed mattress is wet in case of moisture sensor. The buzzer is activated in such case and an alert is then transmitted through cloud server to android phone. For the transmission from microcontroller to cloud server, RS-232 or zigbee can be used.

C. *System Design*

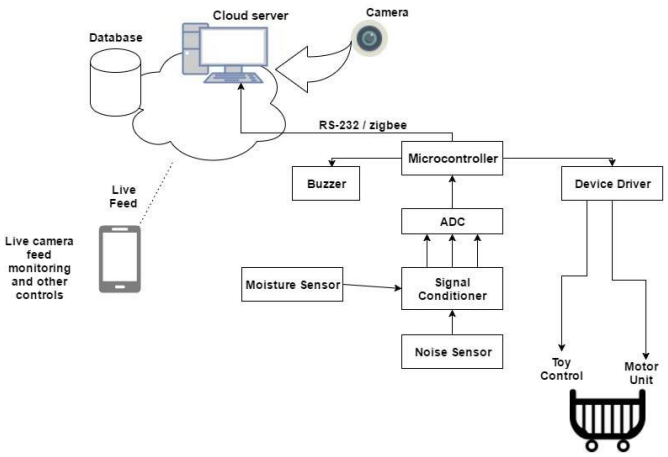

Fig 1.System Architecture

As shown in Fig.1, the Cradle system consists hardware unit, cloud server and database and an android smartphone for video monitoring.

- Cradle: Baby cradle is a bed for an infant which sways as it is connected to motor.

  Cradle consists of rotating toy which starts rotating when baby cry is detected or as per parent's wish. The motor control unit is used to swing the cradle on baby cry detection. Both the motors are controlled using device driver.

  The alert depending upon cry and wet condition canbe sent on smart phone because of IoT.

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT
ISSN2454-9940
www.ijsem.org
Vol 18, Issue.2 April 2024

- Cloud server: A cloud server is similar to a typical server and from a cloud service provider, services can be accessed remotely.
- Camera: A camera is placed near cradle and used for video monitoring. It is continuously capturing images. It is used to know baby status.

  Parent can do video monitoring through an App using internet.

The rotating toy is used to entertain the baby and reduce baby cry possibilities. Most of the time baby cries while awaking from sleep. At such time rotating toy can reduce baby cry by entertaining the baby. The toy starts rotating when baby cry is detected and continue rotating for next 5 minutes. Also the rotation of toy can be controlled as per user's choice.

D. Block Diagram

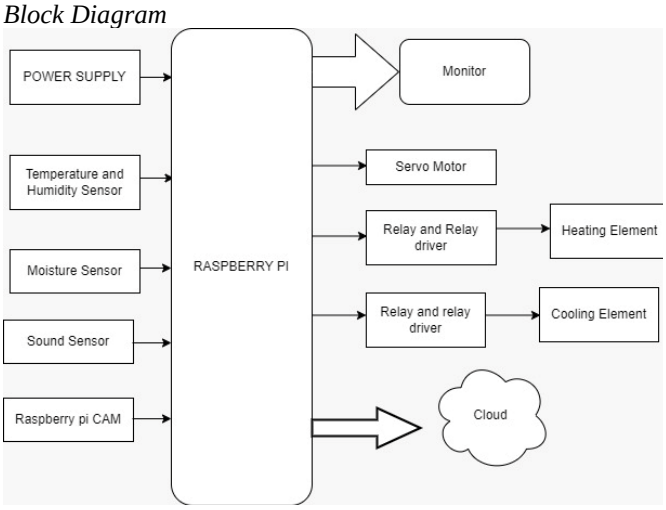

Fig 2 Block Diagram of Cradle's Hardware Unit

Fig.2 shows the basic block diagram build around AVR Atmega32 microcontroller. The system consists of following blocks:

- Noise Sensor: Noise sensor measures the intensity of sound. Microphone detects baby cry sound when baby cries in the bassinet and converts it to electrical signal.
- Signal Conditioning: Amplification of electrical signal is called signal conditioning which is done through op-amp. The amplified signal can then be used by microcontroller.
- Moisture Sensor: The moisture sensor consists of two leads in mesh form. One lead is grounded while other is connected to the microcontroller through pull up resistor. These two leads become short when baby wets the mattress and signal is sent to microcontroller which further sends signal to the buzzer and alert to parent.
- Buzzer: The buzzer is activated in following conditions:
  - If mattress in the cradle is wet indicating that it should be changed along with cloths.
  - If baby does not stop crying after particular time indicating that baby needs attention.
- Driver Circuit: The necessary power to swing the cradle and to rotate the toy is supplied by the driver circuit.
- Motor: DC motors are used to sway the cradle and to rotate a toy.

E. System Analysis

The proposed system S can be represented as

$S^T=\{X(t): t \epsilon T\}$

where,

X(t)= is random input of baby cry sound at time t.

S^T is the all the possible S- valued space containing sample space, algebra, and probability measure of $t \epsilon T$ that map from the set T into the space S.

$S=\{CS, D_{app}, P_{app}, s, d, \mu c\}$

where,

CS= cloud server used to store database, serve clients request (e.g video feed). This database is responsible for storing information related to cloud interactions.

D_{app} is application on server which is mediator between cradle status and android phone. The request sent thorough smart phones are served through this.

P_{app} is android application on parent's smart phone.

s is finite set of sensors. i.e. Noise sensor, Moisture sensor. According to their output, alert will be generated.

d is finite set of devices such as motors for swinging action and toy rotation.

µc is the microcontroller to control hardware and signals.

Here, µc can communicate with PC or cloud server with use of RS-232/ zigbee. Wireless communication like zigbee will be more efficient. As the problem is probabilistic, it can be considered as NP type problem.

IV. RESULTS

A. Implementation in real platform

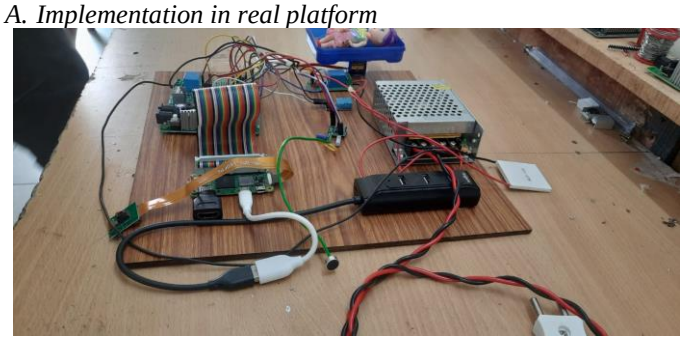

Fig 3 Hardware Unit

ISSN2454-9940
www.ijsem.org
Vol 18, Issue.2 April 2024

As shown in Fig 3. Sensors are connected to microcontroller. Serial communication is used for data transfer.

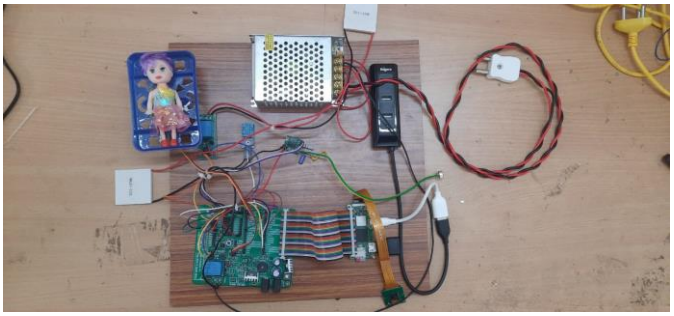

Fig 4 Android Application

As shown in Fig 4. Video monitoring can be done if parent selects start video. According to sensor's data, red highlight indicates that mattress is wet.

Here 4 babies are considered for the analysis. The two cases are considered:

- Babies sleeping in cradle without toy and auto swing facility
- Babies sleeping in cradle with rotating toy and auto swing and monitoring facilities.

The sleep disturbance rate in different cases is as shown in Fig.5

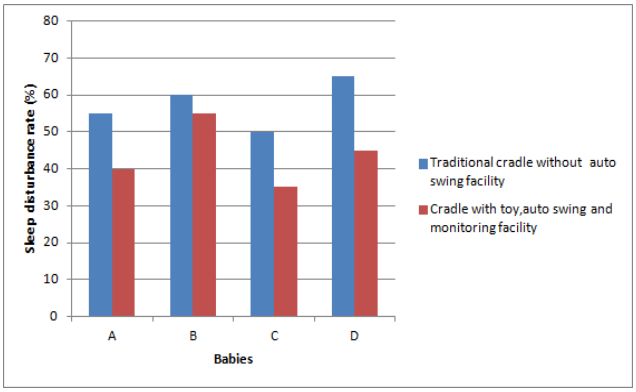

Fig 5 Traditional Cradle Vs Proposed Cradle System

It is observed that baby gets better attention with the help of proposed system design of cradle. It also ensures security of baby with baby sitter.

V. Conclusion

Baby care is hard problem worldwide. It is very important duty as they are our future. Though mother's lap is best for baby, considering the need of present world and knowing the significance of baby care, this system is designed. This system is economical and easy to operate which helps working parents to manage their work. Video monitoring is made available through most commonly used android smart phones.

In future, more features like IR(Infrared) camera for night vision can be an extension of this system. Also other client applications i.e. applications for ios etc. can be designed for this system.

ACKNOWLEDGMENT

The authors would like to thank the college authorities for their cordial support.

REFERENCES

[1] K. Mathan Kumar; R.S. Venkatesan; "A Design Approach to Smart Health Monitoring Using Android Mobile Devices", IEEE International Conference on Advanced Communication Control and Computing Technologies (ICACCCT), 2014 .

[2] Mohamed Y. E. Simik; Abdeldime M.S Abdelgader; Feng Chi; Randa S. I. Saleh; "Automated Alarm System for Diaper Wet Using GSM",IEEE 17th International Conference on Computational Science and Engineering, 2014.

[3] B.Sneha; Bhavana V; Brunda.S; Murali.T.S; Puneeth.S; Ravikiran.B.A; "A Wireless Based Patient Monitoring System Using Android Technology", IEEE International Conference on Applied and Theoretical Computing and Communication Technology (iCATccT), 2015 .

[4] Marie R. Harper, La Mirada, Maxine R. Blea:, "Automatically rocking baby crdle", US3769641, Date of Patent: Nov. 6, 1973.

[5] Gim Wong:, "Automatic bay crib rocker", US3952343, Date of Patent: Apr. 27, 1976.

[6] Chau-Kai-Hsieh, Chiung Lin, Taiwan:, "Baby cry recognizer", US5668780, Date of Patent Sep. 1997.

[7] Steven Bang; Richard Lam; Natalia LoCicero;"Rock Me Baby: The automatic baby rocker" Project for, San Jose State University, Department of Mechanical and Aerospace Engineering, May 17,2011.

[8] Yang Hu, Weihua Gui; "Adaptive sway control for baby bassinet based on Artificial Metabolic Algorithm", School of Information Science and Engineering, Central South University, China.

[9] Anritha Ebenezer, Anupreethi S; "Automatic cradle movement for infant care", Undergraduate Academic Research Journal (UARJ), ISSN: 2278-1129, vol-1, Issue-1, 2012.

[10] Misha Goyal and Dilip Kumar; "Automatic E-Baby Cradle swing based on Baby Cry ", IJCA vo