International Journal of Scientific Research and Engineering Development-– Volume 3 Issue 3, May – June 2020

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

DESIGN OF SMART CRADLE FOR INFANT HEALTH MONITORING SYSTEM USING IOT

Megha Dangi [1] Shraddha Sarna [2] Vinod Kumar Ahuja [3]

[1] Student, Department of Electronics and Communication Engineering, Hyderabad Institute of Technology and Management, Hyderabad, Telangana
meghad404@gmail.com

[2] Lecturer, C.V. Raman University, Bilaspur, Chhattisgarh
Shraddhasarna25@gmail.com

[3] Associate Professor, Department of Electronics and Communication Engineering, Hyderabad Institute of Technology and Management, Hyderabad, Telangana
vinodkumara.ece@hitam.org

Abstract:

Juggling the responsibilities of a job and newborn baby may seem challenging for working parents. Infant health safety and security is always a matter of concern for kith and kin by leaving their baby in care centres. In this paper author has designed an advance cradle system which monitor baby health conditions such as temperature, baby cry and wetness. Parents not only monitor but also can control cradle via mobile. The experimental result shows that the designed system works successfully for the infant healthcare and thus can be implemented practically.

Keywords **— IOT, Infant health monitoring, Node MCU, Smart cradle.**

I. INTRODUCTION

The Internet of Things (IOT) is a massive network of connected devices and encompasses a lot to supply [1]. It is all done using sensors which are embedded in every physical device [2]. IOT provides a standard platform for these devices to dump their data and provides a standard language for all the devices to connect with one another [3]. The real magic is everything communicates over the internet.

Working parents make an enormous proportion of the workforce. Infants need round the clock care, which is practically impossible, particularly where both the parents are working. In such cases, there is a desire of a sheltered and secure mechanism for the consideration of infants [4]. This issue is genuine and inescapable and for parents who are adapting to it every day, it might appear to be overwhelming. It expects them to deal with an unending stream of to-do's, issues and circumstances [5]. At the point when this issue comes out as a matter of great concern today and as we see the strains that the parents are confronting, it straightaway brings the sense of being in charge which at that point opens the entryway for some concrete, practical fixes[6].

The smart cradle system is a boon for parents. It is an innovative cradle system that is designed to nurture an infant in a viable and productive manner. It considers all the minute subtleties engaged with child-care [7]. This system uses IOT for an intelligible and coherent child-care that has the ability to monitor the factors like humidity and body temperature, cry detection mechanism and live video surveillance [8],[9]. An instant mobile alert will likewise be sent to the parent if any irregular action is recognized [10]. Thus, where parents feel difficult to accomplish both the commitments of work and parenting, the framework is planned to such an extent that they can take care of infants even without being genuinely present.

II. METHODOLOGY

Node MCU is the control unit of the entire system. A Wi-Fi module is employed to interface the sensors of the system to the Blynk cloud services. Blynk server is an IoT based server and is utilized for sending, receiving, alarming the parents at whichever point required [11]. The microcontroller receives various inputs, from the sensors and the camera module. The data regarding the cradle will be accessible on the Blynk server with the objective that the parents can monitor the infant any time through their mobile [12]. The various conditions are checked and therefore the information is sent to the parent via Blynk server.

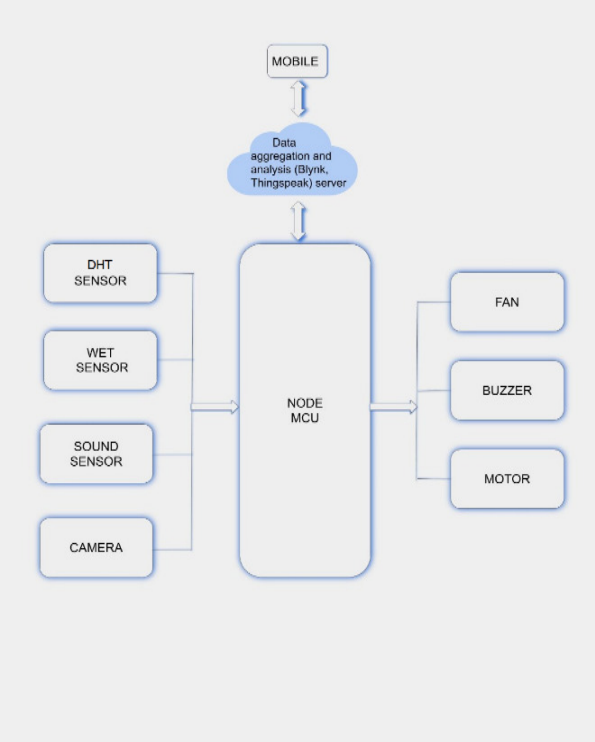

Fig. 1 Block diagram of the proposed system

The above diagram depicts the entire working and overview of proposed framework of the smart cradle system. There are four modules within the cradle system and various sensors like sound sensor, wet sensor, DHT sensor and camera module are executed to monitor the varied activities of the infant.

A. Sound sensor

The sound sensor is employed to detect the sound level of the baby's cry and contrasts it with the threshold limit. In this framework, the motor is accustomed to swing the cradle. Hence, when the baby cries, the motor starts to begin its automatic swinging activity until the infant stops crying.

B. Wet sensor

A hygienic environment is crucial for the infant's wellness. Consequently, to ensure this, we are using the wet sensor to check for the bed wet condition. The sensor's output values recovered will be uploaded to the cloud and remotely monitored. When the wetness is perceived, the parents are intimated through a buzzer.

C. DHT11 Sensor

This sensor is used to gauge the temperature and humidity of the cradle. The purpose is to measure the temperature of the infant's surroundings. If there is a change in temperature and if the temperature exceeds a certain threshold level, a fan can be pivoted.

D. Camera Module

The next module involves the baby monitoring system. The camera module integrated with the cradle establishes a correspondence channel between the parent and the infant. It records all movements of the baby and subsequently the parents have an option to see the child on their mobile application. This will be able to intimate the parent about any unpredictable activities or any irregularities.

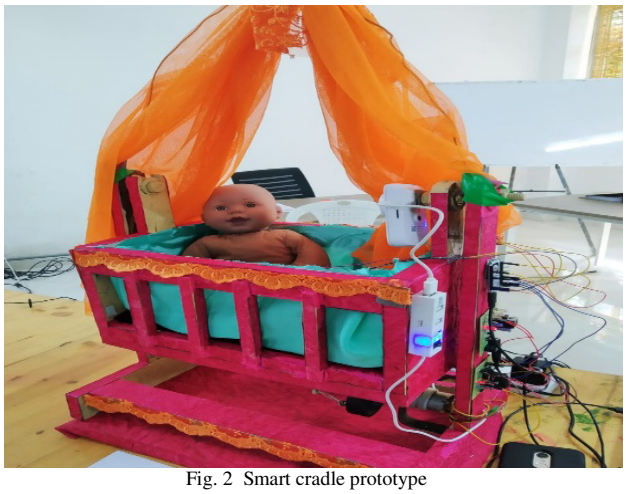

Fig. 2 Smart cradle prototype

III. RESULTS AND DISCUSSIONS

The following results were obtained from the designed smart cradle for infant health care.

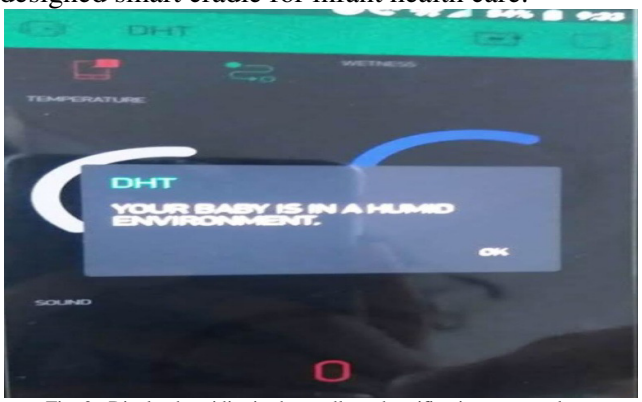

Fig. 3 Display humidity in the cradle and notification to caretaker

The DHT sensor monitors the humidity and depending upon the value measured the parent receives a notification as shown in the above figure.

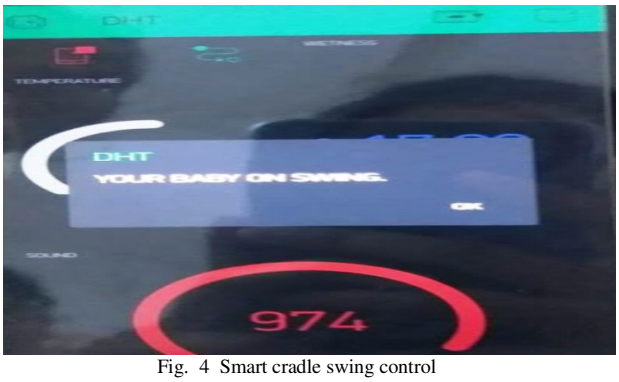

Fig. 4 Smart cradle swing control

In response to the situation where the baby starts crying, the automatic swinging mechanism occurs. The parent is then notified that that the baby is on swing.

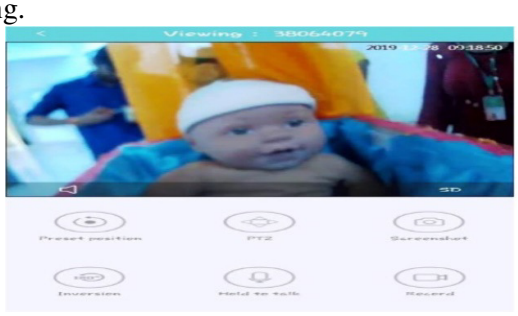

Fig. 5 Baby monitoring via smart phone

As appeared in figure 5, the parents will be able to see the infant live on their mobile application through the camera module that is integrated with the cradle.

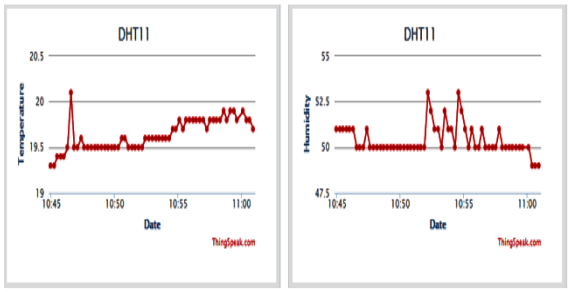

Fig. 6 Cradle temperature and humidity

The graph in figure 6 illustrates temperature and humidity over time. The figure portrays the contrast between the temperature and humidity at various instances of time for the values estimated by the DHT11 sensor. The parent can easily monitor the curve and once it crosses a certain value, necessary action can be taken.

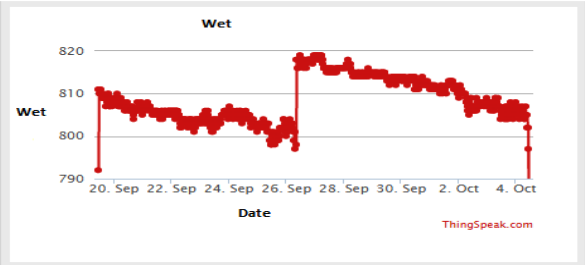

Fig. 7 Baby wetness in the cradle

The wetness over a prolonged interval of time can likewise be visualized by acquiring the plot between the measure of wetness perceived to the corresponding date. This is depicted in the graph in figure 7.

Fig. 8 Baby crying in the cradle

As observed from figure 8, the graph represents the variations in the sound (in decibels) level of the infant's cry at specific time intervals.

IV. CONCLUSIONS

A smart cradle system for infant care is proposed using the Internet of Things. It fulfills the requirements of working parents who probably will not be available with the infant consistently. The framework assures the parents that the baby is secure. Various features that are integrated with the cradle helps the parents to effectively monitor all the prospective parameters remotely. They will likewise receive an instant notification in case there is any anomaly or irregularity. Hence, the smart cradle system comes as an aid to parents and emerge as a reliable system for infant care.

ACKNOWLEDGMENT

We would like to express our special gratitude to students skill development center (SSDC) for providing necessary laboratory facility and guiding us to carryout research work. I would like to extend my sincere thanks to HITAM management.

REFERENCES

[1] Andrea Zanella, Nicola Bui, Angelo Castellani, Lorenzo Vangelista, Michele Zorzi, "Internet of Things for Smart Cities", IEEE INTERNET OF THINGS JOURNAL, VOL. 1, NO. 1, FEBRUARY 2014, pp. 22-32.

[2] Yusuf Perwej, M. A. AbouGhaly, B. Kerim and Hani Ali M. Harb. "An Extended Review on Internet of Things (IoT) and its Promising Applications" Communications on Applied Electronics (CAE), ISSN: 2394-4714, Foundation of Computer Science FCS, New York, USA, Volume 9, Number 26, Pages 8– 22, February 2019.

[3] W. A. Jabbar, M. H. Alsibai, N. S. S. Amran, and S. K. Mahayadin, ''Design and implementation of IoT-based automation system for smart home,'' in Proc. IEEE Int. Symp. Netw., Comput. Commun. (ISNCC), Jun. 2018, pp. 1–6.

[4] Rachana M S, Sanjana M Nadig; "S-MOM: Smart Mom On The Move", 2nd international Conference trends in Electronics and Informatics (ICOEI),2018.

[5] R. Palaskar, S. Pandey, A. Telang, A. Wagh and R. Kagalkar, "An Automatic Monitoring and Swing the Baby Cradle for Infant Care", International Journal of Advanced Research in Computer and Communication Engineering, vol. 4, no. 12, pp. 187-189, 2015.

[6] K. Lohekar, S. Deshmukh, S. Ambekar, N. Gole, and L. Vina, ''Smart baby cradle,'' Int. J. Res. Eng., Sci. Manage., vol. 2, no. 3, Mar. 2019.

[7] M. Levy, D. Bhiwapurkar, G. Viswanathan, S. Kavyashree, and P. K. Yadav, ''Smart cradle for baby using FN-M16P module,'' Perspect. Commun., Embedded-Syst. Signal-Process., vol. 2, no. 10, pp. 252–254, 2019.

[8] C.-T. Chao, C.-W. Wang, J.-S. Chiou, and C.-J. Wang, ''An Arduino-based resonant cradle design with infant cries recognition,'' Sensors, vol. 15, no. 8, pp. 18934–18949, 2015.

[9] M. Goyal and D. Kumar, ''Automatic E-baby cradle swing based on baby cry,'' Int. J. Comput. Appl., vol. 975, p. 8887, Jan. 2013.

[10] A. F. Symon, N. Hassan, H. Rashid, I. U. Ahmed, and S. M. T. Reza, ''Design and development of a smart baby monitoring system based on Raspberry Pi and Pi camera,'' in Proc. 4th Int. Conf. Adv. Elect. Eng. (ICAEE), 2017, pp. 117–122.

[11] E. Saadatian, S. P. Iyer, C. Lihui, O. N. N. Fernando, N. Hideaki, A. D. Cheok, A. P. Madurapperuma, G. Ponnampalam, and Z. Amin, ''Low cost infant monitoring and communication system,'' in Proc. IEEE Colloq. Humanities, Sci. Eng., Dec. 2011, pp. 503–508.

[12] Sujal Rane1, Kajal Sutar2, Vaidehi Temghare3, Prof. Rahul Patil4 and Prof. Sandip Chavan, "Baby Health Monitoring System using Wireless and Remote Access Technology", International Journal of Recent Trends in Engineering & Research, 2017.

AUTHOR'S DETAILS

Megha Dangi is currently a second year Electronics and Communication Engineering (ECE) student at Hyderabad Institute of Technology and Management, Gowdavelly, Medchal mandal, Telangana, Hyderabad. She is a member of Student Skill Development Center (SSDC), a center for excellence in IOT, since 2019. She has worked with various sensors and actuators using Arduino. Her area of research is Internet of Things (IOT).

Shraddha Sarna completed M.Phil from C.V. Raman University, Bilaspur, Chhattisgarh, India. Her area of research includes wireless sensor network, Internet of Things (IOT).

Vinod Kumar Ahuja is working as Associate Professor at the department of Electronics and Communication engineering at Hyderabad Institute of Technology And Management and pursuing PhD from K L University, Guntur, A.P, India. His research interest includes Distributed Antenna System, IOT, and wireless communication. He has published various papers in the field of wireless communication and IOT. He was appointed as IOT trainer for DDUGKY which is central Govt. initiative. His head of student's skills development centre at HITAM.

