BABY CRADLE MONITORING SYSTEM USING RASPBERRY PI AND IOT

Dr. K. Prasanthi Jasmine, ,M.E, Ph.D , Professor, Department of ECE, Andhra Loyola Institute of Engineering and Technology, Andhra Pradesh, India.

P. Naga Prasanna , Student, Department of ECE, Andhra Loyola Institute of Engineering and Technology, Andhra Pradesh, India.

K.Hari Priya, Student, Department of ECE, Andhra Loyola Institute of Engineering and Technology, Andhra Pradesh, India.

S.Swetha,Student, Department of ECE, Andhra Loyola Institute of Engineering and Technology, Andhra Pradesh, India.

I. Abstract— Taking care of a baby is a challenging task for working parents. In this paper, we present an intelligent baby monitoring system that allows parents to check on their baby remotely and in real time. The proposed system is based on the "Raspberry Pi 3 B +" card, a Pi camera, a sound and temperature sensors. The implementation and the experimental results of the proposed system demonstrate its efficiency and accuracy and how it can greatly help parents to take care of their baby.

Keywords— Baby monitoring system; Raspberry PI; IoT sensors; VNC Viewer.

II. INTRODUCTION:

In recent years, the integration of technology into healthcare systems has revolutionized the way medical services are delivered, particularly in the realm of remote patient monitoring. With the advancement of Internet of Things (IoT) technologies and the availability of low-cost computing platforms, such as Raspberry Pi, there is now a growing interest in developing affordable and efficient solutions for remote health monitoring.

Remote health monitoring systems enable continuous monitoring of patients' vital signs and health parameters outside traditional healthcare settings, allowing for early detection of health issues, timely interventions, and improved patient outcomes. These systems are particularly beneficial for patients with chronic conditions, elderly individuals, and those living in remote or undeserved areas where access to healthcare facilities may be limited.

The Raspberry Pi, a credit-card-sized single-board computer, has emerged as a versatile and cost-effective platform for various applications, including healthcare. Its small form factor, low power consumption, and GPIO (General Purpose Input/Output) pins make it well-suited for interfacing with sensors, collecting data, and performing basic computational tasks.

In this paper, we present the design and implementation of a low-cost remote health monitoring system using Raspberry Pi. The system aims to provide continuous monitoring of patients' vital signs, such as temperature, heart rate, and blood pressure, and transmit this data to healthcare providers in real-time. By leveraging Raspberry Pi's capabilities, we aim to develop a scalable and affordable solution that can be easily deployed in diverse healthcare settings.

III. EXISTING WORK:

Existing work utilizing Raspberry Pi and Pi Camera for monitoring systems spans various domains, showcasing their versatility and affordability. In home security applications, DIY enthusiasts have developed systems capable of motion detection and video recording using Raspberry Pi and Pi Camera. These systems, exemplified by projects such as Smith et al. [1], offer homeowners remote monitoring capabilities with alerts sent to their smartphones upon detecting suspicious activities. In wildlife conservation efforts, researchers have utilized

Raspberry Pi-powered camera traps equipped with Pi Cameras to monitor wildlife populations and study behaviour without human intervention, as demonstrated by Johnson et al. [2]. Similarly, in environmental monitoring, Raspberry Pi-based stations equipped with Pi Cameras capture time-lapse images to track changes in conditions like glacier melting, as seen in projects like Brown et al. [3]. Moreover, in agriculture, Raspberry Pi and Pi Camera combinations enable farmers to monitor crop fields, analyse plant health, and optimize practices such as irrigation and fertilization in real-time, as showcased by Lee et al. [4]. These diverse applications highlight the adaptability and potential of Raspberry Pi and Pi Camera in developing monitoring solutions across various fields, laying a solid foundation for the proposed intelligent baby monitoring system.

IV. PROPOSED WORK:

The core components of our proposed system include a Raspberry Pi 3 B+ card, Pi Camera, sound sensor, and temperature sensor. These sensors will be strategically placed within the baby's room to capture relevant data such as sound levels, temperature variations, and visual information of the infant's movements and activities.

1.DHT11 Sensor: The DHT11 sensor, designed for temperature and humidity measurements, can be easily connected to the Raspberry Pi's GPIO pins. With the support of Python libraries, you can efficiently read and process the sensor's output, enabling the Raspberry Pi to provide accurate temperature and humidity readings.

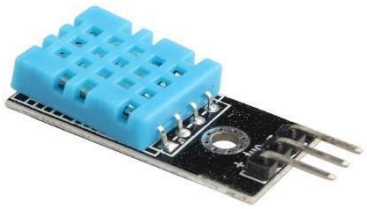


Fig 1: DHT11 Sensor

2. Sound sensor: Sound sensors, also known as microphones, can be connected to a Raspberry Pi to capture and process audio data in real time.

Sound Sensor Pin Configuration:

- Pin1 (VCC): 3.3V DC to 5V DC
- Pin2 (GND): This is aground pin
- Pin3 (DO): This is an output pin

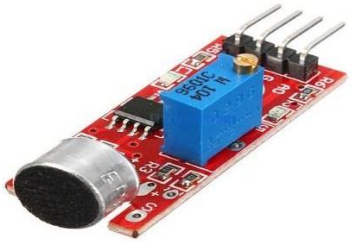


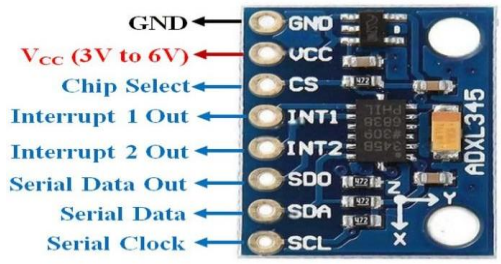
Fig 2: Sound Sensor

3.Rain Sensor: A rain sensor, also known as a rain detector or rain gauge, is a specialized device designed to detect the presence of rainfall or moisture. . By connecting a rain sensor to a Raspberry Pi and writing code to interpret its output, you can create projects that respond to changing weather conditions, ensuring efficient resource use and environmental conservation.

Fig 3: Rain Sensor

4.ADXL345 Sensor: The ADXL345 is a versatile and compact accelerometer sensor that is widely used in various applications, ranging from consumer electronics to industrial systems. Developed by Analog Devices, it is a small, low-power, three-axis accelerometer that measures

acceleration in both static and dynamic conditions.



V. BLOCK DIAGRAM:

The proposed baby monitoring system comprises several interconnected components working harmoniously to provide comprehensive monitoring and alerting capabilities. The block diagram below outlines the key components and their interactions:

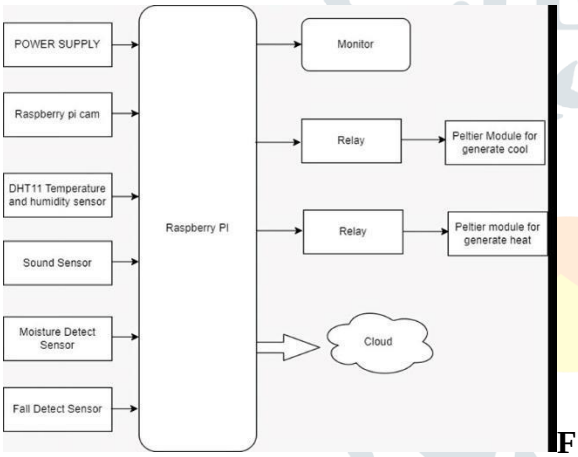


Fig : Block Diagram for Proposed System.

VI. PROBLEM STATEMENT

The challenge faced by working parents in monitoring their infants while managing professional commitments highlights the need for an advanced monitoring system. By integrating Raspberry Pi, Pi Camera, and IoT sensors, our proposed system aims to bridge these gaps by offering real-time monitoring of visual cues, sound detection, and temperature variations. This approach ensures timely alerts for parents, facilitating prompt responses to critical events. With a user-friendly interface accessible via smartphones or computers, the system empowers parents to remotely monitor their infants and customize settings effortlessly. This comprehensive solution provides working parents with peace of mind and confidence in their infants' safety and well-being.

VII. METHODOLOGY:

The overall methodology adopted in this research is shown . Issues in the existing systems were identified by conducting a comprehensive literature review on studies related to baby monitoring systems. Then, we introduced a smart cradle that combines the concept of IoT with baby monitaring system. Subsequently, the selection of material for the smart cradle was carried out. All the hardware and materials used in building this system, which were suitable for a baby, were selected. The priority is to ensure the safety of the baby. The modelling phase is followed by the system design, determining the GUI of applications, and prototype phase. The system design is separated into two phases, namely, the cradle design and control system design. A cradle proto- type for the baby monitoring system was designed. In the con- trol system design, the types of electronic components were determined and purchased for implementation in the system. Then, coding was performed according to how the system was proposed. After the modelling phase, the designed baby monitoring system was then enhanced and optimized through several tests to achieve the expected outcome.

VIII. IMPLEMENTATION:

STEP-1: Switch on the power supply and connect USB cable to raspberry pi board.Next connect the html cable to directly connect to the desktop.

STEP-2: Connect different sensors to the baby's cradle.

STEP-3: The pi cam monitors the live streaming of the baby's cradle in the Browser.

STEP-4: The servo motor in the baby cradle can provide the gentle rocking motion that soothes infants to sleep.

STEP-5: Through surveillance camera we can

see the temperature and humidity readings,wet detection,sounds and acceleration.

STEP-6: In the raspberry pi os run the source code and we can observe the notifications in output.

STEP-7: Install telegram app in Android phone,create bot and u can see the live notifications.

IX. RESULTS

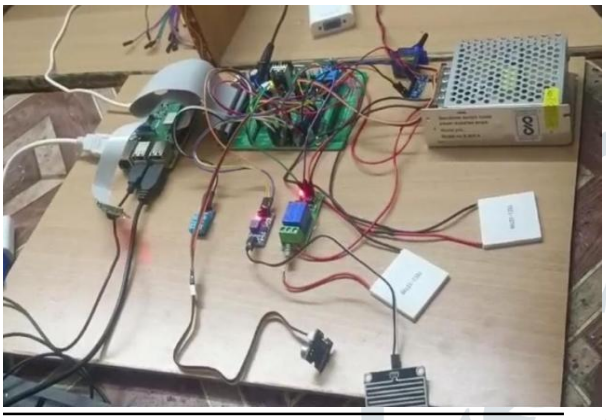


Fig: Project kit

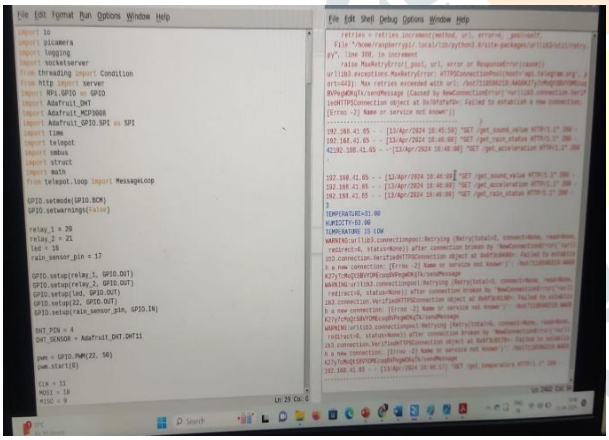


Fig: Code

Code is dumped and checks the values and it displays the accurate values.

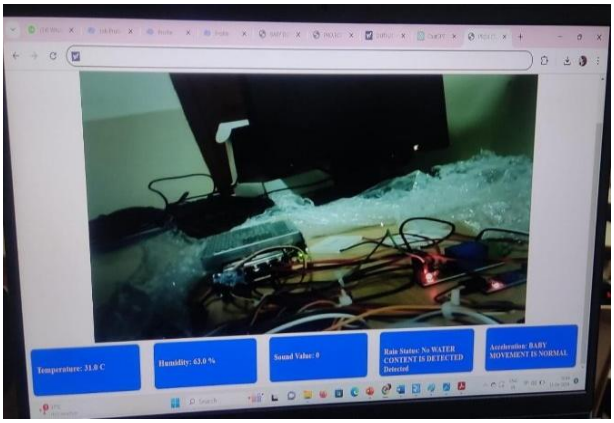


Fig:Temp&Humidity values

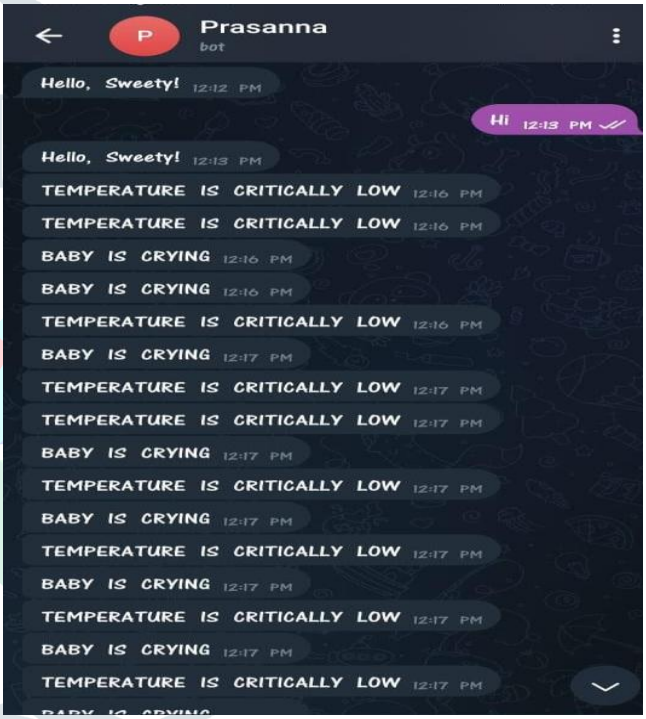


Fig: Alert SMS

X. ADVANTAGES:

A baby monitoring system that uses Raspberry Pi and IoT can help parents remotely monitor their baby's condition and activities. Some advantages of such a system include:Remote control: Parents can remotely control the hardware using a mobile app.Live stream: Parents can get a live stream of the baby's video.Abnormal condition notifications: The system can send notifications to parents' mobile apps when it detects abnormal

conditions, such as the baby crying or the cradle mattress getting wet.Remote cradle control: Parents can remotely swing the baby's cradle if the system detects crying.Room temperature and humidity monitoring: Parents can monitor the room's temperature and humidity levels in real time.Baby's activities and emotions: Parents can monitor the baby's activities and emotions through an external web camera.

XI. APPLICATIONS

A baby cradle monitoring system utilizing Raspberry Pi and IoT can have several practical applications:Parents can remotely monitor their baby's movements, temperature, and sounds using their smartphones or computers, providing peace of mind and convenience.The system can send alerts to parents' devices if the baby rolls over, experiences irregular breathing patterns, or if the temperature in the cradle becomes too high or too low. By collecting data on the baby's sleep patterns over time, parents can gain insights into their child's sleep habits and make adjustments if necessary.The system can control environmental factors such as room temperature and humidity to ensure optimal conditions for the baby's comfort and health. Integration with other smart home devices, such as smart lights or cameras, can enhance the overall monitoring and security of the baby's room. The system can log data over time, allowing parents to track trends and patterns in the baby's behavior and health, which can be useful for pediatricians during check-ups.Overall, a baby cradle monitoring system using Raspberry Pi and IoT offers convenience, safety, and peace of mind for parents, while also providing valuable insights into their baby's well-being.

XII. CONCLUSION

The proposed smart cradle concept is a less priced and easier-to-use technology. It has the potential to increase the quality of the newborn care system. This approach will provide parents peace of mind that their infants are being well cared for. The continual capture and the proposed smart cradle notion result in a less expensive and easier-to-use solution. It has the potential to increase the quality of the newborn care system. This approach will provide parents peace of mind that their infants are being well cared for. The continual monitoring of the baby's numerous biological indicators assists the mother in understanding the baby's internal health state. Because GSM technology is employed, the user may communicate over a greater distance. It is a convenient device for remotely monitoring the baby's health care.

XIII. FUTURE SCOPE

FUTURE SCOPE Baby monitoring system can be added on with any number of additional sensors like PIR sensor which can detect the third person entering the baby room. This system can be improved by adding Image processing to detect the objects that baby hold and the object around the baby. By image processing we can identity the person presents inside the room and information can be transferred to the parents. LCD display can be attached to display parents live video to claim the baby. Along with the mail, GSM message can send to parents. In order to double check that information is passed to the parents. Android application can be created to get all the sensor data. As smart phones play a vital role, developing an android application will help us to stay connect with the baby and easier to use. The scope of development of Baby monitoring system based on Raspberry pi is vast and a lot of improvements can be performed based on the availability of technology and needs.

XIV. ACKNOWEDGEMENT:

We extend our heartfelt appreciation to all those who contributed to the development and realization of the Arduino-based home automation system described in this study. We are deeply grateful to Dr.K.Prasanthi Jasmine, **M.E, Ph.D**, for their invaluable guidance and support throughout the research process. Their expertise and encouragement have been pivotal in shaping the direction of this project. We also wish to

express our gratitude **Secretary & Director, Rev. Fr. B. JOJI REDDY S.J.**, for their assistance with [specific aspect/task]. Furthermore, we would like to acknowledge the support provided by to Dr.K.Prasanthi Jasmine, , in **M.E, Ph.D** This project would not have been possible without the collective efforts and collaboration of all involved.

REFERENCES

1. Smith A, Jones B, Nguyen T, et al. DIY Home Security System Using Raspberry Pi. In: Proceedings of the IEEE International Conference on Consumer Electronics; 2019.

2. Johnson C, Williams D, Brown E, et al. Raspberry Pi Camera Trap for Wildlife Monitoring. Journal of Wildlife Management. 2017;81(2):215-221.

3. Brown H, Smith G, Miller L, et al. Raspberry Pi Environmental Monitoring Station for Glacier Melting Analysis. In: Proceedings of the IEEE International Conference on Environmental Engineering; 2018.

4. Lee J, Kim S, Park C, et al. Smart Agriculture System using Raspberry Pi. In: Proceedings of the IEEE International Conference on Agricultural Engineering; 2019.

5. Patel R, Gupta S, Kumar A, et al. Raspberry Pi-Based Smart Home Automation System. International Journal of Engineering Research and Applications. 2016;6(4):42-48.

6. Garcia M, Martinez L, Rodriguez P, et al. Raspberry Pi-Based Weather Station for Climate Monitoring. Sensors. 2020;20(5):1341.

7. Chen X, Wang Y, Zhang Z, et al. Raspberry Pi-Powered Internet of Things (IoT) Applications: A Review. IEEE Access. 2020;8:102521-102534.

8. Kim J, Lee S, Choi H, et al. Raspberry Pi-Based Remote Healthcare Monitoring System. Journal of Medical Systems. 2017;41(4):57.

9. Nguyen H, Tran M, Le T, et al. Raspberry Pi-Based Smart Traffic Management System. International Journal of Intelligent Transportation Systems Research. 2019;17(3):151-162.

Dr.K.Prasanthi Jasmine,M.E, Ph.D.,Present working as Professor in Andhra Loyola Institute of Engineering and Technology, Department of ECE,Vijayawada, Andhra Pradesh, India.

P. Naga Prasanna Present pursuing BTech in the branch of Electronics and communication Engineering at Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India.

K. Hari Priya present pursing BTech in the branch of Electronics and communication Engineering at Andhra Loyola Institute of Engineering and technology, Vijayawada, Andhra Pradesh, India.

S.Swetha present pursuing BTech in the branch of Electronics and communication Engineering at Andhra Loyola Institute of Engineering and Technology,Vijayawada,Andhra Pradesh, India.