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An Approach on the Development of a Smart Monitoring System of a Baby Cradle

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Abstract: Baby care has grown increasingly vital and difficult for working women in recent years. Working mothers will not have enough time at home to regularly check their babies. They delegate responsibility for their baby to a baby sitter or send the baby to their grandparents' home. A smart cradle with an automatic baby monitoring system was designed in the proposed work. The necessary parameters of the infant, such as temperature, heartbeat rate, gas molecules, capture the movements, and position of the baby, were measured and monitored in the baby monitoring system. The infant monitoring system is connected to the cradle, creating an incubator-like environment for the baby. The infant monitoring device keeps an eye on the baby 24 hours a day, seven days a week. The mobile application will display the measured parameters concerning the baby's health, such as temperature, heartbeat rate, and wetness on the baby bed. The baby monitoring system prototype aids parents in time management while also making life easier for caregivers. This infant monitoring device has been shown to do the least amount of harm to the baby while providing the highest level of accuracy.
Though several models are already available on the market, the primary goal of this research paper would be to propose an approach for recognizing a particular accent of an individual infant among a group of infants using advanced technologies like as Ai, NLP, or speech recognition.

I. INTRODUCTION

Given today's heightened living standards and hectic lifestyles, taking care of infants has become a very difficult duty because they require constant attention and supervision from the caregiver. But as technology has developed, smart baby cradles have appeared to lighten the load on parents and other caretakers. The smart baby cradle is an intelligent device with a variety of features, including the ability to swing the infant automatically whenever necessary, provide live monitoring via a web camera, provide entertainment by playing music or rotating a musical toy, detect baby cries, monitor the infant's vital signs, and send users alert messages when an event is detected (e.g. cry, baby wakeup, mattress wetness, real time monitoring etc).

By offering continuous monitoring for infants, the smart baby cradle seeks to assist parents or caregivers in providing better care for babies and improving baby safety. The standard cradle, which lacks a battery or an adaptor that automatically automates the cradle. Because of the high economic expense, traditional cradles are used in rural and underdeveloped areas. The constant need for manpower to care for their child is its main downside, and such traditional cradles may also cause discomfort to the baby. As a result, we require an automated cradle that can care for the infant using a battery or an electrical power source. Furthermore, this automated cradle has additional features or functions that are advantageous to parents.

The system includes temperature sensors, humidity sensors, sound sensors, and so on. All of these are linked to the Arduino. The message is transmitted to the parents, and the dc motor is employed to move the dummy shaft via the motor driver. Aside from that, the outcome can be viewed on the android application from anyplace in the remote area. This is considered a prototype for our project, although it may be adjusted based on our needs. As some examples of the cradle's advantages The user's needs can be taken into account when customising the cradle. It decreases the workforce as well. Parents who are away from their child can still keep an eye on them using a mobile device. The system's hardware is controlled by an Arduino module, and the baby's movement is tracked using a USB camera and an ultrasonic sensor. The primary goal of this project is to create and implement a baby care cradle that keeps track of a baby's movements and wetness, particularly when it is removed from an unsanitary environment. User-friendly—simple and having a user guide that is straightforward to understand. This is commercially viable and will offer a creative and adaptable cradle. The current project requires less human labour. Aside from that, the entire system is movable, making it simple to relocate from one room to another. The device has a lot of room for advancement, which should lead to its commercial availability and appeal. The suggested remedy strives to raise the standard of the current infant cradle system. The camera module that is attached to the cradle aids in continuous monitoring of the baby as part of the system we have presented, which intends to monitor the signals of the baby, including body temperature and humidity.

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II. DESIGN AND DEVELOPMENT OF SYSTEM

We unveiled a smart cradle that integrates IoT technology with an infant monitoring system.

Fig 1: A Baby Cradle

Utilizing some sensors, the cradle's attributes and dummy model are determined. The cradle is designed in two stages: the cradling design and the control panel. Coding was done to implement the cradle system after collecting all the necessary sensors and hardware. After the modelling stage, the performance and functionality of the created infant monitoring system were then improved and made efficient by multiple testing to get the desired result. Before creating the final version of the smart cradle, the system was afterwards installed on the cradle prototype for testing. The testing procedure was repeated if an error was found until the cradle achieved the intended results and the study goals.

The setup of each and every gear and sensors have little to no error. In order to learn more about the design of the baby cradle in terms of usefulness and cost effectiveness, we also looked at the numerous infant cradles that are currently on the market. The following list of hardware components is included:

1) Arduino UNO
2) Motor shield
3) PIR sensor
4) GPRS shield
5) Surface temperature sensor
6) Wet sensor (designed on PCB)
7) Power Source (9volt rechargeable battery)
8) Geared Motor

A. Designing of the System

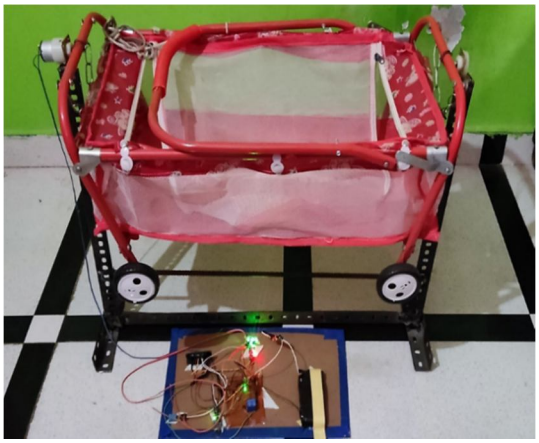

Fig 2: Cradle Design

Before a product can be made, it must have a full design with precise measurements. An essential part of this project's success is its design. Therefore, a few criteria were taken into account before the design process. To visualize our full sketch, use a photo that is more realistic. We created the proportions and primary parts of this baby cradle so that it may swing and be attached to the created monitoring system. A critical phase in the designing and implementation process is choosing the hardware and sensors. The qualities and cost-effectiveness of a candidate are the first considerations in the methodical selection of the best hardware for the specified application. One of the crucial components of a good implementation is choosing the right hardware. It was made to seem like a traditional infant cradle but with modern technology. The infant cradle includes sideways protection to prevent sides including front exits for the child.

To allow the baby to look throughout, the borders have been made translucent. The back side resembles a door; however, it opens and closes at a 90-degree angle out of its starting position and does not travel sideways. It might be the newest infant cradle with cutting-edge technologies integrated. The infant cradle is wide enough and rectangular in design, making it simpler for the end user to change the baby's diaper or clothing.

B. Development of the System

1) *Implementation of the PIR sensor Monitoring System:* A strong state sensor suitable for capturing infrared radiation emitted from objects is the pyroelectric infrared (PIR) sensor. The sensor's primary function is to measure changes in infrared radiation caused by the development of objects that are placed in its field of view. Since the sensor can recognize objects while they are moving, it is frequently referred to as a movement finder. To track the development of the youngster in this investigation, a PIR sensor was attached to the support pole. When the infant's developmental stage was identified, a control sign was made to swing the support for five minutes. If the sensor detected the infant's development after the swing stage had advanced, the swing was repeated for a further five minutes.
2) *Implementation of the BED-WET sensing system:* A mesh-like structure with a cross section comprised of two leads with extended structures was created on a copper-clad board. The expanded structures of the leads don't cross across. The leads were attached to a 5V power source through a 55 kilo-ohm resistance in another section of the bed-wetted state. The second lead was wired to the ground. The framework's yield was calculated using the lattice lead and the 55 kilo-ohm resistance. The yield was linked to the AIO data on the Arduino UNO board. The lattice surface will continue to function as an open circuit with a typical sensor yield of 5V. The bed-wet situation will cause the yield voltage to drop.

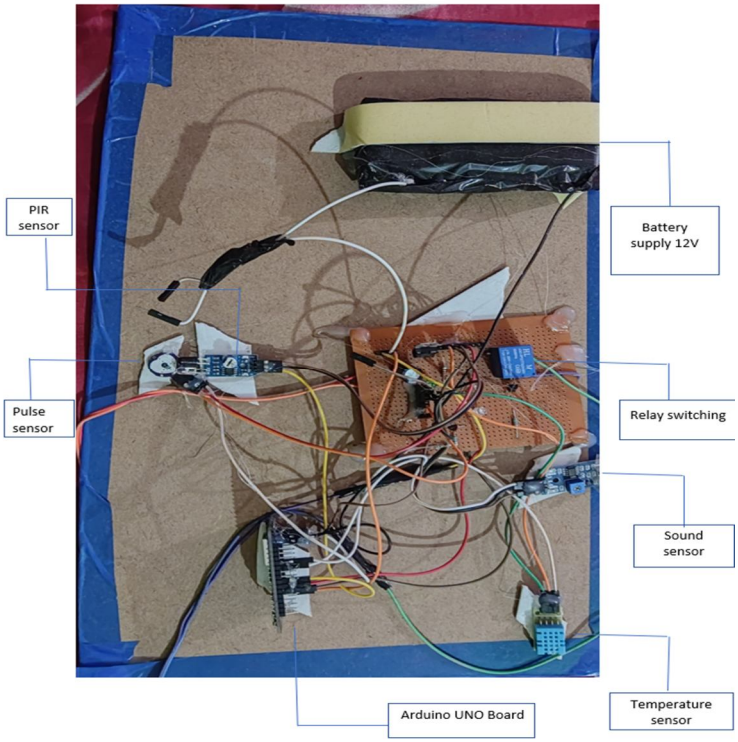

Fig 3: Circuit Implementation

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III. RESULT

Research is done to get knowledge about the project through result and analysis. This chapter will discuss the outcomes, conclusions, and evaluation from the analysis carried out for this project.

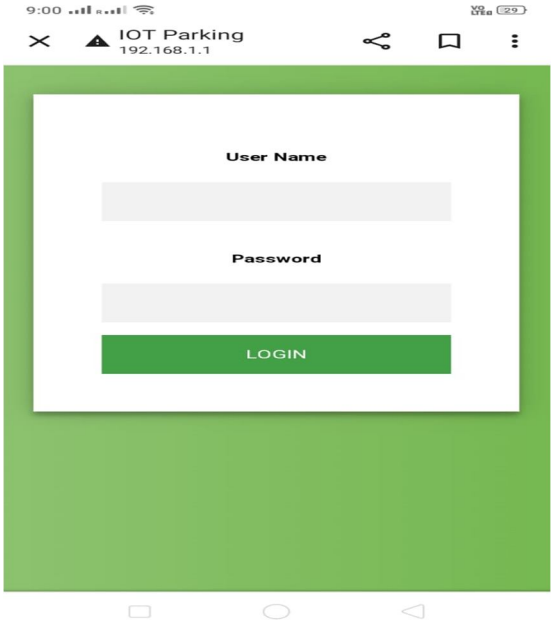

Fig 4: Login panel

The cradle's working sensors have all been extended to the appropriate levels as planned.
The finished product includes an automated cradle with automatic swinging, a temperature monitoring device, and a pulse monitor; if the baby cries, the parents will be notified, and if the crying is caused by dampness, they will also be informed.

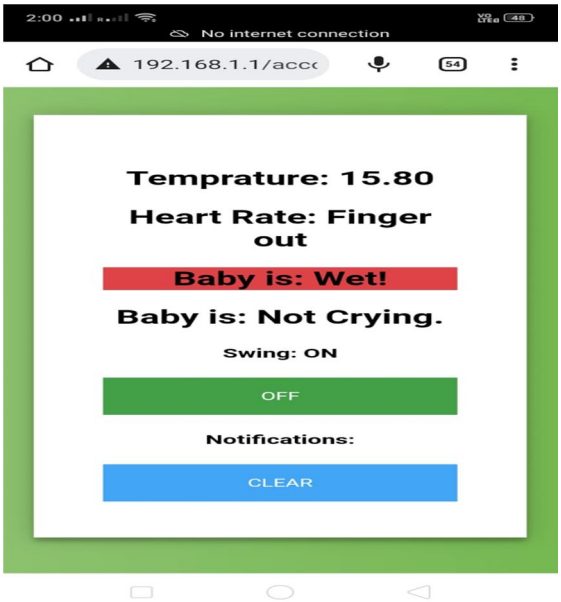

Fig 5: Cradle Info

Parents were also questioned about whether or not the attributes mentioned were necessary. 92% of them reportedly adore the features and truly want to use them for their new born, according to the surprising results.
The results of the combined sensors and cradle were very fantastic and, at least theoretically, received thumbs-up from all the parents.

IV. DISCUSSION AND CONCLUSION

The first study is about baby cradles; it discusses the function of cradles, different types of cradles, how often they are used, and how they are made. Given that the primary objective of the project is to offer an affordable Smart-featured cradle, this study is relevant to it.

The goal of this study is to increase information and understanding of how to address the issue in the current cradle. Additionally, through researching baby cradle parts. The purpose of this study was to evaluate each component's benefit and strength. Both parts of this literature study have been connected to the project by providing visual instructions on how to boost parents' or babysitters' confidence when utilising a baby cradle. Future work will focus on expanding the system's usefulness by incorporating medical instances or illnesses.

For example, introducing a module to detect medical cases/disorders based on baby cry. In general, because this field has not yet been explored by research community, utilising baby's big data resulting from continuous monitoring in providing comprehensive analysis for baby's habits, predicting possible diseases, early detection of disorders, and discovering some patterns will be very meaningful.

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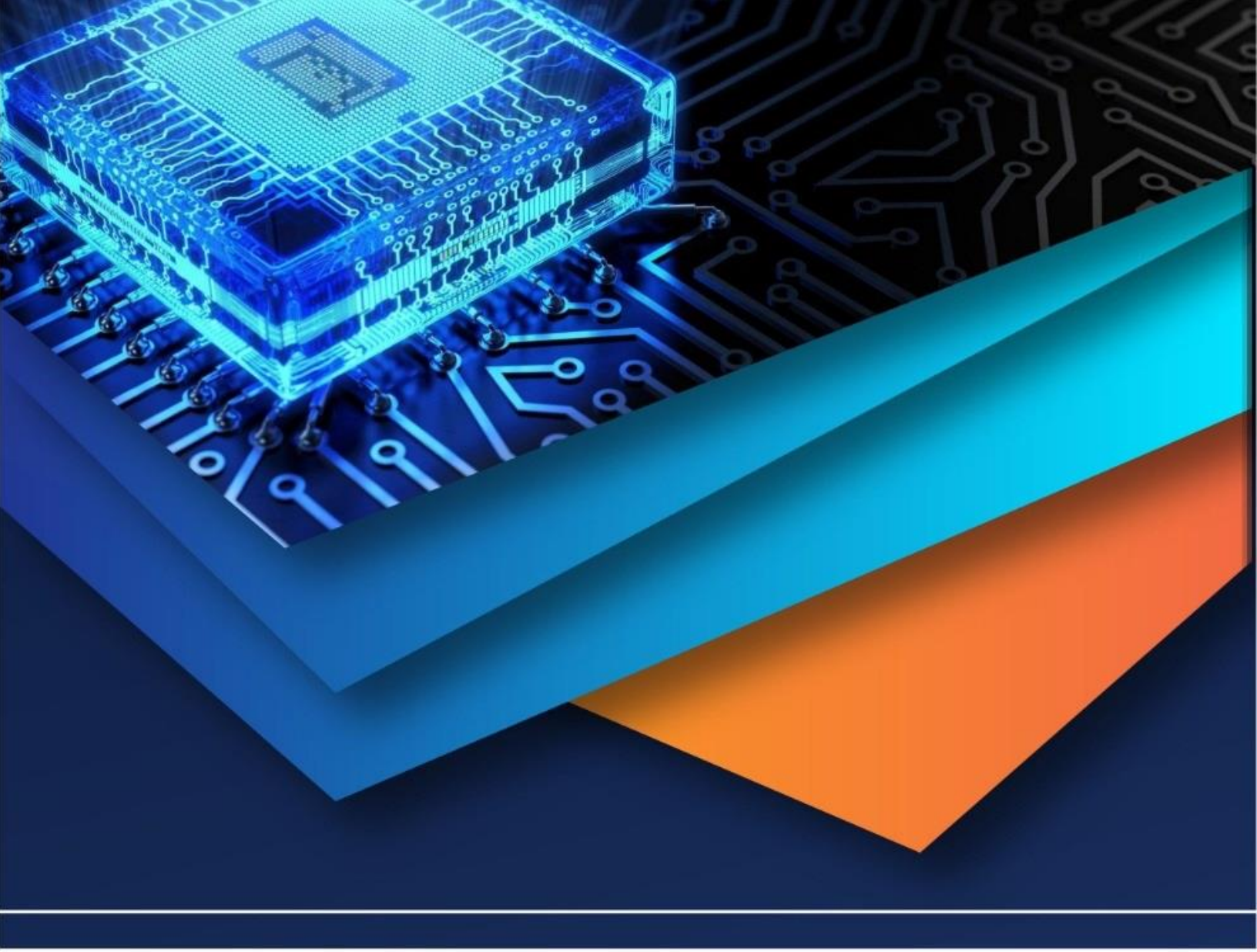

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