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Research on Advanced Baby Stroller

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Abstract: *In today's fast-paced world, ensuring the safety and well- being of infants in strollers is a primary concern for parents, especially in public spaces. The Advanced Baby Stroller is an IoT-enabled smart stroller designed to provide real-time monitoring, security, and enhanced convenience for childcare. This innovative system integrates a Bluetooth module to establish a connection between the stroller and the parent's device, continuously monitoring the range. If the stroller moves beyond a predefined distance, a buzzer alert is triggered, and electromagnetic locks automatically engage to prevent unauthorized movement. To ensure the child's presence and safety, an ultrasonic sensor detects whether the baby is inside, while a wet sensor identifies any toilet accidents, sending instant notifications to the parent via the Blynk app. Additionally, a GPS module provides real-time location tracking, continuously updating coordinates on the app, enabling parents to always track the stroller's exact location. The system collects and processes all sensor data, transmitting it to the Blynk cloud for remote access and monitoring. By integrating wireless communication, sensor technology, and automation, the Advanced Baby Stroller offers a comprehensive, secure, and efficient childcare solution that minimizes risks and enhances parental peace of mind. This smart stroller not only improves child safety but also introduces a new level of convenience in modern parenting, ensuring that caregivers always remain informed and in control.*

Keywords: IoT-Based Automation, Smart Baby Stroller, Real- Time Monitoring

I. INTRODUCTION

In today's rapidly advancing world, technology is playing a crucial role in improving safety and convenience in various aspects of life, including childcare. Traditional baby strollers provide mobility but lack intelligent features that can assist parents in ensuring the security and well-being of their child. Parents often struggle with keeping track of their baby's stroller in crowded places, monitoring their presence, detecting hygiene issues, and ensuring its safety from theft or accidental movement. With the rise of IoT (Internet of Things) and smart automation, there is a growing demand for intelligent strollers that provide real-time monitoring, automated safety mechanisms, and remote accessibility to enhance childcare. The Advanced Baby Stroller is a modern solution designed to address these concerns by integrating sensor technology, wireless communication, and smart control mechanisms to provide an efficient and user-friendly experience for parents.

This system is built using a Bluetooth module for proximity monitoring, an ultrasonic sensor for baby presence detection, a wet sensor for hygiene monitoring, and a GPS module for live tracking. The electromagnetic locks ensure the stroller remains securely in place when necessary, preventing unauthorized movement. All these components work together to provide seamless automation, security, and real-time data transmission via the Blynk app, allowing parents to monitor all essential parameters remotely. With automated alerts, safety mechanisms, and live tracking, this IoT-enabled smart stroller enhances child safety, minimizes risks, and provides a stress-free parenting experience. By combining innovation with practicality, the Advanced Baby Stroller sets a new benchmark for intelligent childcare solutions that cater to the needs of modern families.

II. LITERATURE REVIEW

Adwait B Kadu, Pranav C Dhoble, Jagrut A Ghate, Nilesh B Bhure, Vaidehi A Jhunankar, Prof. P M Sirsat, DC motor will provide rotational motion according to its rated power. As per microcontroller programming the motor rotates in a

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clockwise direction for a given certain time and in an anticlockwise direction for a certain time. When the motor rotates in a clockwise direction it pushes the bassinet to the front side & when the motor rotates in an anticlockwise direction it pushes the bassinet on either side. And in this way the system will keep working

Misha Goyal & Dilip Kumar, E-Baby Cradle swings automatically when the baby cries, for this it has a cry analysing 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's need. The system has an inbuilt alarm that indicates two conditions – first when the mattress is wet, which is an important parameter to keep the baby in a hygienic condition, second when the baby does not stop crying within a stipulated time, which intimated that baby needs attention.

By Chun-Tang Chao, Chia-Wei Wang, Juing-Shian Chiou and Chi- Jo Wang, this paper proposes a resonant electric cradle design having sensors that are designed to detect the oscillation state & infant cries recognition. By detecting oscillation state force is driven at the critical time to achieve the maximum output response while saving energy according to the principle of resonance.

Kaur, , Maslow theorized that people act to meet their needs with their abilities. Human beings shared this need, and so many of the current theories that affect human motivation are born from this reason. Maslow said that motivation is the result of a person's attempt at fulfilling physiological, safety, social, esteem, and self-actualization needs.

Raaij & Wandwossen, Maslow's hierarchy of needs was illustrated in his famous "hierarchy of needs. The first two levels are physiological needs, then there are higher levels such as self-actualization. The hierarchy implies that the higher the level of a need, the more important it is to the individual. Then, each need is given a rank. For example, the need for physical survival would be ranked higher than the need for self-actualization.

Kaur, these concepts were set off into consideration by Raymond Cattell in 1952 when he founded "the Theory of Motivation" in his book. Cattell developed four theories in his theory of motivation: internal versus external, need satisfaction versus self-fulfillment, individual vs. cultural, and stability vs. dynamic. He stressed that people need to achieve goals based on a need, then fulfil the need (i.e. the need to satisfy the need for loving or feeling the love), then identify an external factor that can either create or help in a need.

Hansen From the publication of, it is observed that the self- relationship psychology theory states that people's behaviour is determined by the social interaction they have with other individuals. If a person behaves in a certain way in a certain context, then society is going to react according to that behaviour, and, if society behaves in a certain way, then the behaviour of that individual is going to follow. Society cannot have a response or reaction to every individual behaviour.

III. METHODOLOGY

The Advanced Baby Stroller is an IoT-based smart childcare solution that enhances security and real-time monitoring. It consists of a Transmitter System (Parent's Device) and a Receiver System (Stroller Unit). The transmitter, built with an Arduino Nano and Bluetooth Module (HC-05), ensures continuous connection with the stroller and activates a buzzer if the stroller moves beyond a predefined safe range. The receiver system, managed by NodeMCU, integrates an LM393 Comparator IC, Ultrasonic Sensor, Wet Sensor, GPS Module, and Bluetooth Module for real-time data processing. The Ultrasonic Sensor detects the baby's presence, while the Wet Sensor alerts parents via the Blynk App in case of toilet accidents. The GPS Module provides live location tracking, updating coordinates in real-time. Two Solenoid Locks engage automatically when the stroller moves beyond the set range or when manually activated by the parent. All sensor data, including connection status, baby detection, wet sensor readings, and GPS tracking, are displayed in the Blynk App, ensuring instant notifications and remote control. By integrating advanced IoT sensors, wireless communication, and GPS tracking, the Advanced Baby Stroller minimizes human intervention while maximizing security and efficiency for modern parenting.

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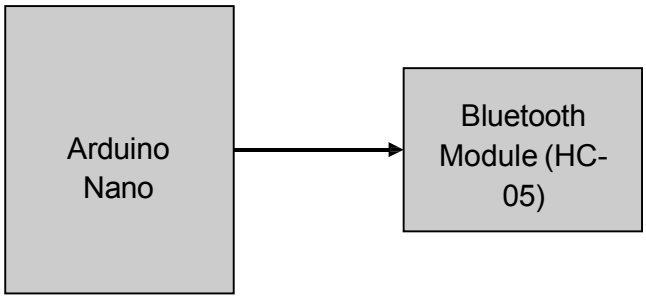
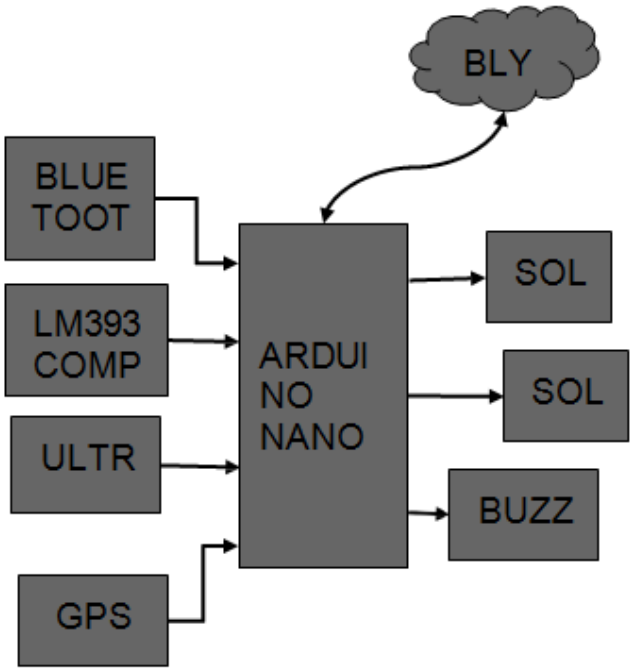
BLOCK DIAGRAM



TRANSMITTER SYSTEM



RECEIVER SYSTEM DESCRIPTION

Block Diagram 1 - First Block Diagram shows the Transmitter system which shows that in this project we used Arduino nano as a microcontroller, and we used a Bluetooth Module (HC-05) as an output device.

Block Diagram 2 - Second Block Diagram shows the receiver module which shows that we used Node MCU as a microcontroller, and we used a Bluetooth module (HC-05). LM393Comparator IC, Ultrasonic Sensor and a GPS module as an input device in it. And a buzzer and two Solenoid locks as an output device. And, we have used the Blynk App to show all the notifications.

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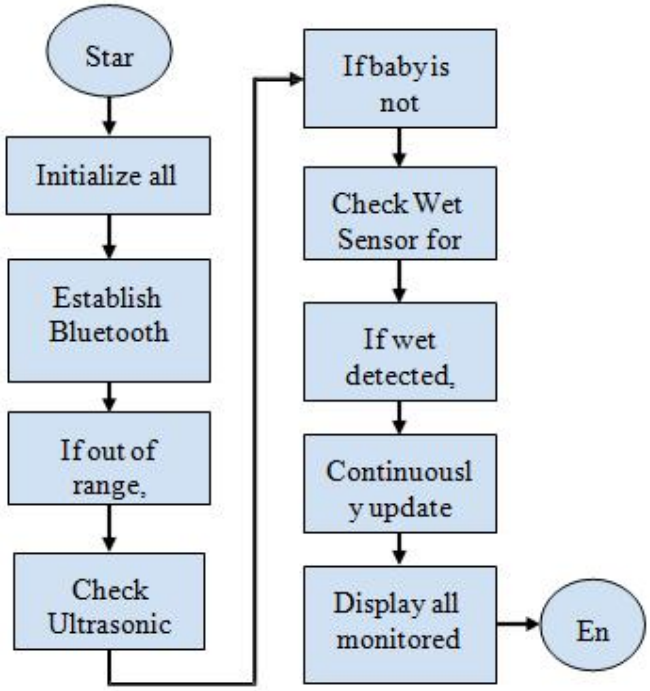
FLOW CHART



IV. WORKING

The Advanced Baby Stroller consists of a Transmitter System (Parent's Device) and a Receiver System (Stroller Unit). The transmitter, built with an Arduino Nano and Bluetooth Module (HC-05), ensures continuous connection with the stroller and activates a buzzer if the stroller moves beyond a predefined safe range. The receiver system, managed by NodeMCU, integrates an LM393 Comparator IC, Ultrasonic Sensor, Wet Sensor, GPS Module, and Bluetooth Module for real-time data processing. The Ultrasonic Sensor detects the baby's presence, while the Wet Sensor alerts parents via the Blynk App in case of toilet accidents. The GPS Module provides live location tracking, updating coordinates in real-time. Two Solenoid Locks engage automatically when the stroller moves beyond the set range or when manually activated by the parent. All sensor data, including connection status, baby detection, wet sensor readings, and GPS tracking, are displayed in the Blynk App, ensuring instant notifications and remote control.

V. SYSTEM REQUIREMENT

HARDWARE REQUIREMENT

1) Arduino Nano
2) Node MCU
3) Bluetooth module
4) Buzzer
5) Switch
6) Electromagnetic lock *2
7) Ultrasonic Sensor
8) Wet sensor to detect toilet
9) GPS Module

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SOFTWARE REQUIREMENT

1) Arduino IDE
2) Proteus
3) Blynk Application

VI. EXPERIMENTAL SETUP & RESULT EXPERIMENTAL SETUP

RESULT

The implementation of the Advanced Baby Stroller successfully enhances child safety, security, and real-time monitoring through IoT- based automation. The Bluetooth module effectively maintains a connection between the stroller and the parent's device, triggering an alert and engaging electromagnetic locks when the stroller moves beyond the predefined range. The ultrasonic sensor accurately detects the baby's presence, ensuring safety measures are activated accordingly, while the wet sensor reliably identifies toilet accidents, providing instant notifications via the Blynk app. The GPS module efficiently tracks the stroller's location in real time, displaying precise coordinates on the app, enabling parents to monitor movement remotely. The entire system operates seamlessly, with all sensor data being transmitted to the Blynk cloud, allowing for easy access and continuous supervision. The successful execution of this project demonstrates that IoT-based automation can significantly improve childcare convenience, reduce safety risks, and provide parents with peace of mind by keeping them always informed and in control.

VII. CONCLUSION

The Advanced Baby Stroller presents a technologically advanced and practical solution to modern childcare challenges by integrating smart monitoring, safety mechanisms, and real-time alerts. By leveraging IoT-based automation, the system ensures that parents can continuously track their child's location, detect their presence, and receive instant notifications in case of emergencies. The incorporation of Bluetooth range detection prevents the stroller from moving out of reach, while electromagnetic locks add an additional layer of security, ensuring that unauthorized movement is prevented. The ultrasonic sensor and wet sensor work seamlessly to monitor the baby's presence and hygiene conditions, reducing the chances of discomfort or unattended accidents. Furthermore, the GPS module with live tracking on the Blynk app allows for real- time location updates, giving parents complete control over the stroller's movements. The continuous data transmission to the Blynk cloud ensures that all critical parameters are remotely accessible, enhancing safety and convenience. This smart stroller system not only reduces the risk of child endangerment but also eliminates manual efforts required for constant supervision, offering a stress-free parenting experience. As technology continues to evolve, such IoT-integrated solutions can revolutionize childcare and infant safety, making parenting safer, more efficient, and highly reliable.

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