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Smart Baby Stroller for Authorized Handler

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Abstract: *The Smart Baby Stroller is an Internet of Things (IoT) based project that incorporates sensors and hardware integrated with ESP 8266. One of the key modules of this project is "Fingerprint Authentication for Authorized Handler of Smart Baby Stroller", which aims to provide enhanced security for the baby stroller. The handlers of the stroller need to authenticate themselves through fingerprint recognition in order to unlock the wheels of the stroller. If the handler fails to authenticate, an alarm is raised, and this data is automatically uploaded to the cloud. The parents or the owner of the Smart Baby Stroller are notified through the Blynk app, a cloud platform designed for connecting IoT circuits and components. Additionally, the stroller is equipped with a moisture sensor that detects if the baby has soiled its diapers. In this work, we provide a brief overview of the design and working of a prototype of the Smart Baby Stroller with fingerprint authentication and moisture sensing features.*

Keywords: *Baby Stroller, Smart Baby Stroller, IoT, Fingerprint Authentication, Authorized Handler, ESP 8266, Security, Cloud Upload, Blynk App, Moisture Sensor.*

I. INTRODUCTION

The Internet of Things (IoT) describes the network of physical objects— “things”—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. The proposed system aims to leverage the power of person authentication through fingerprint recognition technology to enhance the security of baby strollers. With the increasing concern for security and safety of loved ones, this unique system will provide an effective solution for identifying authorized or unauthorized handlers of the stroller.

The system is designed to interface fingerprint sensors with ESP 8266, a popular and versatile microcontroller, along with a fingerprint scanner, relay, and a solenoid lock for seamless locking and unlocking of the stroller wheels. The fingerprint scanner will capture and process the fingerprint data, while the relay and solenoid lock will control the physical locking mechanism of the wheels based on the authentication results. In addition to fingerprint recognition, the system will also incorporate a moisture sensor to detect the baby's toilet. This additional sensor will provide an extra layer of functionality, allowing caregivers to monitor the baby's needs and respond promptly. To further enhance the security of the system, it will be designed to raise an alarm and notify authorized handlers through the Blynk App in case of three unsuccessful attempts to unlock the wheels by unauthorized handlers. This immediate notification mechanism will enable quick response and prevent potential security breaches, ensuring the safety and security of the baby stroller. With the integration of fingerprint recognition technology, moisture sensor, and smart notification system, this unique system will provide a comprehensive solution for enhancing the security and safety of baby strollers in today's technology-driven world. Parents and caregivers can have peace of mind knowing that only authorized handlers can operate the stroller and monitor the baby's needs effectively.

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One of the purposes of this project is to reduce the risk of stealing and kidnapping of baby or stealing stroller with greater security and cost effectiveness. The entire system works with the purpose of providing convenience by monitoring every handler of stroller and thereby providing real time details and updates to the parents with help of cloud platform. This system can be marketed among the general audience as it is very reasonable and every person from different backgrounds and culture can afford it.

II. LITERATURE REVIEW

In order to accomplish a superior comprehension of how the issue can be solved, all the various research and let it review has taken into consideration for the project's better enhancement. And here we will focus on finding some other projects with similar features to be compared to the to the proposed project idea.

Omidiora E Ois [1] suggested a prototype of a fingerprint-based ignition systems in vehicles in which database of the valid users is stored in the fingerprint module. The CPU checks the fingerprint of the individual trying to operate the car against the database that is already stored. The vehicle ignites if the match results in success, else not. Through the parallel port on the PC, external hardware can be managed. For the construction of computer-controlled gadgets and projects, the parallel port is an easy and affordable instrument.

Joshua Sackos [2] suggested at the Smart IoT Stroller was development at the Intel-sponsored 2014 PDX-Transportation Hackathon. The idea for the project came from a YouTube clip of a stroller tumbling over railway lines from a loading station. This film served as an inspiration for research on how technology might assist prevent such catastrophes. The stroller also comes equipped with an Intel Edison board, automatic brakes, turn signals, data synchronisation to the cloud, and an Android app for accessing cloud data. It also lists the required parts, including Grove Smart Relays, Grove Touch Sensors, Grove Connectors, LED strips, a Pull-type solenoid, a RadioShack Board, a 12V battery, and a jogging stroller. These items are in addition to an Intel Edison board mounted on an Intel Arduino expansion board running the most recent firmware. Two 12V LED strips, two relays, two capacitive touch sensors, and two 12V pull-type solenoids make up the turn signal system, while two capacitive touch sensors, a relay, and a 12V pull-type solenoid make up the brake system. The capacitive touch sensors, which are mounted to the stroller handlebar, have their output pins connected to the input pins on the Intel Arduino expansion board. The Intel Edison board's integrated Wi-Fi allows for, the data is uploaded to the cloud.

The Blynk app was used by the authors of a study that was published in the International Journal of Engineering Research and Technology to create a smart pram system. The technology was created to track the baby's location and vital signs, enabling parents to keep an eye on their infant while they are out and about. A graphical user interface that displayed the baby's vital signs, location, and other crucial information in real-time was created using the Blynk app. Parents may also lock and unlock the stroller's wheels, control the stroller's movement, and set alarms for situations like feeding or changing a baby's diaper.

III. METHODOLOGY

The methodology involves gathering and analyzing the requirements for the Smart Baby Stroller project. In this phase, the team has identified the technical, functional, and non-functional requirements for the project.

Software Required:

The software required for the implementation of the Smart Baby Stroller is listed below.

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- Arduino IDE
- Proteus
- Blynk Application

Hardware Required:

The Hardware required for the implementation of the Smart Baby Stroller is listed below.

- Node MCU (ESP 8266)
- R307 Fingerprint Sensor
- Solenoid Lock
- Relay
- FC-28 Moisture Sensor
- Buzzer

Design of the System:

The Smart Baby Stroller is an innovative system designed to ensure the safety and comfort of infants. It is an Internet of Things (IoT) based project that integrates sensors and hardware with the ESP 8266 microcontroller. The design of this system is shown in the block diagram, flowchart, and circuit diagrams below.

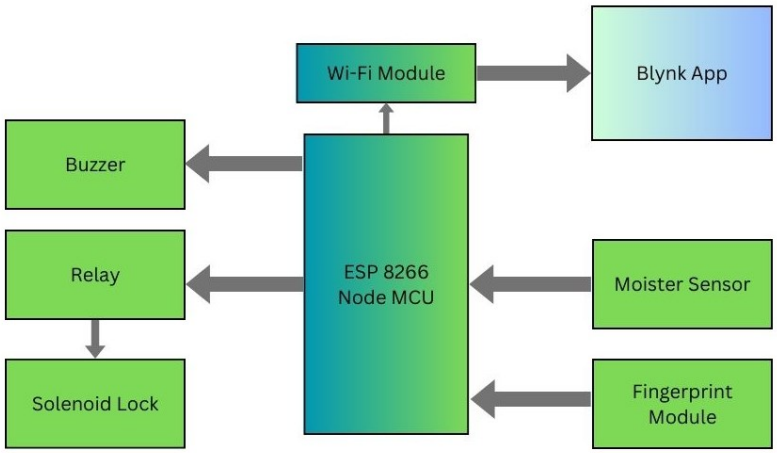

Figure 1: Block Diagram

The above block diagram shows the key components of the Smart Baby Stroller system. The system is built around an ESP 8266 microcontroller that integrates sensors and hardware. The system includes a Fingerprint Authentication module, which ensures that only authorized handlers can unlock the stroller wheels. The moisture sensor detects if the baby has soiled its diapers, and the system automatically notifies the parents or authorized handlers through the Blynk app, ensuring that the baby stays comfortable and dry. If the authentication fails, an alarm is raised, and this data is automatically uploaded to the cloud. The parents or owner of the Smart Baby Stroller are notified through the Blynk app, ensuring that they are always aware of the status of the stroller. The Baby Stroller with Wheels and Chassis is the physical component of the system, which integrates all the modules and sensors.

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The block diagram shows how the modules are interconnected and how they work together to provide enhanced security and convenience for parents and authorized handlers of the Smart Baby Stroller.

IV. IMPLEMENTATION

The circuit diagram (Figure 1) and block diagram (Figure 2) show the experimental setup of the smart baby stroller. A circuit diagram shows the pinout and logical connections of the setup, and a block diagram shows the physical setup of the component.

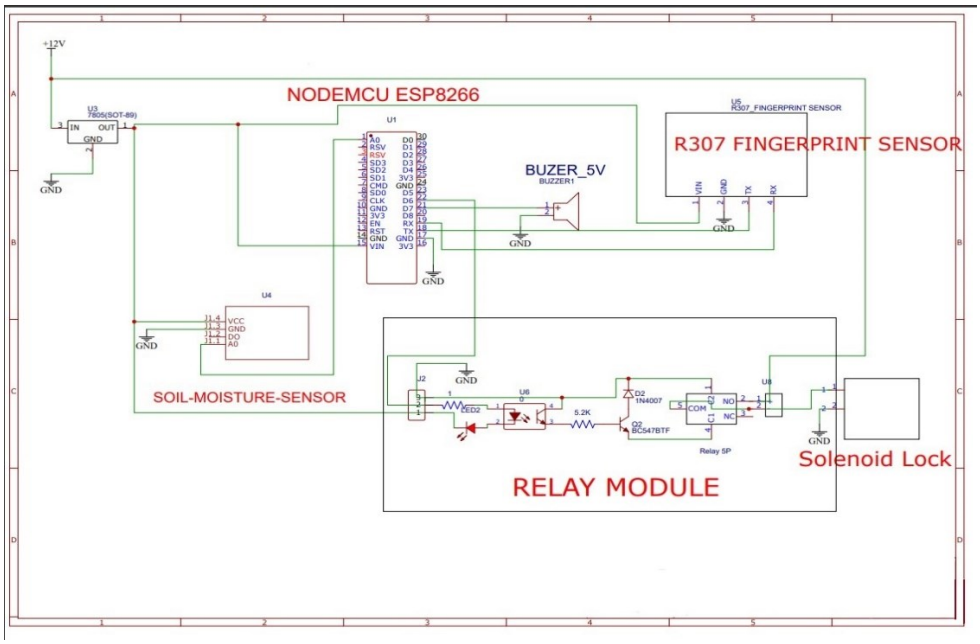

Figure 2: Circuit Diagram

Fingerprint Authentication Based Wheel Locking System:

The system is designed to interface fingerprint sensors with the ESP8266, a popular and versatile microcontroller, along with a fingerprint scanner, relay, and solenoid lock for seamless locking and unlocking of the stroller wheels. The fingerprint scanner will capture and process the fingerprint data, while the relay and solenoid lock will control the physical locking mechanism of the wheels based on the authentication results.

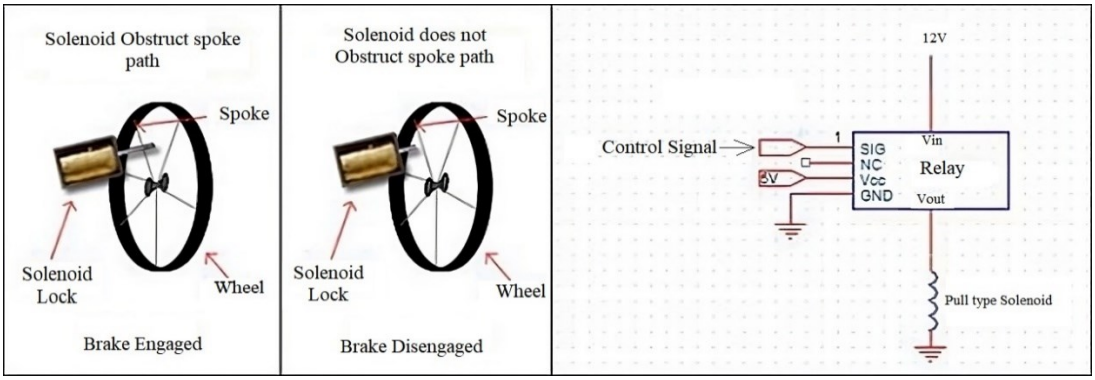

Figure 3: Solenoid Lock Integrated working with Wheel

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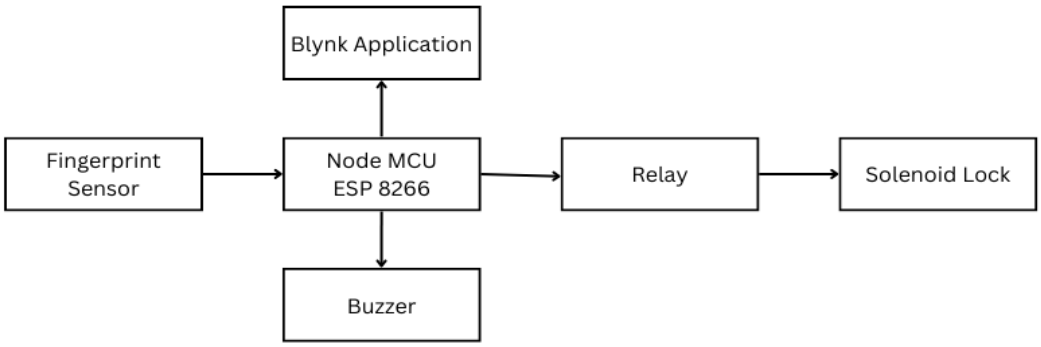

Figure 4: Wheel Locking System

A wheel locking system combines many hardware and software components. The node MCU receives the results of an unauthorized or authorized person from the fingerprint sensor, which is connected to the node MCU. The buzzer also connects to the Node MCU. The relay is connected to the digital pin of the Node MCU. The solenoid lock is integrated with the relay, which regulates the solenoid lock based on a HIGH or LOW signal. Depending on the response provided by the fingerprint sensor, the solenoid lock either unlocks or maintains the lock on the wheel locked. The lock on the wheel will be released if the authorized person can be identified by the fingerprint scanner; otherwise, an unauthorized attempt to unlock the wheel triggers an alarm with the help of buzzer.

Moisture Sensor based Toilet Detection:

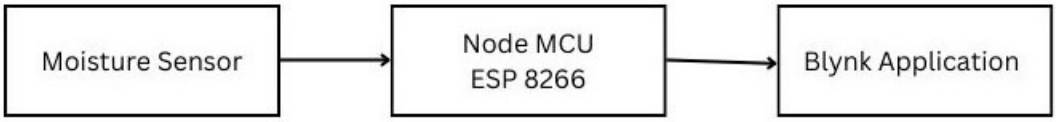

Figure 5: Block Diagram of Moisture sensor Module

The node MCU's analogue pin is connected to the moisture sensor. By detecting the moisture, Node MCU will alert the parent via the Blynk app if the child urinated. An analogue voltage output corresponding to the moisture level is provided by the FC-28 moisture sensor. The microcontroller's analog-to-digital converter (ADC) can be used to read the voltage output. You can tell if the surface is dry or wet by comparing the analogue reading to the threshold value. likewise, the Node MCU will alert parents via the Blynk app based on the value of the moisture sensor.

V. RESULT

The system “smart baby stroller for authorized handler” has been implemented successfully and works as proposed. The fingerprint scanner successfully acquires and processes the fingerprint data. The handler of the stroller has to authenticate himself/herself first to unlock the wheel. The fingerprint scanner successfully authenticates the handler of the stroller by comparing the fingerprint input with already-stored fingerprints in the module’s memory. In response to the person's successful authentication, it alerts the Blynk app and successfully releases the breaks. The buzzer is also raising the alarm in a futile attempt at authentication. As a result, the suggested system's authentication module has been successfully implemented and is operating.

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The solenoid lock is integrated with the wheel, and it is successfully working for locking and unlocking the wheel of the smart baby stroller. Depending on the outcomes of the authentication, the relay and solenoid lock regulate the locking mechanism of the wheels. When authentication is completed successfully, the ESP signals the relay, which successfully releases the wheel by releasing the break. Ideally, the solenoid lock keeps the wheel locked, and whenever the authentication is successfully done, the ESP signals the relay, which successfully unlocks the wheel by releasing the break. The stroller cannot be moved forward or backward without releasing the breaks. Hence, the locking system of the smart baby stroller has been effectively implemented and is working as per the proposed work. Also, the moisture sensor is working as desired and providing the correct output on the detection of moisture on the stroller's seat. The purpose of this project is to enhance the security and safety of baby strollers by reducing the risk of theft or kidnapping. The entire system provides convenience by monitoring every handler of the stroller and providing real-time updates to the parents with the help of the Blynk application. Hence, all modules of the system are working and providing the desired results and outcomes as per the proposed work.

VI. CONCLUSION

In conclusion, the Smart Baby Stroller is an innovative project that incorporates IoT technology to enhance the security and safety of baby strollers. The project uses fingerprint authentication for authorized handlers to unlock the stroller wheels, with an alarm raised and data uploaded to the cloud in case of failed authentication. The stroller is also equipped with a moisture sensor to detect when the baby needs to be changed. The Blynk app is used to notify parents or the owner of the stroller of any potential security breaches or changes in the baby's needs. The project is cost-effective and can be marketed to a wide audience, providing peace of mind to parents and caregivers. With the increasing number of IoT devices, this project highlights the potential of IoT technology to revolutionize various fields, including childcare. Overall, the Smart Baby Stroller provides a comprehensive solution for the security and safety of baby strollers, ensuring the peace of mind of parents and caregivers.

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