Automated Baby Stroller Using IOT

Chetan Nasare¹, Vedant Nimbarkar², Dishant Talware³ ,Prathamesh Mokale⁴

¹Information Technology &Sipna College of Engineering
²Information Technology &Sipna College of Engineering
³Information Technology &Sipna College of Engineering
⁴Information Technology &Sipna College of Engineering

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Abstract - The Automated 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 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. Additionally, the stroller is equipped with a sensor that detects obstacle the way. 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 sensing features.

*Key Words***:** Baby Stroller, Automated Baby Stroller, IoT, Fingerprint Authentication, Authorized Handler, ESP 8266, Security, Sensor, Prototype.

1.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. These devices range from ordinary household objects to sophisticated industrial tools. With more than 7 billion connected IoT devices today, experts are expecting this number to grow to 10 billion by 2020 and 22 billion by 2025. The Internet of Things (IoT) contains a variety of devices, such as wearable devices, smartphones, computers, personal digital assistants (PDAs), and tablets. These devices, which consist of embedded sensors and processors that can handle their internal states or the external environment around them have become part of people's daily necessities because of their decreasing cost, mobility and increasing computational capability. IoT includes a great diversity of smart devices collaborating to bring convenience and accessibility to people's lives. The benefits of IoT are immense and its applications are revolutionizing the manner in which we work and live. It also generates new opportunities for innovation, growth and knowledge sharing between different entities. With a sharp increase in the number of IoT devices, these interconnected smart devices can be deployed in a variety of fields and their applications include but are not limited to smart homes, smart cities, environment, agriculture, smart grid, industry, healthcare, and transport. 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 will be 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 o the wheels based on the authentication results. In addition to fingerprint recognition, the system will also incorporate sensor to detect obstacle. With the integration of fingerprint recognition technology, sensor, 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. 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. 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.

2.LITRUTURE 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. Adwait B Kadu et al..[1], DC motor will provide rational motion according to its rated power. As per microcontroller programming the motor rotates in a clockwise direction for a given certain time period and in an anticlockwise direction for a certain time period. 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 et al. [2], E-Baby cradle swings automatically when the baby cries, for this it has a cry analyzing System which detects the baby cry voice and according 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 conditions, second when the baby does not stop crying within a stipulated time, which intimated that baby needs attention.By Chun- Tang Cho et. [3], 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.

By Dalal Almutairi et al.[3], The author implemented automatic baby stroller with sensor that detects obstacles and avoids holes for the baby's safety and to detect place of the user of the stroller through the mobile application..

Ajinkya Kawale [4] says that fingerprints are patterns of ridges and valleys on the surface of the finger. Like everything in the human body, these ridges form through a combination of genetic and environmental factors. The genetic code in DNA gives general orders on the way skin should form in a developing fetus, but the specific way it forms is a result of random events. With the help of interfacing, fingerprints can be used to create secure and impenetrable door locks and several lock systems. Interfacing is a method of establishing communication between Microcontroller and the Interface. Fingerprint interfaces are generic and can communicate with any microcontroller. It is a combination of hardware (i.e., the Interface) and Software (i.e., The source code to communicate, also called as the Driver). In simple words, . to use LED as output device, LED should be connected to a port pin of the microcontroller and

there has to be a program running inside the microcontroller to make it on or off or blink or dim. This program can be developed using any programming language like Assembly, C, Basic etc.

Omidiora et.al [5] suggested a prototype of a fingerprint-based ignition systems in vehicles in which database of the valid users is stored in the fingerprint module. When a person tries to operate the vehicle then the CPU matches the fingerprint of the person with the stored database if the match result is successful then the vehicle is ignited and otherwise not. External devices (hardware) can be controlled through the PC parallel port. The parallel port isa simple and inexpensive tool for building computer-controlled devices and project.

Fernando L. Podio [6] cited that, fingerprints are one of many forms of biometrics, used to identify individuals and verify their identity. The analysis of fingerprints for matching purposes generally requires the comparison of several features of the print pattern. These include patterns, which are aggregate characteristics of ridges, and minutia points, which are unique features found within the patterns. According to him, it is also necessary to know the structure and properties of human skin in order to successfully employ some of the imaging technologies. Minutiae and patterns are very important in the analysis of fingerprints since no two fingers have been shown to be identical. He also added that the three basic patterns of fingerprint ridges are the arch, loop, and whorl. In his description-Arch are the ridges that enter from one side of the finger, rise in the center forming an arc, and then exit the other side of the finger. Loops are the ridges that enter from one side of a finger, form a curve, and then exit on that same side. Last but not the least, he says that whorl are ridges that are formed circularly around a central point on the finger. In the whorl pattern, ridges form circularly around a finger.

Misha Goyal & Dilip Kumar [7] proposed that E-Baby Cradle swings automatically when the baby cries, for this it has a cry analyzing 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.

Joshua Sackos [8] suggested the Smart IoT Stroller is an innovative stroller developed at the 2014 PDX Transportation Hackathon hosted by Intel. The motivation for the project came from a YouTube video showing a baby stroller falling off a train loading platform onto the tracks below, which spurred research into how technology can help prevent such events. The stroller features an Intel Edison board, an automatic braking system, turn signals, data synchronization

to the cloud, and an Android app for pulling data from the cloud. The article provides a detailed description of the stroller's features and how to make one. It also lists the materials required, including an Intel Edison board mounted on the Intel Arduino expansion board with the latest firmware version, Grove Smart Relays, Grove Touch Sensors, Grove Connectors, LED strips, a Pull-type solenoid, a RadioShack Board, a 12V battery, and a jogging baby stroller. The braking system consists of two capacitive touch sensors, a relay, and a 12V pull-type solenoid, while the turn signal system consists of two 12V LED strips, two relays, and two capacitive touch sensors. The capacitive touch sensors are mounted on the stroller's handlebar, and the output pins are connected to input pins on the Intel Arduino expansion board.

The data is uploaded to the cloud via the Intel Edison board's onboard Wi-Fi. Ilkyu Ha [9] suggested an that digital Door Locking System can explore the various technologies used in designing such systems. Password-based locking systems are common and provide enhanced security features as compared to mechanical locks. The project has used IR remote and embedded systems technology to design a low-cost digital door lock. The literature survey can explore different types of digital door locks, such as biometric and RFID-based locks, and compare their advantages and disadvantages. The survey can also explore the different types of wireless communication technologies, such as Zigbee, Wi-Fi, and Bluetooth, and their applications in digital door locking systems. In a study published in the International Journal of Engineering Research and Technology, the authors developed a smart baby stroller system. The system was designed to monitor and track the baby's vital signs and location, allowing parents to keep an eye on their child while on the move. The system was used to develop a graphical user interface that displayed the baby's vital signs, location, and other important information in real-time. The app also allowed parents to control the stroller's movement, lock and unlock the wheels, and set alarms for specific events such as diaper changes or feeding times

3.METHODOLOGY

3.1 Microcontroller

The ESP8266 is used as a microcontroller for the system. This ESP8266 is used to control the sensors and take the digital signals as an input and send this data on the internet. We have connected several sensors to this microcontroller. We used this microcontroller because of its low-cost Wi-Fi chip that can be used to build IoT devices and other Wi-Fi enabled projects. It provides developers developer to write Lua scripts to control the module's hardware and interact with Wi-Fi networks.

3.2 Ultrasonic Sensor:

The HC-SR04 ultrasonic sensor is used to detect the obstacle. The high-frequency sound waves generated by active ultrasonic sensors are received back by the ultrasonic sensor for evaluating the echo. Thus, the time interval taken for transmitting and receiving the echo is used for determining the distance to an object.

3.3 IR Sensor

We have used this IR sensor for detection of baby in the stroller which detects the presence of the baby inside the stroller. IR Sensors or Infrared Sensor are light based sensors that are used in various applications like Proximity and Object Detection.

3.4 Relay

We used Relay as an output to handle the solenoid brake. We used REES52 5v relay for the solenoid brake. The REES52 5V relay is a type of electromechanical relay that operates at a voltage of 5 volts DC. This relay is commonly used in electronic circuits to control the flow of electricity to different devices and components.

3.5 Brake

We used solenoid brake as brake to stop the stroller. A solenoid brake is an electromechanical device that converts electrical energy into mechanical energy to generate a braking force. e. It typically consists of a coil of wire (the solenoid) and a plunger or armature that moves when the coil is energized. When the solenoid coil is energized with an electrical current, it creates a magnetic field that attracts the plunger or armature. This movement creates a mechanical force that is used to apply a braking force to a shaft, drum, or other rotating component.

3.6 Fingerprint Sensor Module:

This is a fingerprint sensor module with TTL UART interface for direct connections to microcontroller UART or to PC through MAX232 / USB-Serial adapter. The user can store the fingerprint data in the module and can configure it in 1:1 or 1:N mode for identifying the person. The Fingerprint module can be directly interfaced with any microcontroller as well as Arduino Board. This optical biometric fingerprint reader with great features and can be embedded into a variety of end products like access control system, attendance system, safety deposit box, car door locking system. In this project fingerprint is used for authorized person, Only authorized person can access it, The person's data will already be saved in the ESP 8266 and when he accesses the fingerprint the wheel lock will unlock. The best use of a fingerprint would be that it cannot be accessed by unauthorized persons and the baby stroller will remain secure.

3.7 Buzzer:

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based

on the various designs, it can generate different sounds like alarms, music, bell & siren. A buzzer is an audio signal device In this project the buzzer is connected to the sensor, if an object comes close to the baby stroller, the sensor will sense it and pass the signal to the buzzer, then the buzzer will sound.

4.IMPLEMENTATION

Implementation of ultrasonic sensor with solenoid brake :
We have connected the ultrasonic sensor with the ESP8266 or node-MCU. The ultrasonic sensor emits the ultrasonic sound waves from the trig and this ultrasonic sound travels up to the obstacle. The obstacles will reflect the ultrasonic sound and be measured with the echo. The ultrasonic sensor has defined the distance of 70cm. When there is obstacle in distance between 70cm, After the ultrasonic sensor detects an obstacle, it transmits a signal to the Node-MCU microcontroller. The Node-MCU then sends a signal to activate the relay, which in turn sends a command to the solenoid brake to apply the brake. The command to the solenoid brake is in passing the electrical supply to the solenoid brake.

Implement fingerprint authentication for authorized handlers :

511C3 or R305 are commonly used with Arduino and ESP8266. Connect the fingerprint sensor module to the ESP8266. Typically, fingerprint sensors communicate over serial (UART). Connect the sensor's Select a fingerprint sensor module compatible with your microcontroller. Modules like the GT-TX pin to one of the ESP8266's RX pins and vice versa. Make sure to connect power (VCC) and ground (GND) as well. Install the appropriate library for your fingerprint sensor module. Usually, libraries are available for Arduino, and they can be adapted for use with the ESP8266. Write code to enroll authorized handlers' fingerprints into the system. This involves capturing fingerprint data and storing it securely in the microcontroller's memory. You'll need to assign each enrolled fingerprint a unique identifier (ID) for later verification. Implement code to verify fingerprints. When someone places their finger on the sensor, the microcontroller should compare the captured fingerprint data with the enrolled fingerprints. If a match is found, the person is authorized to use the stroller. Integrate the fingerprint verification with the locking mechanism of the stroller. When an authorized handler's fingerprint is detected, unlock the stroller's brake or other security measures. Ensure the brake remains locked if an unauthorized fingerprint is detected.

5.DESIGN

The Automated Baby Stroller is an IoT-based project that incorporates sensors and hardware integrated with the ESP8266 microcontroller. The stroller is equipped with fingerprint authentication and sensor. The handlers of the stroller need to authenticate themselves through fingerprint recognition to unlock the wheels of the stroller. If authentication fails, an alarm is raised. The sensor detects obstacle in way then it will stop. The system aims to provide enhanced security for the baby stroller by providing an effective solution for identifying authorized or unauthorized handlersof the stroller. 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. The system will be designed to raise an alarm.

Algorithm:

Step1: START

Step2: The system checks if the stroller is locked or unlocked

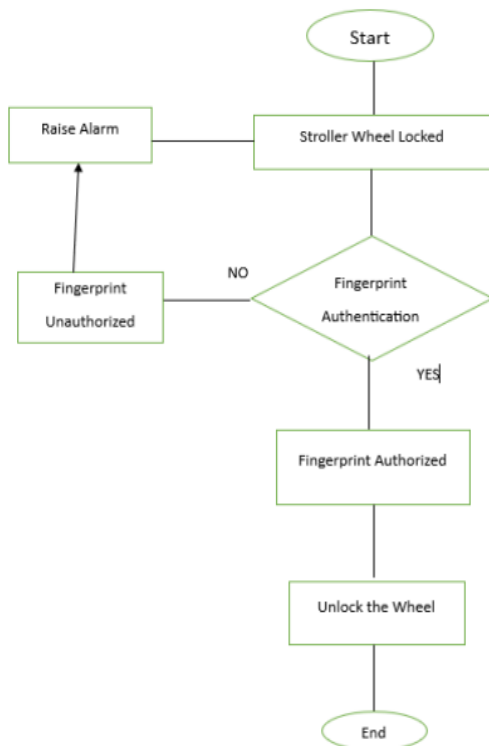Step3: Then fingerprint start and wait for authorize person access

Step4: If the authorized person access detected the stroller it is unlocked and the unauthorized person access detected the stroller lock then alarm is raise

Step5: Any object is in front of stroller immediately the stroller is locked and the movement is not detected 3 or more than 3sec the stroller is also locked.

Step6: Then the process is end

Step7: END

Fig -5.1: System Flowchart

6. CONCLUSIONS

In conclusion, the Automated 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 sensor to detect when the baby needs to be changed. 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.

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