



IoT Enabled Smart Baby Stroller

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Abstract: Technology has become an indispensable part of our lives, and its significance and advantages cannot be overstated. The creation of innovative products like the Automatic Baby Stroller can significantly enhance our quality of life and simplify everyday tasks. The IoT Enabled Smart Baby Stroller Project involves the integration of sensors, microcontrollers, wireless communication, and other cutting-edge technologies to create a state-of-the-art baby stroller that provides parents with a safer and more convenient way to transport their infants. This technology can offer parents real-time information about their child's safety and comfort, such as temperature sensors that monitor and adjust the stroller's environment, and wireless communication that enables parents to control and monitor the stroller remotely via a mobile app. Overall, incorporating advanced technology into baby strollers can revolutionize the way parents experience childcare.

Keywords: IoT, Convenience, Sensors, Safety, etc.

I. INTRODUCTION

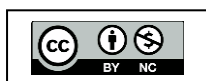
Parenting may be a challenging task that requires parents to put their kids' safety and wellbeing first, especially when they are out and about. Baby strollers have been a popular choice for decades, but they don't have the current features and functionality that parents of today require. In order to make strolling simpler, safer, and more environmentally friendly, the IoT enabled smart baby stroller project seeks to develop a breakthrough stroller that includes cutting-edge technology. The project is dedicated to creating a pram that fulfils the high expectations of contemporary parents and has professionals from a variety of sectors, including engineering, computer science, and industrial design [2].

Typically, baby strollers are used to help babies sleep and soothe them. However, conventional strollers lack electronic features such as batteries or adapters to automate them. These types of strollers are typically used in rural areas or less developed cities due to their affordability. People's expectations for the use of household goods have increased along with the improvement of the quality of life, people have higher requirements for the use of household products. The emergence of intelligent home goods is an unavoidable trend [8]. Unfortunately, such strollers require caregivers to manually attend to the baby's needs, which can be inconvenient and unsafe. This highlights the need for automatic strollers powered by batteries or other power sources.

Additionally, modern parents are often busy with their professional lives and do not have enough time to care for their infants, making it challenging to attend to their needs. Hiring professionals to care for babies can be expensive. As a result, an automatic stroller with additional features that benefit parents is essential.

II. LITERATURE REVIEW

The development of IoT enabled Smart Baby Stroller technology is an emerging research area that has gained significant attention in recent years.



Several studies have been conducted to explore the potential of this technology in enhancing the safety and comfort of infants and reducing the workload of parents.

Adwait B Kadu et al.[1], DC motor will provide rotational 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 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 et al. [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. [4], The author implemented automatic baby stroller with sensors that detects obstacles and avoids holes for the baby's safety and to detect the place of the user of the stroller through the mobile application.

By Mark Davis et al. [5], The author has implemented the automatic braking system consists of two capacitive touch sensors (Grove* - Touch Sensors), a relay (Grove* - Smart Relay), and a 12V pull-type solenoid.

III. METHODOLOGY

BLOCK DIAGRAM

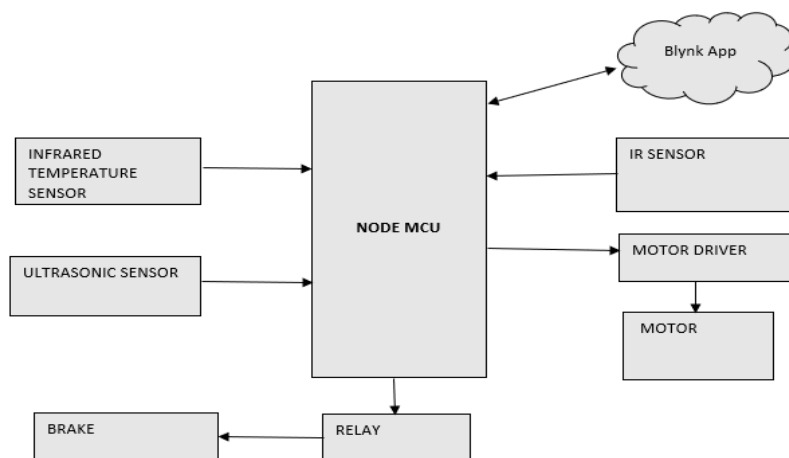


Fig 1: Block Diagram of IoT Enabled Smart Baby Stroller



The fig 1 shows the basic block diagram build around ESP8266. The Main designing block of the System is as follows:

3.1 Microcontroller

The ESP8266 or Node-MCU 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 Infrared Temperature Sensor

The MLX90614 temperature sensor is used for sensing the temperature of the baby. The MLX90614 is a non-contact infrared temperature sensor that is used to measure the surface temperature of an object without physically touching it. The MLX90614 detects the infrared radiation emitted from an object's surface and generates an electrical signal that is proportional to the surface temperature.

3.3 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.

3.4 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.

3.5 Motor Driver

We used L293D motor driver in our project. The L293D is a popular motor driver integrated circuit (IC) that can be used to drive DC motors and bipolar stepper motors. By controlling the input signals, the motor can be made to turn in either direction, or to stop.

3.6 Motor

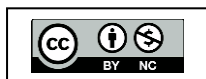
We used DC motor in our project. y. A DC motor is an electrical machine that converts mechanical energy into direct current and vice-versa. A DC motor (direct current motor) is a type of electric motor that uses direct current to generate mechanical power. We used DC motor to tight the seatbelt of the stroller.

3.7 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.

3.8 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.

3.9 Blynk App

We used Blynk app to display data on a mobile device. Blynk is a mobile app platform used for controlling and monitoring IoT devices. It is compatible with a wide range of microcontrollers, such as Arduino, Raspberry Pi, ESP8266, and Node-MCU, and allows users to remotely control their devices from anywhere in the world using their mobile devices.

IV. IMPLEMENTATION

1. 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. The implementation is shown in fig 2.

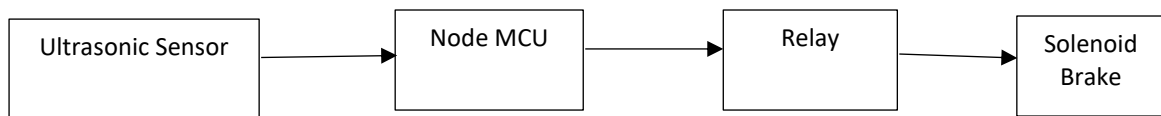


Fig 2: Block Diagram to detect obstacle and apply brake.

2. Implementation of Temperature sensor and show on blynk App

We have connected the MLX90614 temperature sensor with node MCU as shown in fig 3. The MLX90614 is used to detect the temperature. It detects the temperature by getting in contact with the baby. The MLX90614 has two sensors: one for ambient temperature measurement and another for object temperature measurement. It has a wide temperature range from -70°C to +380°C and a high accuracy of $\pm 0.5^\circ\text{C}$. The temperature gives the digital signals to the node MCU. The blynk app relates to the node MCU by WI-FI. Node MCU has a Wi-Fi module which gets connected with the internet. The blynk is the cloud server app. The temperature value which gets from the MLX90614 sensor passed to the blynk app by internet.

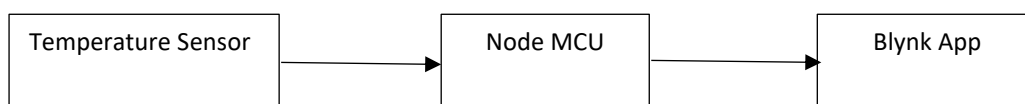


Fig 3: Block Diagram to Measure temperature of Baby through blynk app.

3. Implementation of automatic Seatbelt locking by detecting baby

We have placed the IR sensor in the baby stroller. IR Sensors or Infrared Sensor are light based sensors that are used in various applications like Proximity and Object Detection. When the baby will come in front of the IR

sensor then it will detect the baby and pass signal to the node MCU s shown in fig 4. The node MCU send the signal to the L293D motor driver. This motor driver will rotate about 10 sec. This rotation will tight the seatbelt of baby.

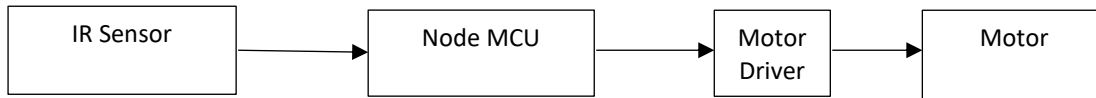


Fig 4: Block Diagram to apply automatic seatbelt by sensing baby

V. RESULT

We are successful in detection of obstacle and avoiding it by applying brake automatically. Whenever there is any obstacle within the range of 70cm the brakes are applied immediately before colliding with the obstacle. We are also successful in measuring temperature and updating it live on the blynk app. Its measurers the temperature withing an interval of 10-15 sec and update it on the blynk app. We are also successful of detecting baby and automatically tight the seatbelt which keeps the baby safe.

IV. CONCLUSION

This paper presents the “IoT enabled Smart Baby Stroller” is a technologically advanced device that offers a range of features designed to improve the safety of the child and convenience of parents. The IoT Enabled smart baby stroller comes with a variety of sensors such as ultrasonic sensor, IR sensor, temperature sensor and WI-FI module which connects the blynk app. The special features like obstacle detection which protects the baby from the obstacles which enhance the safety of the baby. Temperature monitoring with the blynk app, and automatic seatbelt tightening by detecting the baby which also enhance safety of baby. Finally, it is concluded that the proposed system can be used for baby’s safety.

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