

Smart Cradle with IOT based Baby Monitoring System

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Abstract— In this modern era, parents are busy building their career, lifestyle etc. So it's now become hard for the parents to take care of their children simultaneously, which paves a lot of work pressure and family pressure especially for women. Therefore, an Internet of Things(IoT) based Smart cradle with baby monitoring system is proposed, which will help the parents to monitor their child even if they are away from home and detect every activity of baby from any distant corner of the world. In the designed system, NodeMCU Controller board is exploited to gather the data read by the sensors(i.e. Sound sensor,DHT11 sensor, Moisture sensor) and uploaded via Wi-Fi. The system consists of a baby cradle that will automatically swing using a motor when the baby cries. DC fan is automatically turned on when surrounding temperature exceeds a specified range. Parents can also monitor their baby's condition through an external web camera(ESP32 CAM). All the data taken from the sensors will be stored in Blynk server and an instant mobile notification is sent through Blynk app whenever baby cries.

Index Terms—IoT, NodeMCU, DHT11 sensor, Sound sensor, Moisture sensor, Blynk App, ESP32 CAM, Wi-Fi

I. INTRODUCTION

At present, both parents are required to work due to high cost of living. However, they still need to look after their babies, thereby increasing workload and stress. Working parents cannot always care for their babies. They either send their babies to their parents or hire a care taker while they are working. Some parents do not want to hire a care-taker because of safety issues and expenses. So, a smart cradle with IoT based baby monitoring system that can monitor their babies condition in real time is proposed to solve these problems. It is an innovative, smart and protective cradle system to nurture an infant in an efficient way. It has automatic cooling fan and swing mechanism, live video surveillance. In order to detect each and every activity of baby, different sensors/modules are

attached to the cradle: Humidity and Temperature sensing module for sensing surrounding temperature, Moisture sensor to detect the wetness of the bed, Sound sensor to detect cry of the baby. Notification alerts will be sent whenever cry is detected through Blynk app.

II. LITERATURE SURVEY

Few studies have investigated the possibilities of automated baby cradle using different perspectives.

Goyal and Kumar introduced an E-baby cradle that can swing automatically when it detects crying and stops swinging when the crying stops. The speed for the swinging cradle can be controlled based on the user's need. It has an alarm embedded in the system, which notifies the user when two conditions occurred. First, the alarm goes off when the mattress is wet, indicating that the mattress should be changed. Second, when the baby does not stop crying for a certain time, the alarm alerts the parents to attend to their baby. However, it is only applicable when parents are near the cradle, because it only uses a buzzer alarm, the sound of which might frighten the baby. Parents cannot monitor their baby when they are away from home, for example when at work or when traveling to other places.

A similar automatic baby monitoring system was proposed in which the author developed a low budget system that swings the cradle when the crying sound is detected, and the cradle stops when the baby stops crying. The built-in alarm goes off under either one of the following conditions: the mattress is wet or the baby does not stop crying after a certain period. A video camera is placed above the cradle to monitor the baby. However, the parents can only receive the notification via SMS and cannot control the system. Therefore, the proposed system in the current study is more advanced, because it

utilizes an IoT application to monitor and control the developed smart cradle in real time anywhere and anytime.

A baby condition monitoring system based on GSM network. The authors built a prototype that can measure infant’s pulse rate, body temperature, movement, and moisture sends an SMS alert to the parent’s mobile number. Although the system was proposed to monitor the baby’s condition and send information through GSM network. It consists of sensors, LCD screen, GSM interface, and buzzer, which are controlled by a PIC 18f4520 8-bit microcontroller. The LCD module displays the sensor readings, and the GSM interface condition, appropriate control actions are required to make accurate readings, given that the baby could have crawled around and the sensors might have been detached. The baby might also get injured or electrocuted when the unattended baby touches the system circuit. The system should be improved in terms of safety, cost effectiveness, and user-friendliness.

III METHODOLOGY

A device that provides electric current to the load is called a power supply. The 12V and 5V dual power supply is a simple circuit that provides 12V and 5V DC voltage at the output after processing through a few steps. NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. The DHT11 is a commonly used Temperature and humidity sensor that comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sound sensor is one type of module used to notice the sound. Generally, this module is used to detect the intensity of sound. DC Fan is used for cooling purpose. DC motor is used for swinging the cradle. Motor Driver is used to give high power to motor by using a small voltage signal from a microcontroller, it also allows to control working speed and direction of two motors simultaneously. Moisture sensor is used to detect the wetness. A camera(ESP32CAM) is connected at the top for cradle for live video surveillance. Blynk is an IoT platform for android smartphones that is used to control NodeMCU via internet. Blynk server is responsible for the communication between smartphone and hardware.

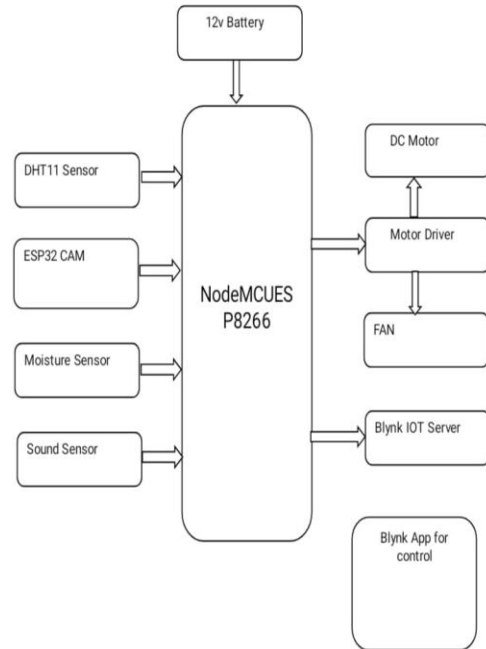


Fig-1 Block Diagram

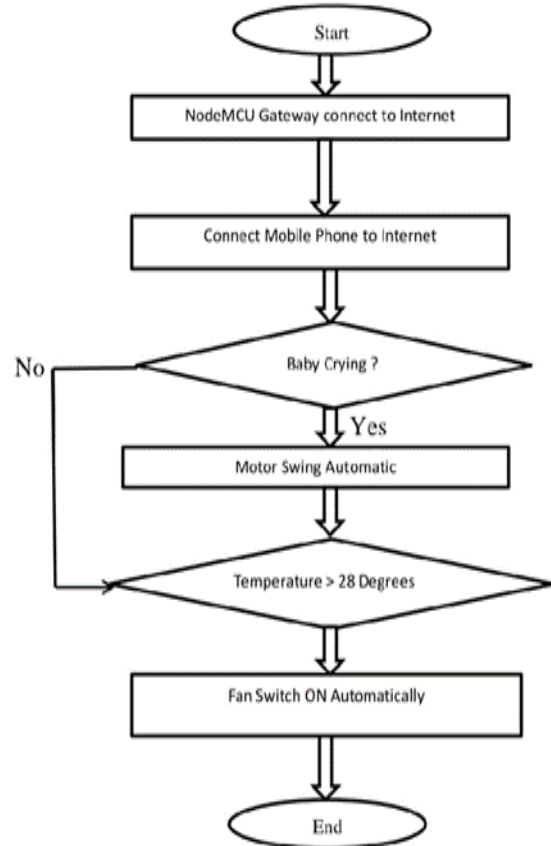


Fig-2 Flowchart

IV RESULTS

The proposed system detects each and every activity of baby via different sensors that are attached to the cradle. All data taken from the sensors will be stored in Blynk server and analyzed at regular Intervals. Cradle will trigger automatically via motor driver by microcontroller when the baby cries continuously upon the set point values. The temperature value, humidity, and cry status of the baby displayed on Blynk app. The temperature and humidity of surroundings were determined and a mini fan is turned on if temperature is above 28 degrees.

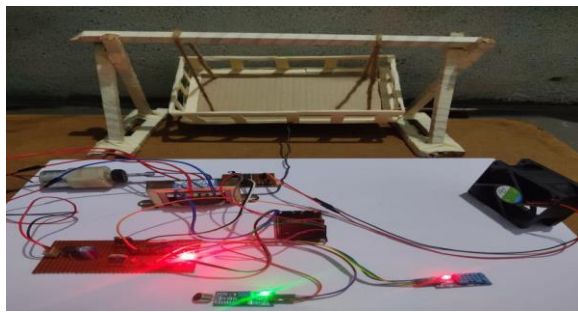


Fig-3 Experimental setup

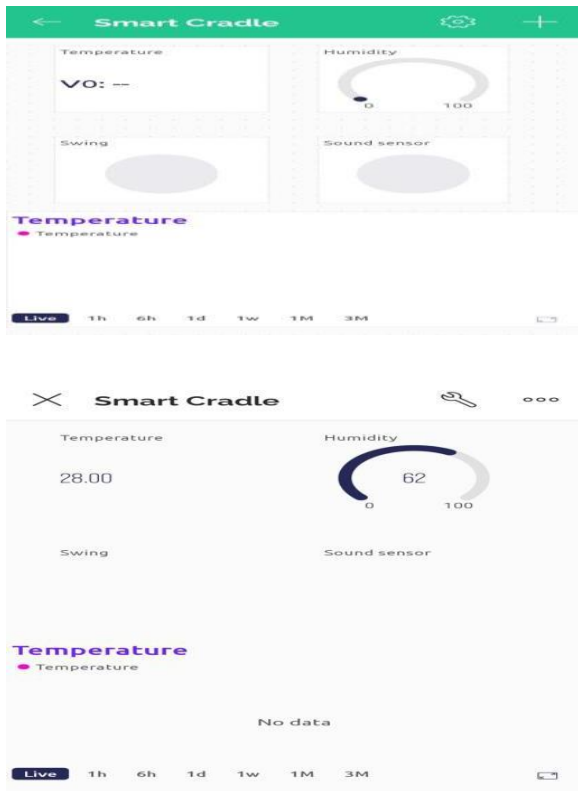


Fig-4 Blynk App User Interface

The smart cradle can swing automatically whenever sound is detected by the sound sensor. A notification, is sent to the user through email/Blynk mobile application to notify the user that crying is detected on the baby monitoring system. Parents can even turn on live video camera and check baby activity using mobile.



Fig-5 Mobile Notification

V CONCLUSION

The main goal of the project is to design a smart cradle with IoT based baby monitoring system, which will help the parents to monitor and nurture their child in an efficient way even if they are away from the home. The finished prototype was tested by using a mobile phone with a baby crying ringtone, which was placed in the cradle. When the mobile phone rang for a few seconds, the cradle started swinging because of the system's assumption that the baby was crying due to the detected sound. A notification was sent to the mobile phone of the user to signal that the baby is crying. The temperature and humidity of the surroundings were determined, and the mini fan was turned on if the measured temperature was above 28 °C. ESP32 CAM is used for live video surveillance with the help of its IP address. The project is totally safe in terms of electricity and other hazards. Whole system is compact. It helps working women balance their work and domestic chores. Can be used in day care centers/hospitals for the aid of human beings.

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