iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VI **Month of publication:** June 2021

DOI: https://doi.org/10.22214/ijraset.2021.35940

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VI June 2021- Available at www.ijraset.com

Development of an Intelligent Baby Cradle for Application at Home

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Abstract: In today's modern society, there has been automation of all kinds and can be seen everywhere. Our project focuses on the "Intelligent Baby Cradle Systems," As there are only a few options available in the market, and of those, most are expensive and are not value for money in terms of the features. This initiative is intended to assist mothers who are too busy and have a specialist in cleaning or sitting with their babies. This document depicts the architecture of a programmable cradle, which essentially is based on Node MCU. It also houses a temperature sensor, sound sensor, and moisture sensor to increase the baby cradle's efficiency. The data is synced with the mobile app, which makes it an Intelligent Baby Cradle.
Keywords -baby cradle, smart baby bed wet detector, node mcu

I. INTRODUCTION

Both men and women enjoy equal rights in this 21st century, both of which work equally hard to preserve their social standing and compete in this rapidly developing globe. Technology also advances extremely quickly every day, and human beings create it. It is therefore extremely vital to look after the future generation, especially newborns.

This project is designed and implemented with a particular gift for parents in the present century, the baby monitoring system. The project aims at designing an Intelligent baby cradleIntelligent baby with numerous functions to assist in monitoring newborns and update parents' status. This design includes many functions, such as monitoring, automated cradle swinging, detecting if the bed is wet, detecting of a baby in the cradle, and all these features include a baby's crying, baby's temperature message to a cell phone app called Blynk to let the parents know about their child.

II. LITERATURE SURVEY

Misha Goyal et. al [1] Presented the suggestion for a health monitoring system for infants and children. The technology suggested detects the body temperature and humidity content of the bedding construction. The op amp provides the signal conditioning.. The system suggested enables live monitoring of the kid and a toy to calm the youngster and rotary movement through a DC motor. The fundamental issue of this idea is the lack of the android application for displaying calibrated data from sensors.

Tushar P. Patekar et. al [2] Created a system that offers all the movement that the mother may take via a mobile control of the voice and motion sensor. The gadget may be utilised within a range of any position and can be manipulated by beads linked to the frame from one position to another. The sensor is positioned at the bottom of the bed such that no swing happens smoothly.

S.P. Patil et. al [3] Developed a method that can assess a baby's heart rate, body temperature, movement, and moisture level and communicate the data over a GSM network. Sensors, an LCD screen, a GSM interface, and a buzzer are all controlled by a PIC 18f4520 8-bit microcontroller. The sensor data are shown on the LCD module, and an SMS alarm is sent to the parent's mobile phone through the GSM interface. Although the apparatus was intended to assess the infant's status, reliable data require proper management measures, considering that the child may have moved about and the sensors could have been disconnected.

Manisha et. al [4] suggests a model for a self-regulating infant cradle that includes a microphone that recognises the baby's cry. The electrical device operational amplifier is used for amplifying signal conditioning circuit to turn it into an electric signal. To accept the enhanced signal and convert it to a digital signal, a microcontroller is used. The microcontroller keeps an eye on the driving circuit, which starts a motor and swings the infant cradle.

J.-R. C. Chien et. al. [5] Presented an embedded ARM baby surveillance platform project. A system including an embedded system platform with the Linux kernel, CMOS image sensor, and control system was proposed by the author. The technology is utilized via a web browser to monitor children's activities and the environment. When a baby cries are detected in the system, parents are alerted by sending a sound signal to the room of the parents. In addition to a wireless module to communicate temperature data to the platform, the body temperature of the child is monitored using a TMP75 temperature sensor. As a power regulation component of a light control unit, a bi-directional thyristor triode is utilized.

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A. F. Symon et al. [6] Drafted the Raspberry Pi and Pi camera baby monitoring system. The device can detect the movement and weeping of the infant. The condenser MIC and pIR motion sensor were utilised to detect infant movements using the PI camera. Currently it was employed. Only when the MIC condenser detects sound and transmits a signal to Raspberry Pi, is the camera switched on. However, the outcome of this technology is only visible on a monitor display, thus parents are only allowed to examine the information in a confined area on a limited number of devices.

C.-T. Chao et. al [7] suggested an Arduino-based resonance cradle suited for newborn cries. In order to decrease system dampening, a ball-bearing design allows the cabin to swing freely, even without electricity. A suitable sensor is then developed to detect the swinging state or angle. The researchers have claimed that their method saves energy and allows parents to record newborn cries on an SD card saved in an SD module owing to hunger or pain. Such a local control solution, however, is not ideal if parents are somewhat away from their kids, as the data on an IoT server can not be updated or a cradle remotely operated.

III. PROPOSED SYSTEM

Block Diagram of the system

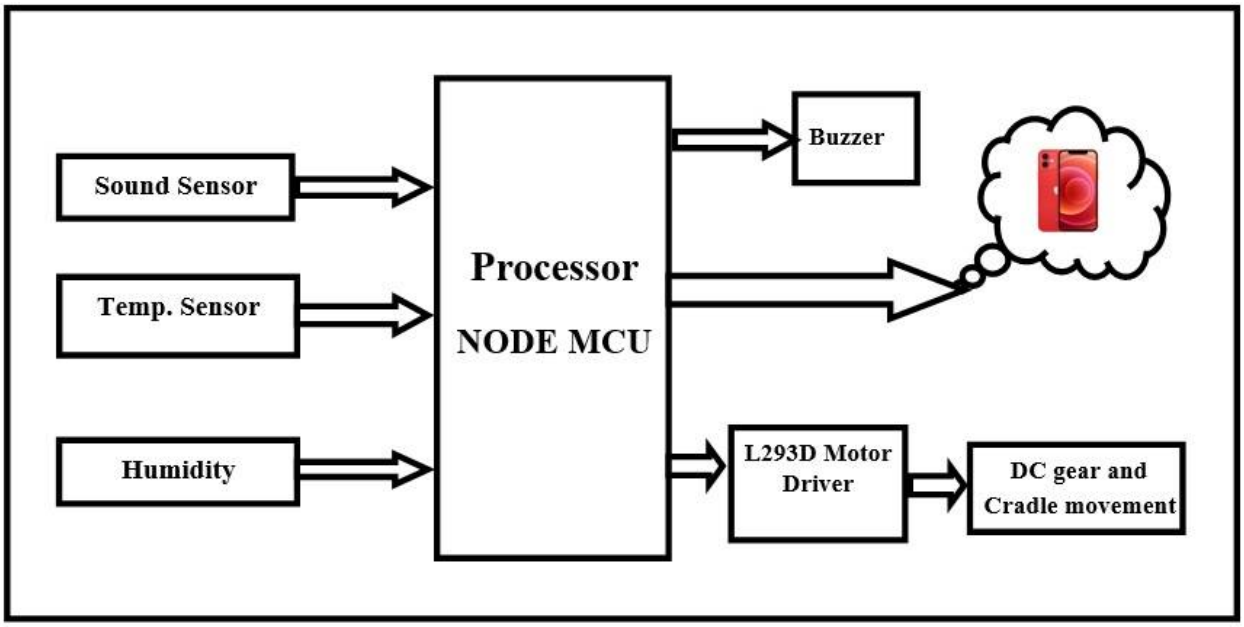

Fig.1 Block Diagram of The System

A. Working of the System

The intelligent baby cradle is equipped with Sound sensor, Temperature sensor and Humidity sensor. All these sensors are primary input modules of the system connected to Node MCU which is our main microcontroller unit. Also, the outputs such as buzzer, motor and a mobile app is available in this system. All the input sensors collect relevant sensor data and send it to the Node MCU and the node MCU after analysing the data give output in the form of buzzer alarm, or movement of motor for cradle and sending data to the Blynk app via internet, making it intelligent.

Also, the system is designed using both hardware and software elements. Some of which are featured below.

B. Hardware Elements

1) *Node MCU:* Node MCU is an open source microcontroller unit which is usually used for iot projects. As it is a low priced product featuring GPIOs and can be programmed using Arduino IDE, our project requirements were satisfied by NodeMCU.
2) *Sound Sensor:* Sound sensor is a sensor which can be interfaced with our NodeMCU, and this sensor collects sound data and converts it into electrical signals. It is used to detect the sound of baby in our project. This data is sent to NodeMCU for analysing the data and act accordingly.
3) *Temperature Sensor:* Temperature sensor gets the temperature data from the baby cradle and sends to the NodeMCU and the Microcontroller analyses the data and updates the same to the Blynk app.

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4) *DC Motor:* DC motor is being used in our project as an output form. When the Node MCU senses the data taken as input from sound sensor and analyses it as the baby is awake or crying then it is programmed to work and the cradle is connected to the motor.
5) *Moisture Sensor:* Moisture sensor is an input form of sensor being given to the NodeMCU. This sensor is equipped in the cradle's bed and senses any water or moisture present on the bed and after sensing it is being sent to the Node MCU and after which it is sent to the Blynk App and Buzzer is turned on alarming the parents.

C. *Software Elements*

1) *Arduino IDE:* Arduino IDE is an open source IDE which is being used to write and program the Arduino microcontroller. It is also used to program NodeMCU.
2) *Blynk App:* Blynk is a IoT data platform where the sensor data can be viewed, and also the project can be controlled using the Blynk platform. Our project shows Temperature, Moisture data on the Blynk app and the motor for cradle can be controlled using the app.

IV. FLOWCHART AND ALGORITHM OF THE SYSTEM

A. *Algorithm*

1) Start the System
2) Initialize
3) Accept the inputs from the input Devices
4) Detect the sound if Baby is crying
5) If yes Turn On The Motor for five minutes and turn off the motor
6) If No keep checking with sound sensor if the baby is crying
7) Go to step 3
8) Check whether the bed is wet using Moisture sensor
9) If yes send notification via internet
10) If no go to step 3
11) Check the temperature using DHT 11 sensor
12) If the temperature is above set point send notification via internet
13) Go to step 3

B. *Flowchart*

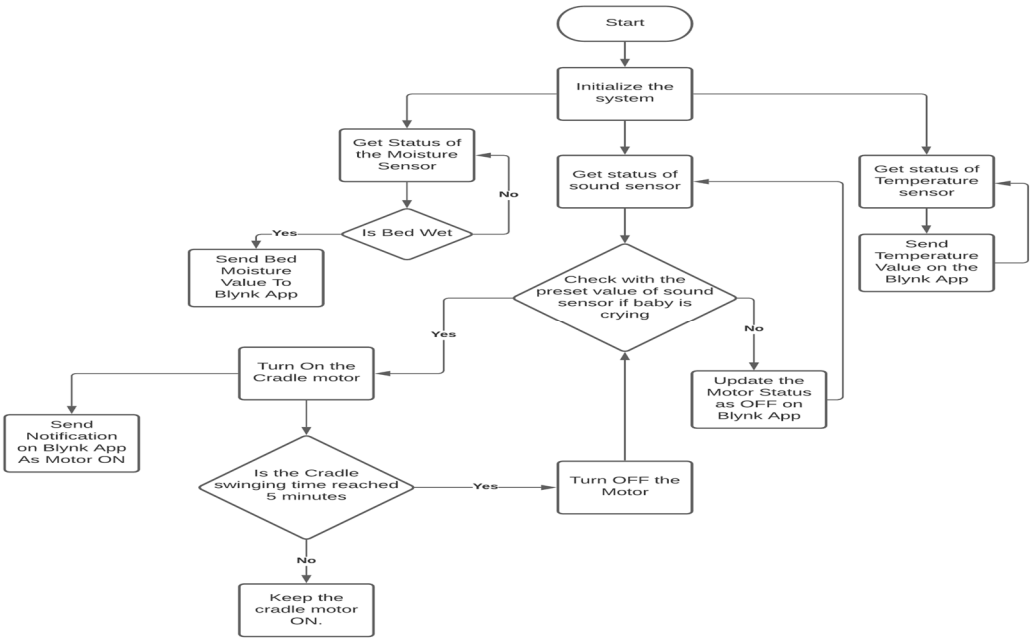

Fig.2 Flowchart of the system

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V. RESULT

Fig.3 Experimental setup of Intelligent Baby Cradle.

Feature	Result
Temperature	29 °C
Moisture	68 $g.m^{-3}$
Cradle Motor	Off
Baby Crying	No

Table 1 Outputs of the sensors

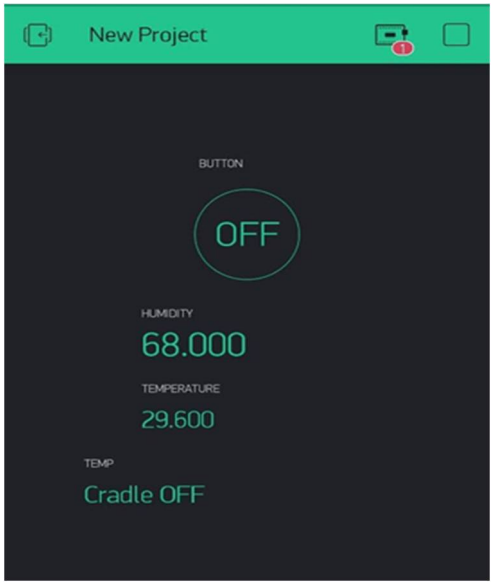

Fig.4 Sensor data being displayed on The Blynk App when Cradle is in OFF condition.

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Fig.5 Sensor data being displayed on The Blynk App when Cradle is in ON condition.

VI. CONCLUSION

The project designed is extremely useful for the parents who are into working class and cannot spend whole day with babies. The days are of full hectic schedule and employing a maid for mentoring and taking care of babies is very expensive. Our designed system is a boon for working class parents. The Intelligent Baby cradle is equipped with Sound sensor, Temperature sensor, Moisture sensor, Motor, Buzzer acting as inputs and outputs and also we have used Blynk IoT platform for sending sensor data and controlling the system using internet. There could be some modifications for the future scope.

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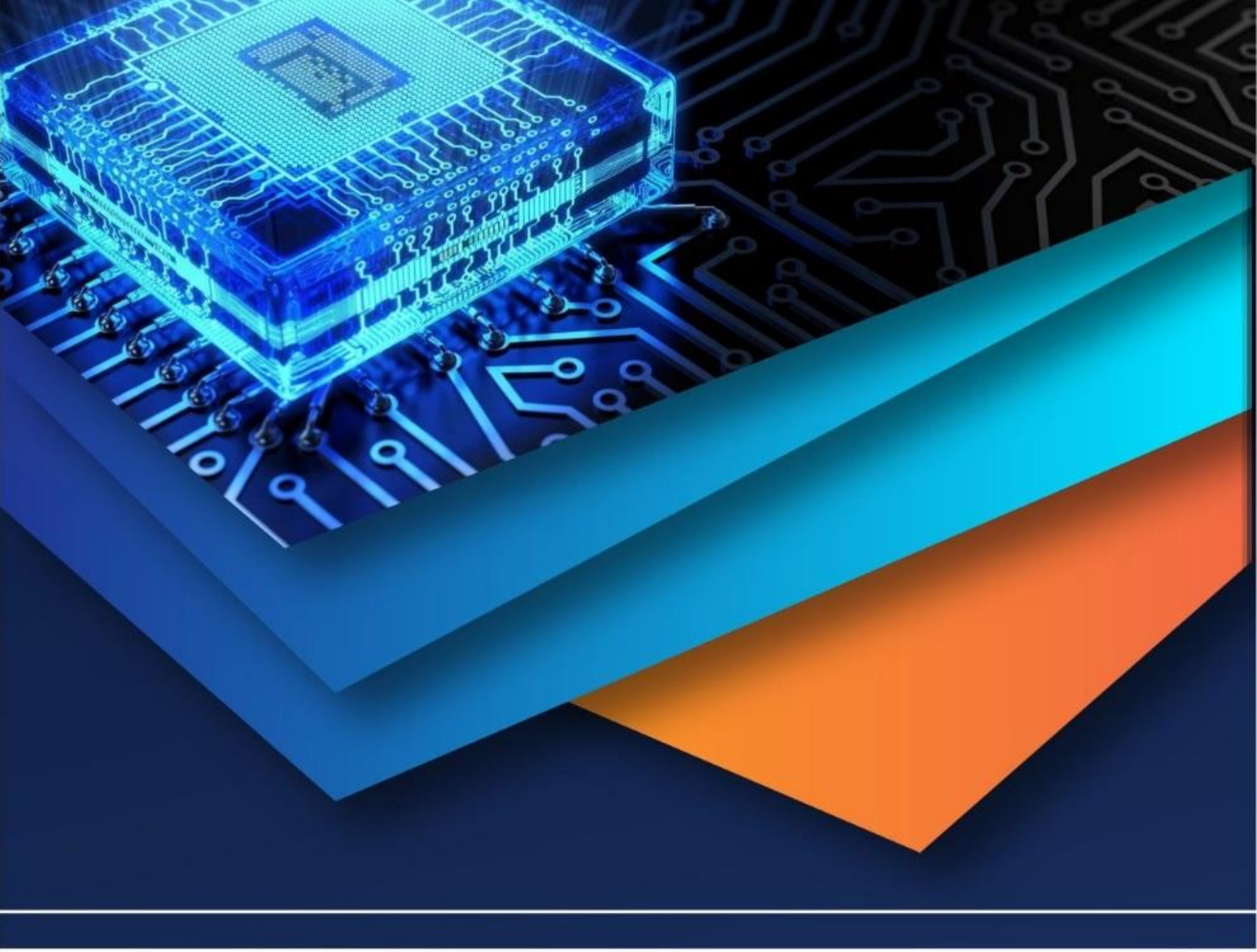

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