Smart Baby Monitoring Cradle Using IOT

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Abstract.

In a current digital age, the majority of women are in charge of newborn care, which is difficult and causes concern about the baby's safety, health, comfort, and other factors. Smart devices are capable of sensing their surroundings and transmitting that data to a higher level. Because of the current era of digitalization, data and computer skills are now widely available and those technologies connects the working mother and child. This study suggested super-smart cradle gadget would send a message to the parent. While the parents are not present, the cradle is live streamed through a webcam using Alfred camera software. If there's too much movement detected, the PIR motion sensor alerts the parents. The humidity sensor determines whether or not the baby has urinated. It will notify the parents if it detects any type of dampness. The sound sensor detects whether the infant is crying or making other noises, while the temperature sensor measures the child's body temperature. If any of the sensors mentioned above detects an abnormality, an alarm is sent to the parents or other people caring for the baby. Twilio will keep the user informed of all actions. The information presented is saved on the ThingSpeak server webpage and application. This strategy employs a cloud service for remote child monitoring. Our Smart Cradle System has been professionally demonstrated to be the least harmful to newborns. As a result, the IoT-based Super Smart Cradle system real-time monitoring is used to monitor the child using the cradle.

Keywords. *Internet of Things, Alfred Camera Software, Twilio, ThingSpeak Server & Application, Cloud.*

1.   INTRODUCTION

Industrialization has resulted number of women increases now a days. As a result, many female professionals are often required to work away from home. As a result, these mothers are now unable to care for a newborn. Mother is constantly concerned about the infant's well-being.India and other industrialising countries, parents must work while also providing for their children, putting an additional burden on both parents. These families will benefit greatly from the development of a system that allows parents to keep track of

their children when they are ill or simply going about their everyday lives, as they will be able to focus more on their work difficulties and less on the baby. All the unusual activity tracked instantly, an alert about the situation will also be sent out, and it to be addressed quickly. A baby frequently cries when they are thirsty, ill, awakened from nap, or want their diaper changed.

In our proposed prototype, we provide a cradle with intelligence to monitor the aforementioned acts, identify the cause, and alert the parents. The Internet of Things (IoT) is a network of interconnected things that can collect and communicate data over a wireless network without human interference. Because of this technology, devices can now communicate sensor data over the Internet without requiring human intervention. Using this proposed technology, parents would be informed of the infant's condition within the cradle, allowing them to relax and worry less about the child's welfare while they are away. Another advantage is the ability of sensors to detect suspicious behavior and send alert signals in such cases.

A smart cradle based on Arduino UNO and GSM was developed for baby monitoring [1]. An Internet of Things (IoT)-based smart programmed monitoring of infants based on parameters such as temperature, pulse rate, and gas molecules, as well as recording the baby's movement and position [2]. A video output-based baby intensive care system based on a Raspberry Pi B+ module and a pi camera has been proposed [3]. Using an Arduino UNO, a microcontroller, and a GSM module, an automated cradle system will send an alarm message to the parent's mobile phone [4]. A smart infant cradle that allows working mothers to keep an eye on their children was proposed [5]. A Smart Baby Cradle prototype, an IoT-based Cradle Management System, was created in 2018. The cradle will be able to communicate with a smartphone using this system [6]. An IoT-based Smart Cradle System Baby Monitoring Android App with video monitoring includes an automated rotating toy for the infant's entertainment, which minimizes the possibility of a baby crying [7].

The majority of existing baby monitoring systems use a swinging cradle with a sound sensor to detect crying.To help with ventilation, a small fan is attached to the cradle. The fan turn on automatically when the temperature reached 28 °C or higher. To provide real-time video monitoring, an Wi-Fi camera used on the cradle. The primary goal of the system is to drown out distracting noises for the baby by playing soothing music. The architecture of the existing methods is illustrated in Fig.1. The existing monitoring system does not utilize any optimization algorithms. Secondly the data storage is not utilizes the cloud platform.

2. METHODOLOGY

Our idea is to create a super-intelligent cradle system that sends an alarm message to the parent. When the parents are not present, the cradle is monitored live via webcam using Alfred Camera software, and the PIR sensor detects motion and sends an alarm to the parents

if there is too much motion. The Humidity Sensor detects whether the newborn has peed and alerts the parents.
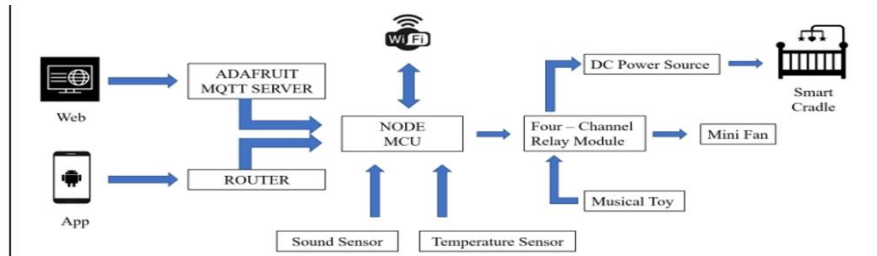

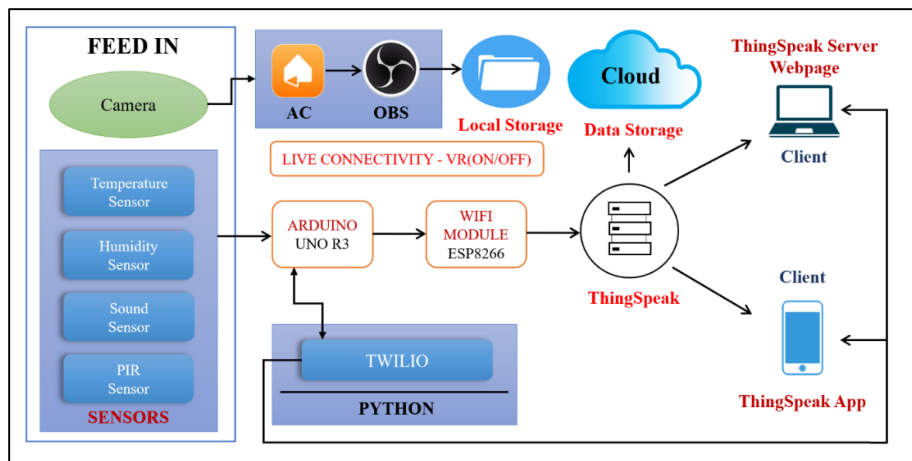Fig. 1. Architecture of Node MCE based baby monitoring system

Fig.2 Architecture of the proposed system

To enable faster operation, we use the Arduino UNO R3. Twilio will keep the user informed about all operations. Twilio is a platform that is used thousands of businesses and million developers all over the world to create unique, personalized experiences for their customers. Everything displayed is saved in the ThingSpeak server's webpage and application, which functions as a cloud service. ThingSpeak is open-source software that helps users to connect with internet-enabled devices. ThingSpeak was originally launched in 2010 by ioBridge as a service to support IoT applications. The architecture of the proposed system is illustrated in Fig. 2. The major advantage of the projected system is that the Twilio is notified of any activity that occurs in the cradle. secondly it requires no additional hardware or software knowledge, nor does it require any human input to rock the cradle.Operation is made possible by RIS because it minimizes the antenna's contact with its substrate [6].

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3. OUTPUT AND DISCUSSION

In our proposed system, the PIR motion sensor alerts the parents if there is too much movement detected. The humidity sensor determines whether the baby has urinated or not. If it detects any type of dampness, it will notify the parents. The sound sensor detects whether the infant is crying or making other noises, and the temperature sensor determines the child's body temperature. If any of the above-mentioned sensors detects an abnormality, an alarm is sent to the parents or other people responsible for the baby. Twilio will keep the user up to date on all actions. Fig. 3 depicts a sample notification message on a mobile screen. Fig. 4 depicts the live monitoring of a baby via mobile using an Alfred camera.

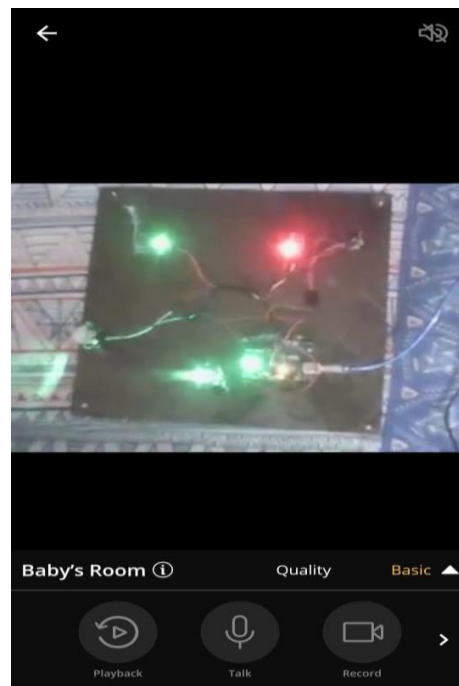| Fig.3. Sample message received on mobile through Twillo sandbox	Fig. 4. live monitoring of a baby via mobile

Performance metric analysis

ThingSpeak is used to observe the temperature and humidity when the system is turned on, and the results are depicted below. When the system is turned on, the graph displays the temperature and humidity fluctuations over time. The results are precise because the values

are kept consistent with the date and time. The performance metrics of ThingSpeak is illustrated in Fig.5.

a) Metrics of twilio

Key performance metrics must be analyzed in order to understand the performance characteristics of your hardware devices and how they relate to the performance of your applications. The Twilio performance statistics are shown below. The total number of messages is displayed, and as of July 6th, there were approximately 105 messages, with 99 percent of them having the status "ok." The 1 percent unsuccessful status is caused by a network problem while Twilio is delivering the modified messages. Fig.6 represents the performance metrics of humidity and temperature using Twilio.

b) Metrics of ThingSpeak

The overall assembly of the proposed smart baby curdle system which included the sensors, camera and board is illustrated in the Fig.7.
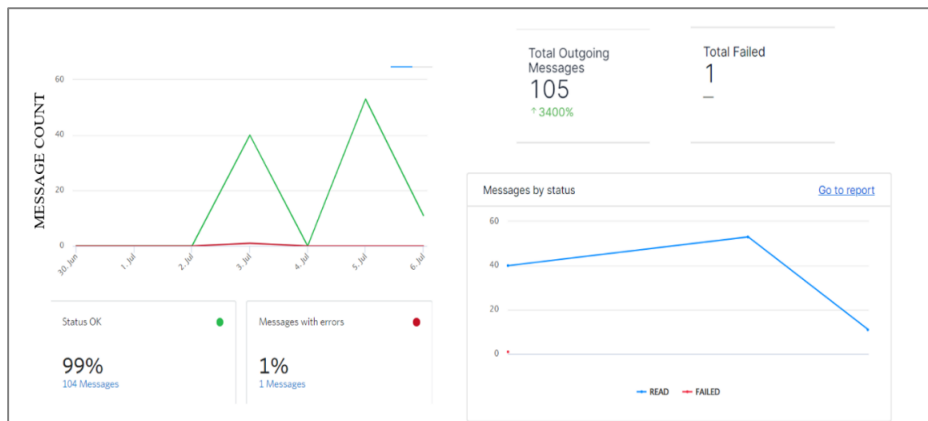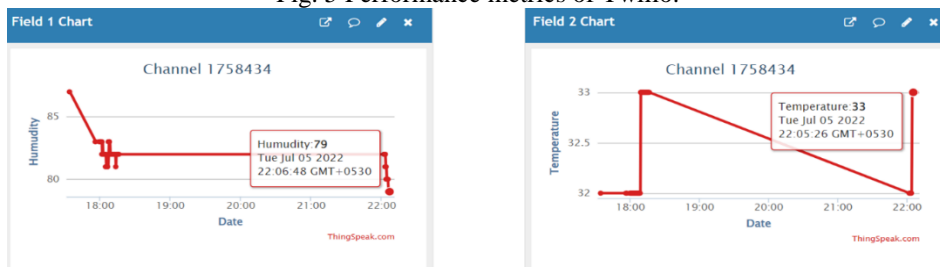

Fig. 5 Performance metrics of Twilio.

Fig. 6 performance metrics of ThingSpeak a) Humidity b) Temprature

Fig. 7 overall assembly of the proposed smart baby curdle system

4. SUMMARY

T IoT applications are expected to bring about significant changes in the near future. We mitigated the risks of the Smart Baby Monitoring Cradle by connecting it to IoT devices. IoT and ThingSpeak can be used together until scalability issues are resolved. Data from multiple devices in an IoT network is stored in a centralized database, making it vulnerable to security breaches. The proposed architecture creates a Wi-Fi network to allow ThingSpeak to spread to all end users while also ensuring communication security. We present an architecture that uses the Arduino UNO Board to securely interact with ThingSpeak and Twilio. Clinical studies have shown that this Smart Cradle System is the least harmful to newborns.

Deep Learning technology can be used to detect pests in real-time while monitoring the child's cradle. In the future, machine learning and deep learning algorithms may be used to assess the baby's comfort based on facial expressions and crying patterns.

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