BABY SURVEILLANCE SYSTEM USING IOT FOR SMART CRADLE

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ABSTRACT

In recent times, baby care has come more important and challenging for working maters. Indeed home, working maters will not have sufficient time to track their babies continuously. They give the responsibility of their baby to either a baby caretaker or they shoot the baby to their grandparents' house. In the proposed plan, a smart carrycot with an automated baby monitoring system was developed. In the baby monitoring system, the necessary parameters of the child like temperature, Beat rate, molecule of gases, capture the stir and position of the baby were measured and track. The baby monitoring system is attached to the cradle so that an incubator kind of surrounding will be created for the baby. The baby monitoring system tacks the baby 24x7. The measured parameters regarding the baby's health like temperature, Beat rate, moistness on the baby bed will be displayed in the web application. If the recorded readings show any abnormalities, the necessary actions like controlling temperature, switching on or off the fan, setting up cradle's stir, playing music for the baby will be taken. If the readings seem abnormal, the caretaker along with the parents will get an alert message. The baby monitoring system prototype helps the parents in time operations and makes it easier for the caretakers as well. This baby monitoring system is proven to have less hurt for the baby with the most delicacy. This monitoring system is a largely effective IoT grounded system for Real-time monitoring with the finest security measures.

Keywords: *Baby monitoring system; Cradle; IoT device; Real-Time Monitoring; Inspection.*

1. INTRODUCTION

In India, in recent times, both the parents functioning have been common. In these span babies monitoring will be the toughest thing for working parents. While they have a guardian for the baby, but it would be difficult and tough for them to have a view of the baby and its health status. In addition to this, almost one in every ten babies is born earlier. Premature babies are the more sensitive than the normal born babies. Premature babies tolerate with home environment and after also coming from incubators in hospitals. Premature babies are those who are born more than three weeks earlier the baby's estimated time of delivery. They often have medical disorder and higher threat of life. The situation of the baby needs to be tracked for every second and time to time. They will be kept in a remote chamber or incubator, for a total minute to minute monitoring. Premature babies need to have an extended stay in the hospital than a normal born baby in the nursery unit or neonatal intensive care unit. The most general problem that premature babies face is PDA and hypotension, trouble in breathing due to an undeveloped respiratory system. They also lose their body temperature and tolerate due to a weak immune system etc. On a survey basis there are 4 million babies worldwide would die in the four weeks of their life due to low birth weight as well as the high temperatures and humid environments also make babies breathless. These types of conditions create additional threats to the baby's health. To maintain the baby's condition, they require an additional controller in an incubator for maintaining the baby's body temperature, humidity, and pulse rate, and oxygen flows

without any assistance. In the same manner, when the premature baby's span in hospital is completed, they need to be taken more care of in their homes too. Caretakers and parents solely can't take care of baby minute to minute.

In general, in the hospitals, the incubator protects and monitors the baby's condition with every parameter that needs to be monitored. Whereas in homes there is something more compatible for the baby, where it can monitor the baby minute to minute regarding its health issues and surveillance also. The baby needs to be taken care of the moisture and temperature around it. The monitoring systems and automation with data exchange are growing quickly with the Internet of Things (IoT). An IoT device includes wireless sensors, software, hardware, actuators, cyber systems, computer devices, and all are connected to an object that facilitates the network. It also permits the transfer of data and managing of the sensors and any connected devices with its data fetching software. By with the help of the IoT, a minute to minute real-time tracking is set without any human interruption.

IoT devices are combined with the current technology which makes a mix of communication or interconnection on the internet, managed, and controlled remotely when required through, constant investigation, installed framework and artificial intelligence (AI). In real-time, digital automated systems work and help at best in each step over the network. The IoT also permit inspection mode for the monitoring system, which in turn helps better health as well as environmental monitoring. In this work, there are parameters like room humidity control, temperature control representation of insecure gases, and functioning of the heartbeat parameters are measured with the help of actual sensors. The baby's health status including the sensors readings are updated on the web application. The sensors are connected into the Adriano board i.e., the framework on board development interface. This decreases the basic circuit complexity all over the baby and the onboard complexity. The cradle is the first place for the baby in a home. By maintaining care of this, the baby's health status is track and controlled by all regular updates and health readings. This cradle helps the baby in having both comfort as well as security. The cradle carries less complexity in circuits which reduces the risk of short circuits. The cradle has a surveillance system and the baby's positional status and area are completely monitored every time either in an online web application.

2. LITERATURE REVIEW

Few studies have investigated the possibilities of automated baby cradle using different perspectives. A baby monitoring system has been proposed in which an enhanced noise cancelling system that monitors the baby and reduces sound pollution has been suggested the main function of the system is to reduce the noise that might disturb the baby by playing relaxing songs. This system can also adjust the room's light intensity with the aid of a light sensor. However, our system has more advanced features, such as supporting real-time monitoring over the IoT network[1].

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[2].

A similar automatic baby monitoring system was proposed in the authors 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[3].

An Arduino based resonant cradle designed with infant cry recognition was proposed by , a ball bearing design is adopted to reduce system damping and allows the cradle to swing freely even without electricity. Subsequently, an appropriate sensor is designed to detect the swinging status or angle. The authors claimed that their system is energy saving and allows parents to record infant cries due to hunger or pain on an SD card stored in an SD module. However, such local control solution is inappropriate when parents are located slightly far from their babies, because it does not allow updating of the data in the IoT server or controlling the cradle remotely[4].

3. System Architecture

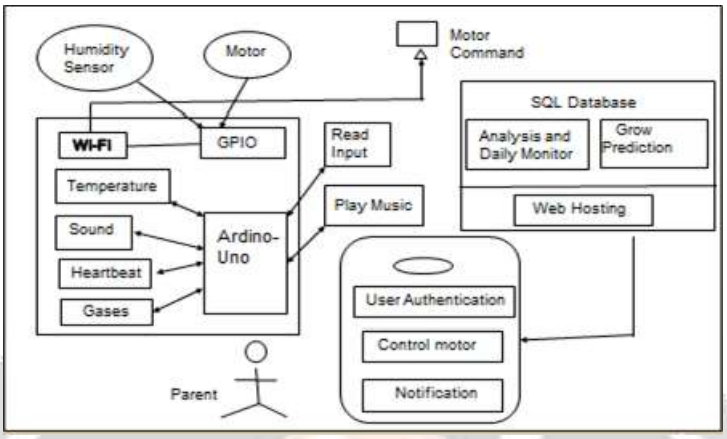

Fig 1: System Architecture

Aurdino-uno is a multi-utility board with a dual microcontroller that works on the parallel mechanism with Wi-Fi and microcontroller. There are some necessary parameters for the infant that needs to be monitored on daily basis from time to time. Such parameters are body temperature, gas sensor, and pulse rate that are measured using sensors. A microphone module is attached to the cradle that gives the necessary indication of the baby, whether he/ she is crying or not. With this, the reason for the baby's crying is temperature, pulse rate difference, nature calls, or the baby's hunger can be identified. The sensor's readings will be processed by the microcontroller and the recorded data is transmitted using Wi-Fi module. The sensor readings will be monitored, and the necessary actions will be processed according to the baby's condition. As per the readings, if the temperature is high and the baby is crying, the heater placed under the cradle provides sufficient heat for the baby to comfort. In the same way, when the temperature is too high, a portable fan is arranged on the top side of the cradle, which is operated with levels of speed. Along with this, if the baby cries, the attached music player plays the songs, and that will be managed by the microcontroller or outer source. The cradle is controlled using a servo motor that makes the cradle swing whenever the baby cries. This will be detected using a microphone.

Proceedings coding interface that works in the backend it shows all the readings and statuses of the sensors and other interfaces (Heater, Fan, and Music System). All the sensors are connected, and their readings are measured according to the flow chart. This whole continuous recording and monitoring help to check the baby's condition and health care up to date and it is user-friendly, so that it will be easier for anyone to understand the Infant's comfort and health conditions.

3.1 Algorithm:

STEP 1: Turn ON the cradle.
STEP 2: Monitor the conditions of cradle as well as baby.
STEP 3: Alerts and activate-deactivate module.
STEP 3.1.1: If urine is detected Arduino-uno send message to parents and alarm is activated.
STEP 3.1.2: Parents can send "start swings" message to Arduino-uno parents and alarm is activated.
STEP 3.1.3: To stop swing motion parents can send to Arduino-uno or the swing motion will stop automatically.
STEP 3.2.1: If baby cries Arduino-uno sends message to parents.
STEP 3.2.2: Parent can send "activate" message to Arduino-uno to start the baby toys.
STEP 3.2.3: Parents can send deactivate message to stop baby toy.

3.2 Flowchart

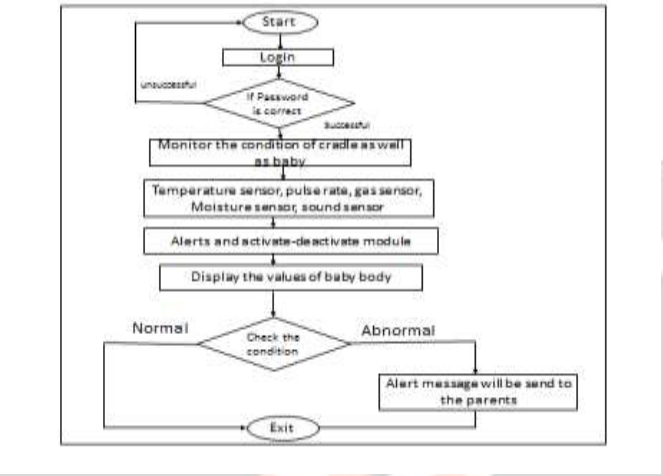

Fig 2: Flowchart of Baby Monitoring System

4. CONCLUSIONS

In the developed system all the necessary sensors that are used for measuring the parameters, In the application, the parents gets necessary alarm messages or alerts regarding the temperature, moisture, gases, baby's bed dampness, crying sound and pulse rate of the baby. Minute to minute monitoring can be done. The necessary framework for baby monitoring with the screening of necessary parameters like health monitoring and full-time surveillance of the baby is demonstrated.

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