IOT BASED SMART BABY CRADLE WITH ROBOTIC PARENTS VOICE TOYS USING MACHINE LEARNING AND ARTIFITIAL INTELLIGENCY

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Abstract— Being one of the most populated country, child birth rate is increasing every day and the basic need of the baby which is the cradle is still been at a very traditional way, there are hardly any improvement seen on the development side of the cradle, as the increase in the number of Mothers going out for work has increased, many families have been left with the only option to leave their children with their servants. As monitoring their kids while they are out to work has been a real challenge nowadays. A prototype of the proposed baby cradle has been designed using Foam sheet and all the arrangements and fabrication part has been done as close as possible to the real time cradle, where we have added the basic function that is the swinging of the cradle, also added a auto tune, if the baby cries, the mic detects the sound of the baby and immediately turns the lullaby tune on to soothe the baby, while the swinging motion is turned ON. Further added a water sensor at the bedding of the baby, so that if bed wet happens it triggers the microcontroller and the message can be sent to the parents to get the diaper changed. Also added a moisture sensor so that if there is rise in humidity, then the mini fan that we have fixed turns on automatically to cool the baby down.

Keywords— Baby Care, Embedded System, Microcontroller, Swing Mechanism, IoT Introduction (HEADING 1)

INTRODUCTION- Using cradles to make the baby fall asleep has been done from ages. The history of cribs and cradles are still unknown to the modern world. There are many kinds or methods to make a baby fall asleep, but like many parents it is always a challenge to shift the baby from arm to the cribs while the baby is asleep as there is a higher chance that the baby would wake up and if it does, than the baby will not sleep back right away, hence cradle is a better option, where even after shifting the baby from arms to the cradle, if the baby wakes up, the swinging motion of the cradle makes the baby fall asleep again, There are many kinds, like cradles, rockers, cribs, hammocks etc. the Traditional Cradles are made up of wood in the earlier civilizations specially in ancient India, which was completely made up of wood and they used to tie it to the roof top using ropes. But in today's world the cradles come in a various variety right from wood, wooden frames, metal frames, made up of ropes and fabric etc. But still all the cradles serve the basic swinging principle and there are hardly any modifications or advancements seen in the cradle. With the new IoT based smart cradle and baby monitoring system, we have made many advancements to the traditional cradle. The smart baby cradle helps working women balance their work and domestic chores. It creates a positive impact on society as women can continue their studies or job without worrying about their children and can take part in development of the nation. There are a lot of accidents such as SIDS(Sudden infant death syndrome)which occur when the child suffocates after crying in the cradle and if it is not attended there is risk of SIDS, so as soon as the baby starts crying the care taker can recognize and take the appropriate action the new advanced and the prototype that we made we have made many advancements wherein we have basically added DHT11 sensor which is also known as humidity sensor, to detect the humidity in the cradle, a sound sensor to detect if the baby wakes up and cries, the sound senses it and the tempo audio plays the music and ON, and turns on the Fan if the humidity increases in the cradle. So basically, we have made few advancements and improvisations in the traditional cradle and we have added ESP8266 IC and made it IoT compatible so that we can monitor the baby with a PC or mobile remotely as well.

RELATED WORK

The SIDS is the common death cause for the infants, which is more evident, so monitoring the baby becomes an utmost priority, various people tested and after a lot of surveys, even they have not got satisfactory result on what the exact cause is for the SIDS which is an abbreviation of sudden infant death syndrome. To study more on the topic, we have even referred R. S. C. Horne, ''Sudden infant death syndrome: Current perspectives,'' Int. Med. J., vol. 49, no. 4, pp. 433–438, 2019[1]. To look for all the possibilities and better options as to what we can do to differently to built a smarter cradle, we have collected and referred to the past actions and the technologies used to build a smart cradle, the two theories [8] M. P. Joshi and D. C. Mehetre, ''IoT based smart cradle system with an Android app for baby monitoring,'' in Proc. Int. Conf. Comput., Commun., Control Autom. (ICCUBEA), 2017, pp. 1–4. [9] M. Levy, D. Bhiwapurkar, G. Viswanathan, S. Kavyashree, and P. K.

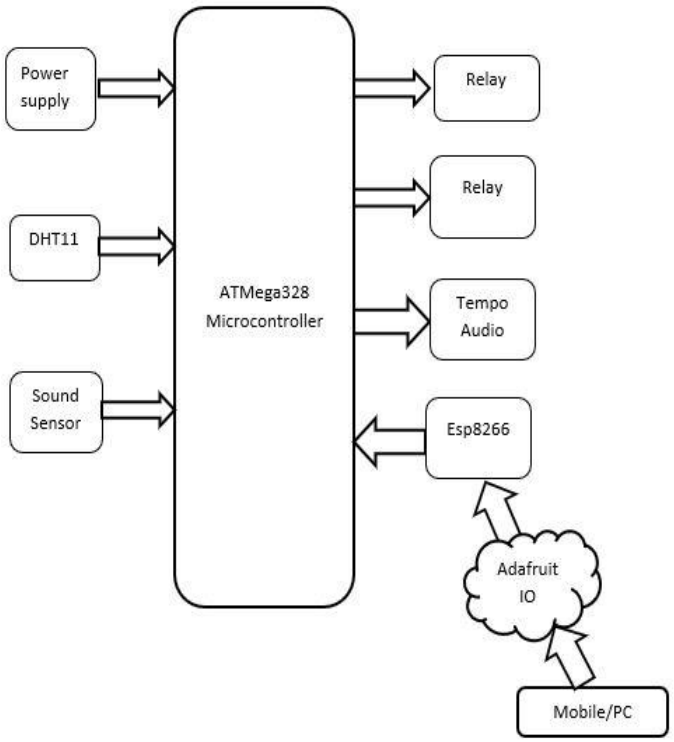
Yadav, ''Smart cradle for baby using FN-M16P module,'' Perspective. Commun., Embedded-Syst. Signal-Process., vol. 2, no. 10, pp. 252–254, 2019. Both the research paper and articles give us good amount of exposure to the technology, mechanism as to what we can do to develop a smart cradle and make baby monitoring system more efficient.

EXISTING SYSTEM

The existing system doesn't have modifications or any developments and hardly any electricity is used in the cradle, most of them are manual cradles and a few are run on battery as well with a fixed swing motion. Not many developments are seen even till date. So, whenever the baby sleeps in the cradle, an attender or a care taker should always be near the baby to take care of the baby. If the baby wakes up most of the babies cry when they wake up, and if the attender is not nearby then the baby might wake up fully. At many instances we have even seen baby falling off due to lack of attention when the baby is awake. Just because in Indian families men go out to work and the women stay back, and in nuclear families its only the mother who has to take care of the baby and also do the household work at the same time, so if the baby cries the mother has to sit in front of the cradle and swing the baby till its asleep. So we have made the set up to the cradle so that just by pressing the swing button on the IoT platform then swing can be activated and the swinging will continue till the button is turned OFF.

PROPOSED SYSTEM

BLOCK DIAGRAM:



The new proposed system consists of basically all the essential things that needs to be added to the traditional swing. We have implemented an automated swing where we have fixed a DC motor to the cradle, whenever the baby wakes up the microphone senses the crying sound of the baby and activates the DC motor and swings the cradle. Along with dc motor the melody tune will start to play to relax a crying baby and also if the attender is not nearby then we are providing button feeds in the IoT server so that we can go control the motion of the swing as well. And if the humidity increases to a certain pre-set level, then automatically the fan will turn On. There is also a water sensor that we have added which will be placed at the bottom of the bedding, so if the baby makes the bed wet, then the water sensor senses the wetness send real time feed to the IoT monitoring system, so that the guardians or parents can change the diaper. We have added an independent camera where it will have a real time feed to the guardian or the parents to check if the baby is asleep. So basically, whenever the baby is crying then the cradle swing goes on automatically or even the guardians can turn on the cradle manually on the IoT feed buttons. The fan also works on the same principle, if the humidity goes above the pre-set level the fan turns on automatically or even the fan can be activated manually with the IoT feed button. All these functions can be seen on the LCD display what exactly is the status going on. The block diagram of proposed system is shown in fig 1 and the implementation is done as following:

- **Power Supply:** We are using 12v 1A adapter, for the Arduino microcontroller and another power supply 12v 1A to run the fan and the DC motor for the swinging of the cradle.
- **DHT11:** This sensor helps us to monitor the room temperature around the baby and if the temperature goes above the threshold level, then it automatically triggers the fan, so it turns on the Fan.
- Sound sensor/Mic: this sensor senses if the baby is crying or not, we have again taken analog pins as an input into the Arduino and set the preset level to 1024, and whenever the baby cries as the intensity of the sound is much higher the sensor sends the signal to the ESP8266 monitoring screen and activates the lullaby buzzer that plays the music.
- Relays: We are using two relays to trigger the Fan and the DC motor, so as soon as the room temperature or the humidity level goes beyond the preset level the relay connected to the fan gets activated, and the DC motor relay gets triggered in two scenarios, if the swing feed button is activated on the Adafruit IO server or if the baby crying sound is detected by the sound sensor.
- Tempo Audio: We have added a small chipset which is preloaded with a rhyme and it gets triggered when the baby starts crying so when the baby starts crying the swinging motion and the

lullaby sound both gets turned on for a certain delay.

- ESP8266: We are using ESP8266 device to interface the IoT with the adafruit server where all the feed buttons are stored and when the swinging and the fan buttons are activated on the adafruit server than the ESP8266 sends the information to Arduino and the Arduino turns on the fan and DC motor respectively.
- Mobile/PC: As the adafruit IO is an open source platform we can operate the cradle remotely using the same WIFI network by browsing the adafruit server and logging in using the credentials. Thus began the journey of the start up **Cradle wise**, with the development of an AI-powered smart crib, replete with a bassinet and rocker.here An ATtiny 2313 was chosen for the microcontroller an AT45D 4 megabit flash model provided the storage 8bit/8khz audio. Smart sensors in the cradle are designed to detect even the slightest movements of a baby and instinctively rock the child back to sleep. A combination of hardware, software and deep tech makes the Smart Cradle an all-in-one device that can provide responsive soothing to a baby, detect loud sounds outside the cradle, constantly monitor the sleeping child and send updates to the parents through an app. Some of the features include Responsive soothing, where smart sensors look for early wake-up signals in the baby, following which the cradle automatically rocks the baby back to sleep along with soothing music or robotic toy with parents voice. Moreover, AI decodes and understands the baby's sleep patterns and creates personalized sleep recipes for the child. External loud sound detection sensors allow for effortless detection of sudden, loud external sounds that could disturb a child, and the cradle begins to rock the child immediately. New parents often worry if their new born is sleeping right – specifically to ensure if their baby is breathing properly while sleeping or if there is any kind of physical discomfort in a crib or cradle. Cradle wise also provides a Contactless Baby Monitor, which detects unsafe sleep postures, and obstruction to breathing among others. Cradle wise uses a patented technology to ensure the swinging of the cradle is noiseless. Moreover, the rocking mechanism is rather gentle and also doesn't use much power. Keeping in line with the tech-savvy generation of parents, Cradle wise has an app that provides constant updates on the baby to the parents. The app is designed for Android devices.

Why do we need it?

A traditional Cradle has no electricity involved so the swinging has to be done manually, so we have ensured that most of the job is done automatically either via ESP8266 automatic feeds or when the baby cries the sound sensor detects the sound and turns ON the swinging of the cradle and the lullaby of the sound is played for a certain amount of time and if the baby is asleep or silent then the sound or the lullaby is made silent, but the swing motion continues to swing the baby till the ESP8266 feed is turned OFF manually. Apart from that we have also added a camera to monitor the baby real time, which is most useful when it can be used in hospitals, mostly in maternity homes where there are number of babies that are born every day. So, we have ensured that the cameras can help them to monitor the kids in the cradle and accordingly turn on the swing motion as and when needed.

RESULT & CONCLUSION:

As we have created a prototype of a smart cradle, the function of the cradle is to swing when the baby lying inside is crying, so we have used two techniques to swing the cradle. One is by activating the feed button on the adafruit server which is done manually as shown in the below figure no.2, and the second way is that it gets activated whenever the baby starts to cry and the sound sensor senses it and activates the DC motor for the swing motion.

Figure 2: Shows the feed buttons available in the IoT server.

The below mentioned images shows the quick procedure to create the IoT server and dashboard.

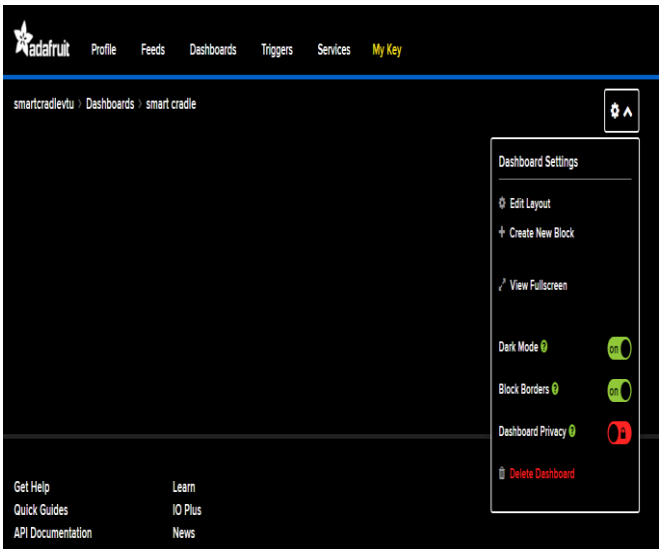


Figure 3: shows the initial Smart cradle account which is empty without any feeds.

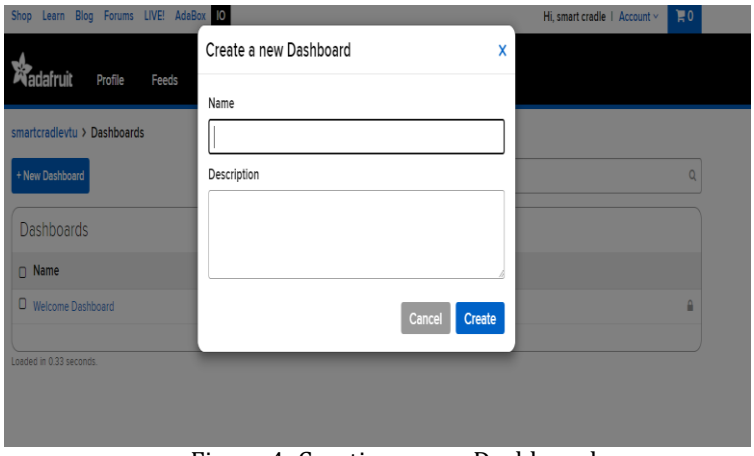


Figure 4: Creating a new Dashboard.

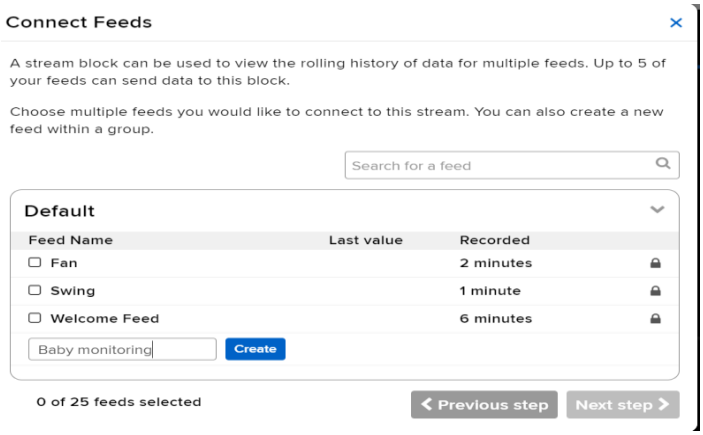


Figure 5: default page to connect the feeds to send data to the block.

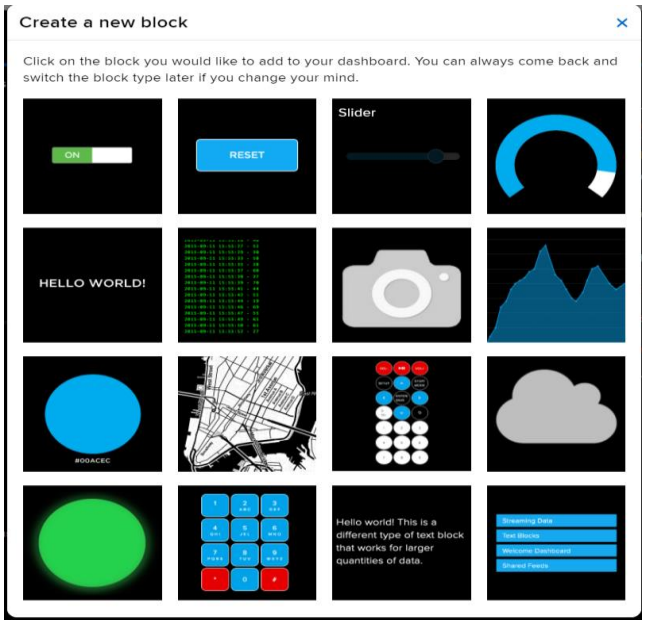


Figure 6: Creating a new block along with the image of the block or a button.

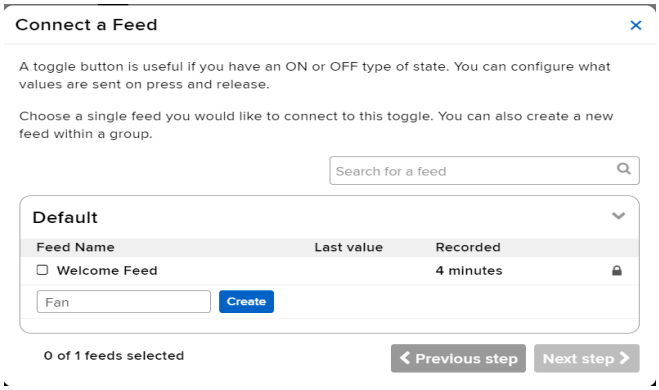
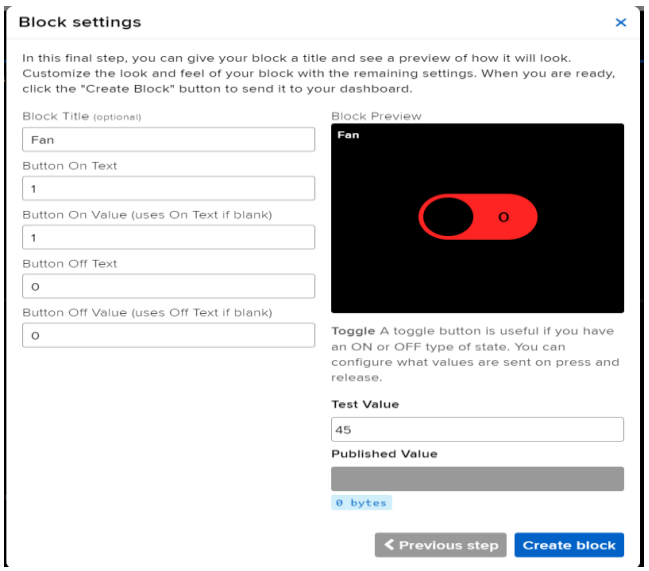


Figure7: individual toggle ON/OFF button assigned to the feeds.



The above steps show the procedure in creating the complete dashboard along with the feed buttons, which is

step by step procedure. Below are the sample pictures of the Prototype Smart cradle that we have created.

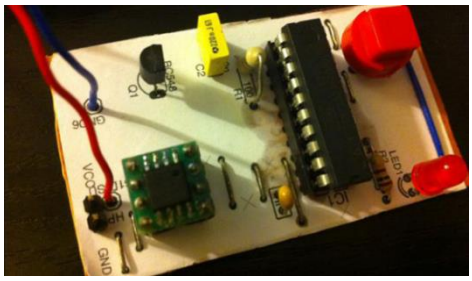


Figure 8. .Robotic toy hardware with AI & ML

In our project we are using robotic parents voice toys (Doll) which has a parents voice.

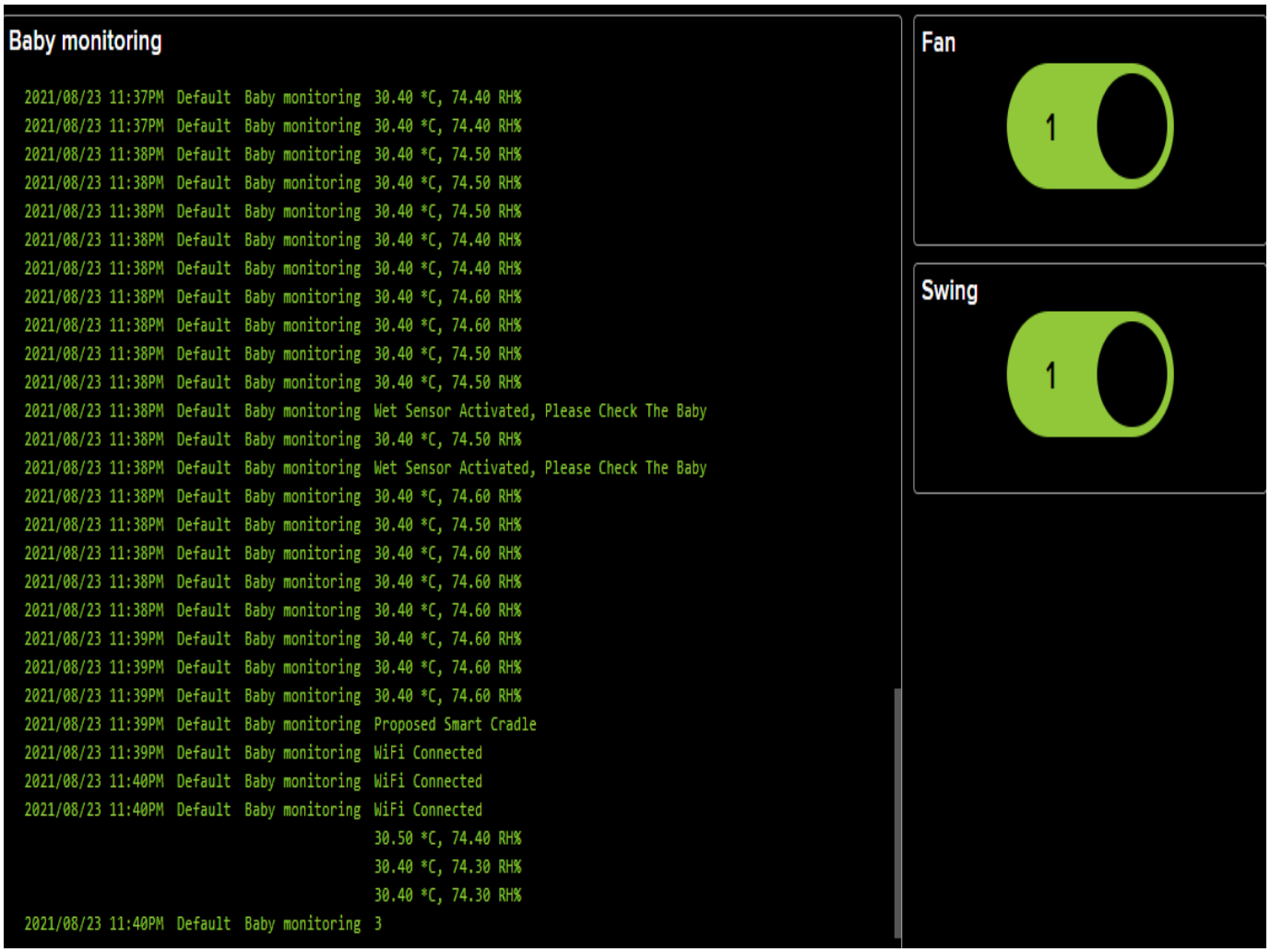


Figure 8: Final output of server feed in real time.

In our project we are using robotic parents voice toys (Doll) which has a parents voice.

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