SMART BABY CRADLE USING IOT

Main Project Report

Submitted by

Anakha Pavithran

Reg No : FIT20MCA-2017

Submitted in partial fulfillment of the requirements for the award of the degree of

Master of Computer Applications
Of
A P J Abdul Kalam Technological University

FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY (FISAT)®
ANGAMALY-683577, ERNAKULAM(DIST)
JULY 2022

DECLARATION

I, **Anakha Pavithran** hereby declare that the report of this project work, submitted to the Department of Computer Applications, Federal Institute of Science and Technology (**FISAT**), Angamaly in partial fulfillment of the award of the degree of Master of Computer Application is an authentic record of my original work.

The report has not been submitted for the award of any degree of this university or any other university.

Date : 10 - 08 - 2022

Signature : Anakha

Place: Angamaly

Name : Anakha Pavithran

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11TH July 2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Mr./Ms. ANAKHA PAVITHRAN (Reg. No. FIT20MCA-2017) has successfully completed his/her Main Project with the title "Smart Baby Cradle", in the Department of Computer Applications, FISAT, during the period from 30th March 2022 to 11th July 2022.

Dr DEEPA MARY MATHEWS

HEAD OF THE DEPARTMENT

FEDERAL INSTITUTE OF SCIENCE & TECHNOLOGY (FISAT) ANGAMALY
DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

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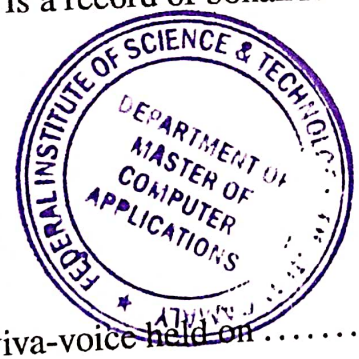
CERTIFICATE

This is to certify that the project report titled **'Smart Baby Cradle Using IOT'** submitted by **Anakha Pavithran [Reg No: FIT20MCA-2017]** towards partial fulfillment of the requirements for the award of the degree of Master of Computer Applications is a record of bonafide work carried out by her during the year 2022.

Project Guide



Head of the Department

Submitted for the viva-voice held on ..... at .....

Examiner :

ACKNOWLEDGEMENT

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ABSTRACT

Cradle is a device that is used to put babies to sleep. Cradle has a side- to-side rocking motion that eases the baby and put it to sleep. It takes lot of efforts from parent to physically rock the cradle to generate swinging motion. When baby is kept inside the cradle need to be constant monitoring parent to keep to track of baby's activity. An Arduino micro-controller will be used to assemble all the sensors and hardware component required. Constant monitoring of the baby inside the cradle will be done. If any activity such as urination or baby crying, it occurs a notification through an SMS will be sent to the parent's device. The Smart cradle will also have additional features such as rocking the baby automatically via geared motor mechanism. . Use of various sensors such as sound sensor to detect baby sound, a moisture sensor for sensing wet conditions and DHT11 sensor for measuring humidity and temperature. The cradle is suitable for parents who are not able to invest all their time at home sitting near the baby. Other applications of this cradle can be at a maternity hospital as an assistant to the staff who are responsible to look after the baby.

Contents

Chapter 1

INTRODUCTION

Today's lifestyle is fast paced. Most of the working parents find a bit difficult to manage work along with babysitting. They cannot keep an eye on their child all the time and is hard after long working hours. To sooth the baby by manually swinging the cradle might not be possible in such case. If they have taken help of babysitter for it then also baby's safety related thoughts keep going in their minds. Hence there is need of product which bridges this gap between parents and baby. This cradle system is proposed to help these parents, so that they can take good care of their baby.

Internet of Things (IoT) technology has brought revolution to each and every field of common man's life by making everything smart and intelligent. IoT refers to a network of things which make a self configuring network. Availability of high speed internet and wide use of mobile phones leads to gain the popularity to IoT. The smart baby cradle system using IoT.

This cradle system automatically swings according to baby cry. An Arduino micro-controller will be used to assemble all the sensors and hardware component required. Constant monitoring of the baby inside the cradle will be done. This cradle swings automatically on detection of baby cry sound. Also it gives gives notification on parent's phone if –first, baby cry continues till specific time which means now cradle cannot handle baby and baby needs personal

attention and second, if the mattress in the cradle is wet.

So through this project , it help all parents, so that they can take good care of their baby.

Chapter 2

PROOF OF CONCEPT

In IoT based smart baby cradle, a system is formed to monitor the child with the help of sensors, which senses components like sound, moisture, temperature, humidity etc.The cradle automatically swings according to baby cry. And If any activity such as urination or baby cry, a notification through an SMS will be sent to the parent's device.

In the last years there are a limited number of research articles relating to smart baby cradles. But in recent years it will change.The articles "S-MOM: Smart Mom On The Move" by Rachnana M S and Sanjana M Nadig, " IoT Based Smart Baby Cradle System with an Android App for Baby Monitoring" by Madhuri P Joshi and Deepak C etc says how possible to work baby cradle in the society. Year by year the developers make modifications on the existing cradle system. So it is more efficient than previous. All cradle system target is to give special care for babies.

2.1 Existing System

The present system is like babysitter look after the child. The cradle has to be swung by the babysitter or parents itself.The main problem is to, they can't keep an eye on their child all the time and is hard after long working hours.

2.2 Proposed System

The smart cradle automatically swings according to baby cry. An Arduino microcontroller will be used to assemble all the sensors and hardware component required. Constant monitoring of the baby inside the cradle will be done. If any activity such as urination or baby waking up from sleep occurs a notification through an SMS will be sent to the parent's device.

The advanatges of the prposed system are :

- Easy for parents to monitor their baby
- Provides security
- Small in size
- Lightweight
- Easily portable from one place to another
- Easy to use
- Cost efficient
- Less power consumption

2.3 Objectives

The objective is to build a device based on IoT .The Internet of Things helps the cradle to swings automatically on detection of baby cry sound. And the notification will be sent to parent's device.

- Study the working of Arduino with different sensors.
- To study function of different sensors like sound sensor, moisture sensor and DHT11 sensor.
- This system helps parents can work freely without any tension
- Reduced time consumption
- Better look after of child.
- To test the developed prototype.

Chapter 3

IMPLEMENTATION

The Smart Baby cradle is designed in such a way that to make baby more comfort. The foremost goal is to design a baby cradle, which has the capability to sway automatically when baby is not comfortable, and several sensors and actuators are used to detect the wet condition and retain the baby free from insanitation and to notify the parents through sms.

The most important sensor functions are : the sound sensor which detects the baby cry around the cradle through condenser microphone. Whenever the baby cries in the cradle, the microphone detects the sound and converts it into electrical signal to send to the microcontroller. Then the moisture sensor notify parents when the baby diaper gets wet. The parents will get a message from the system automatically. And temperature/humidity sensor which commonly used DHT11 sesnor is used to measure temperature and humidity around the baby and cradle.

Through this device it minimize the workload of the parents and nurses in home and hospitals respectively.

3.1 Hardware Requirements

- ARDUINO UNO
- SOUND SENSOR
- MOISTURE SENSOR
- DHT11 SENSOR
- MOTOR
- RELAY

3.1.1 Arduino UNO

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board.

Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits.

The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.

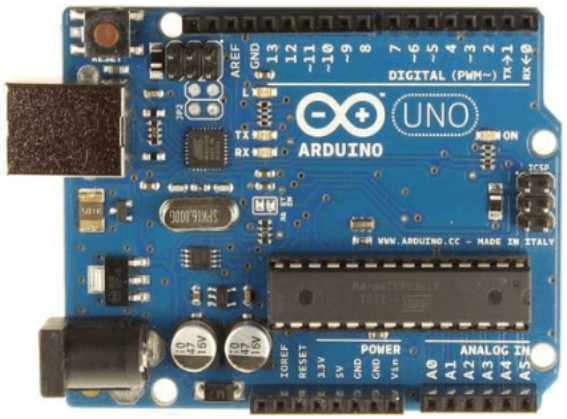

Figure 3.1: Arduino Uno

Arduino UNO Specifications:

- Microcontroller: ATmega328P
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Inout Voltage (limit): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- PWM Digital I/O Pins: 6
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB (ATmega328P) of which 0.5 KB used by bootloader
- SRAM: 2 KB (ATmega328P)

- EEPROM: 1 KB (ATmega328P)
- Clock Speed: 16 MHz
- LED_BUILTIN: 13
- Length: 68.6 mm
- Width: 58.4 mm
- Weight: 25 g

3.1.2 Sensors

1. Sound Sensor

   The sound sensor module provides an easy way to detect sound and is generally used for detecting sound intensity. This module can be used for security, switch, and monitoring applications. Its accuracy can be easily adjusted for the convenience of usage. It uses a microphone which supplies the input to an amplifier, peak detector and buffer. When the sensor detects a sound, it processes an output signal voltage which is sent to a microcontroller then performs necessary processing. Sound detection sensor module for arduino detects whether sound has exceeded a threshold value. Sound is detected via microphone and fed into an LM393 op amp. The sound level set point is adjusted via an on board potentiometer. When the sound level exceeds the set point, an LED on the module is illuminated and the output is set low.

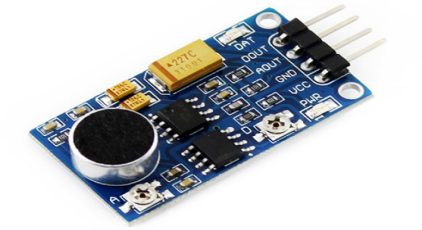

Figure 3.2: Sound Sensor

Sound Sensor Specifications:

- Working voltage: DC 3.3-5V
- Adjustable Sensitivity
- Dimensions: 32 x 17 mm
- Signal output indication
- Single channel signal output
- With the retaining bolt hole, convenient installation
- Outputs low level and the signal light when there is sound
- Output in the form of digital switching outputs (0 and 1 high and low)

2. Moisture Sensor

   The moisture sensor is used to measure wetness in the cradle. Soil moisture sensor is used here. The sensor consist of two components. A two legged Lead, that goes into the soil or anywhere else where water content has to be measured. This has two header pins which connect to an Amplifier/ A-D circuit which is in turn connected to the Arduino.

   The Amplifier has a Vin, Gnd, Analog and Digital Data Pins. This means that get the values in both Analog and Digital forms.

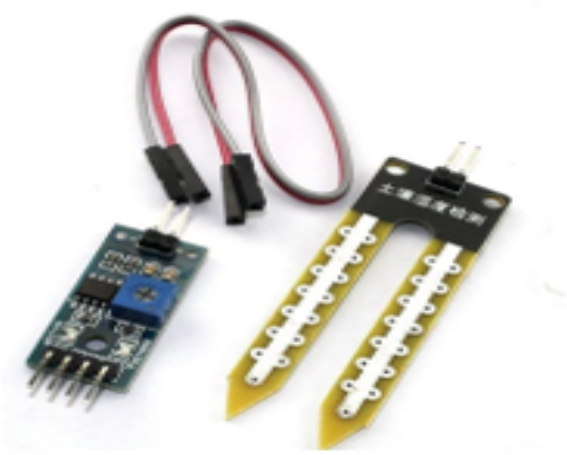

Figure 3.3: Moisture Sensor

Moisture sensor Specifications:

- Input Voltage 3.3 – 5V
- Output Voltage 0 – 4.2V
- Input Current 35mA
- Output Signal Both Analog and Digital

3. DHT11 Sensor

   The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin.

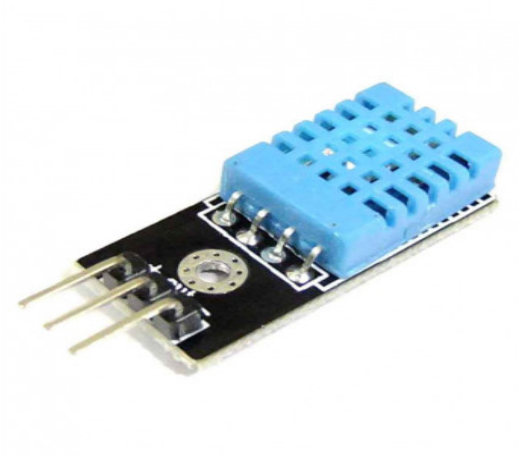

Figure 3.4: DHT11 Sensor

DHT11 Specifications:

- Operating Voltage: 3.5V to 5.5V
- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data
- Temperature Range: 0°C to 50°C
- Humidity Range: 20
- Resolution: Temperature and Humidity both are 16-bit
- Accuracy: ±1°C and ±1

3.1.3 Motor

The motor works automatically while the baby cries. The motor was placed under the cradle.

Figure 3.5: Motor

3.1.4 Relay

A relay is a programmable electrical switch, which can be controlled by Arduino or any micro-controller. It is used to programmatically control on/off the devices, which use the high voltage and/or high current. It is a bridge between Arduino and high voltage devices.The relay give power to motor for its working.

Figure 3.6: Relay

3.2 Software Requirements

- Arduino IDE
- JetBrains PyCharm 2018.1.3
- Fast2SMS

3.2.1 Arduino IDE

Arduino IDE is an open-source software program that allows users to write and upload code within a real-time work environment.Here we uses embedded C programming to control the whole mechanisms.

Arduino IDE(Integrated Development Environment) is the software for Arduino. It is a text editor like a notepad with different features. It is used for writing code, compiling the code to check if any errors are there and uploading the code to the Arduino. It is a cross-platform software which is available for every Operating System like Windows, Linux, macOS.It supports C/C++ language It is open-source software, where the user can use the software as they want it to. They can also make their own modules/functions and add them to the software

Figure 3.7: Arduino IDE

(a) Embedded C

Embedded C is an extension of C language and it is used to develop micro-controller based applications. The extensions in the Embedded C language from normal C Programming Language is the I/O Hardware Addressing, fixed-point arithmetic operations, accessing address spaces, etc. Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C.In embedded system programming C code is preferred over other language. Features :

- Easy to understand
- High Reliability
- Portability
- Scalability

3.2.2 Python IDE

IDE stands for Integrated Development Environment is defined as a coding tool that helps to automate the process of editing, compiling, testing, etc. in an SDLC and it provides ease to the developer to run, write and debug the code.

It is specially designed for software development that consists of several tools which is used for developing and testing the software. Python IDE's are Pycharm, Spyder, jupyter, PyDev etc.

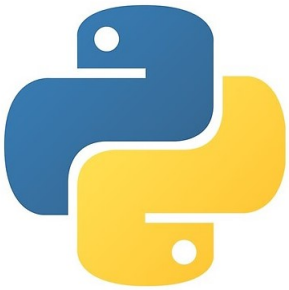

Figure 3.8: Python IDE

3.2.3 Fast2SMS

Bulk SMS Gateway helps in connecting with our target audience at a much faster level. Fast2SMS is the most trusted API SMS service provider in India. The speed with which the messages are sent and the quality of our services cannot be compared with any other service provider. Here the notifications send to parent's device through this gateway.

Figure 3.9: Fast2SMS

Chapter 4

SYSTEM DESIGN

The cradle is designed in such a way that to make baby more comfort. The foremost goal is to design a baby cradle, which has the capability to sway automatically when baby is not comfortable, and several sensors and actuators are used to detect the wet condition and retain the baby free from insanitation and to notify the parents for attention for their baby.

4.1 Architecture

Architecture of this project is as follows

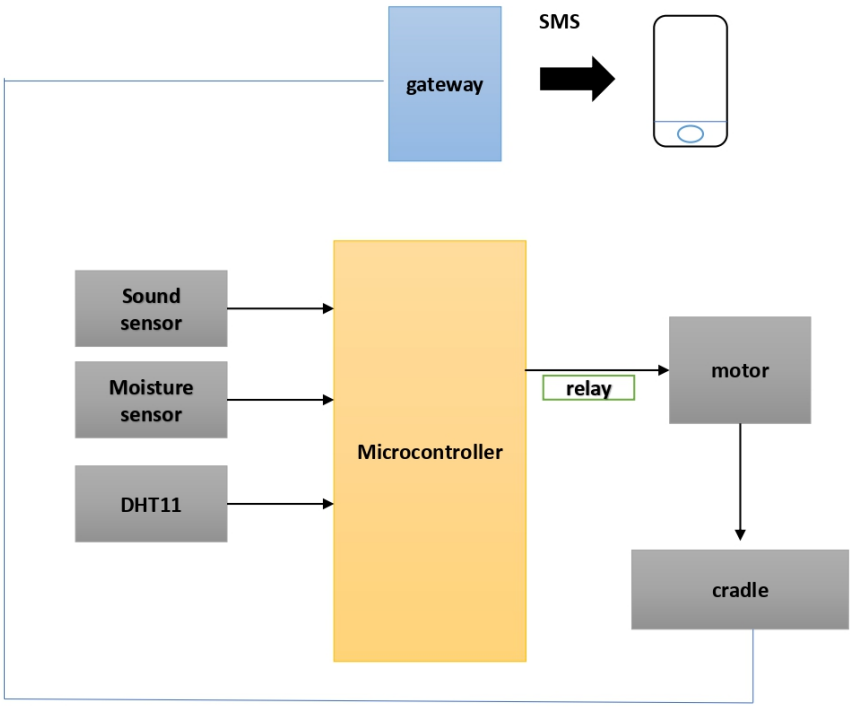

Figure 4.1: Architecture

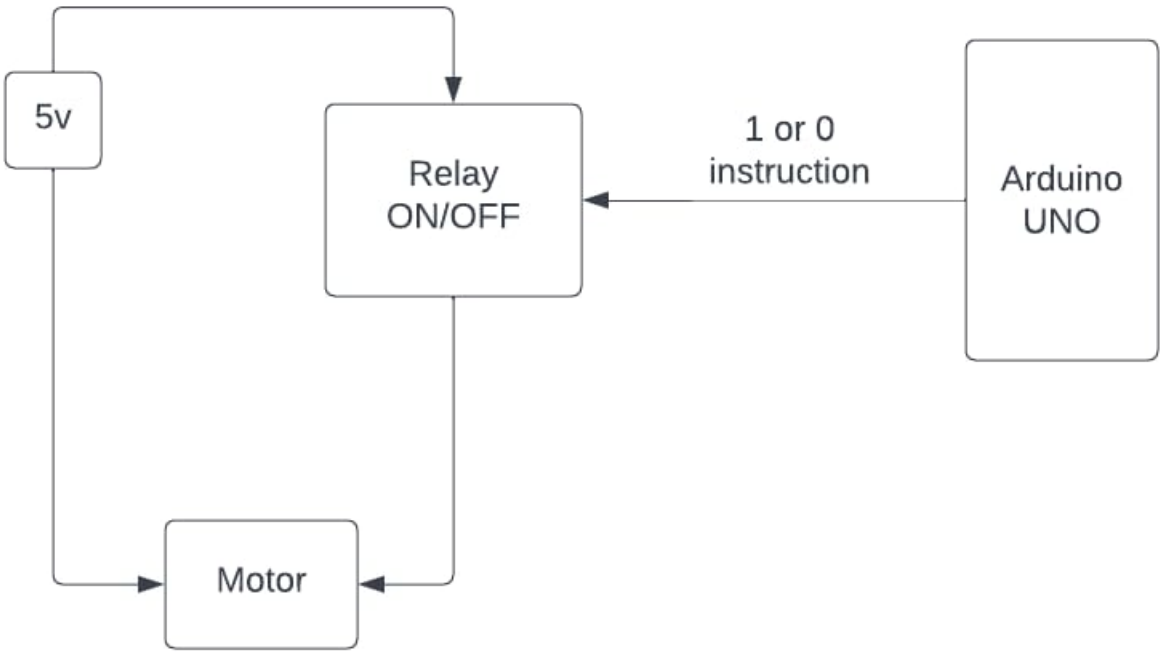

Figure 4.2: Block Diagram

4.2 Project Layout

Layout of this project is as follows

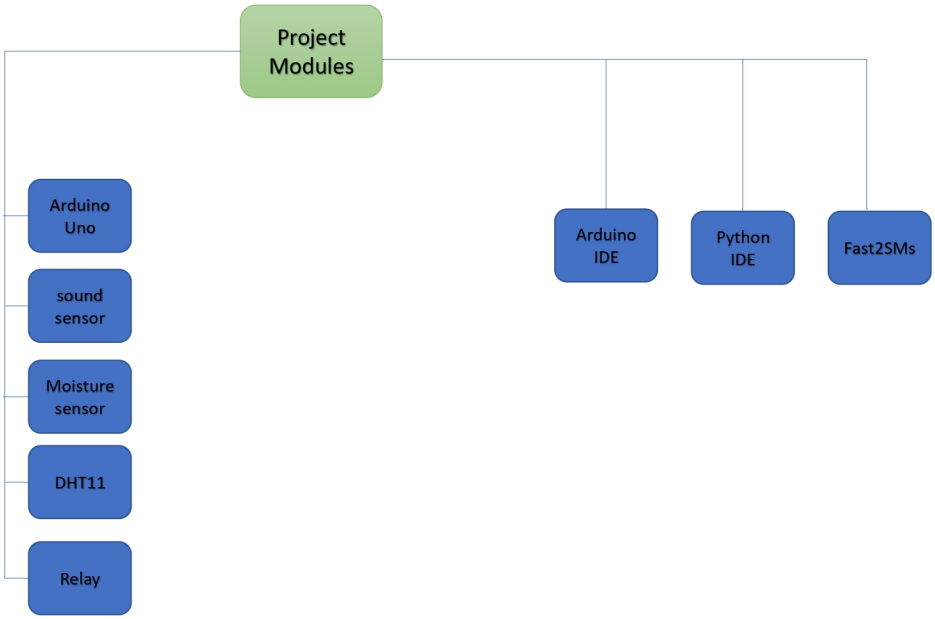

Figure 4.3: Project Layout

Chapter 5

RESULT ANALYSIS

The result of the proposed project 'Smart Baby Cradle' system for babies using IoT , which helps parents and caretakers very much.

This System results :

1. Automatic cradle movement while the baby cries.

2. Send notification to parents when mattress gets wet.

3. When baby continuously crying, notification is send to the parents phone.

4. Parents can view the notification about condition of the baby.

5. Babies get care and attention ath the right time.

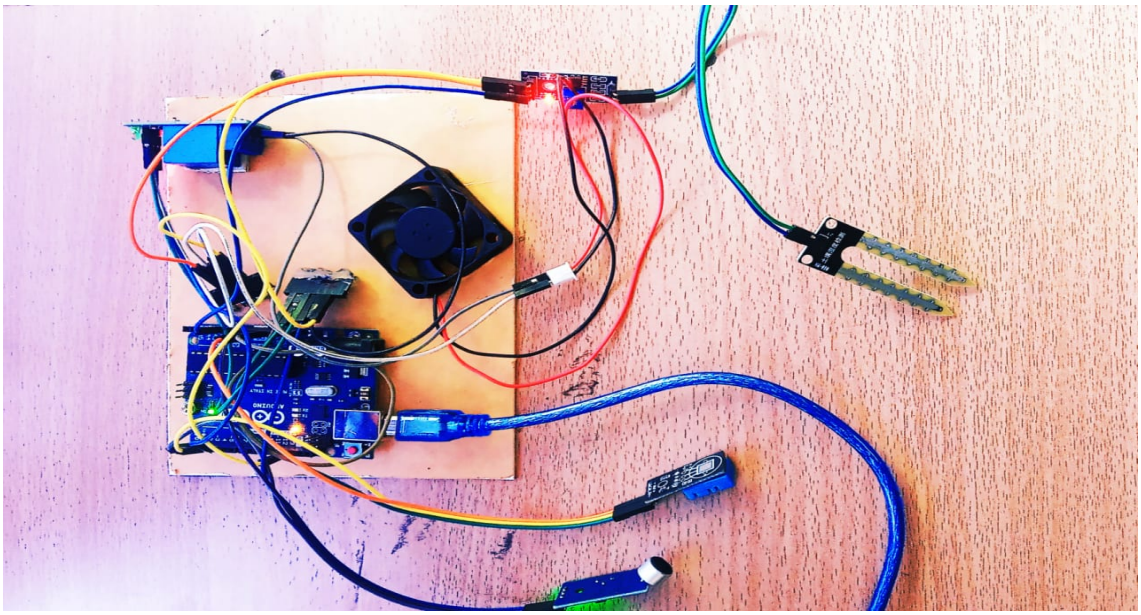

Figure 5.1: smart baby cradle

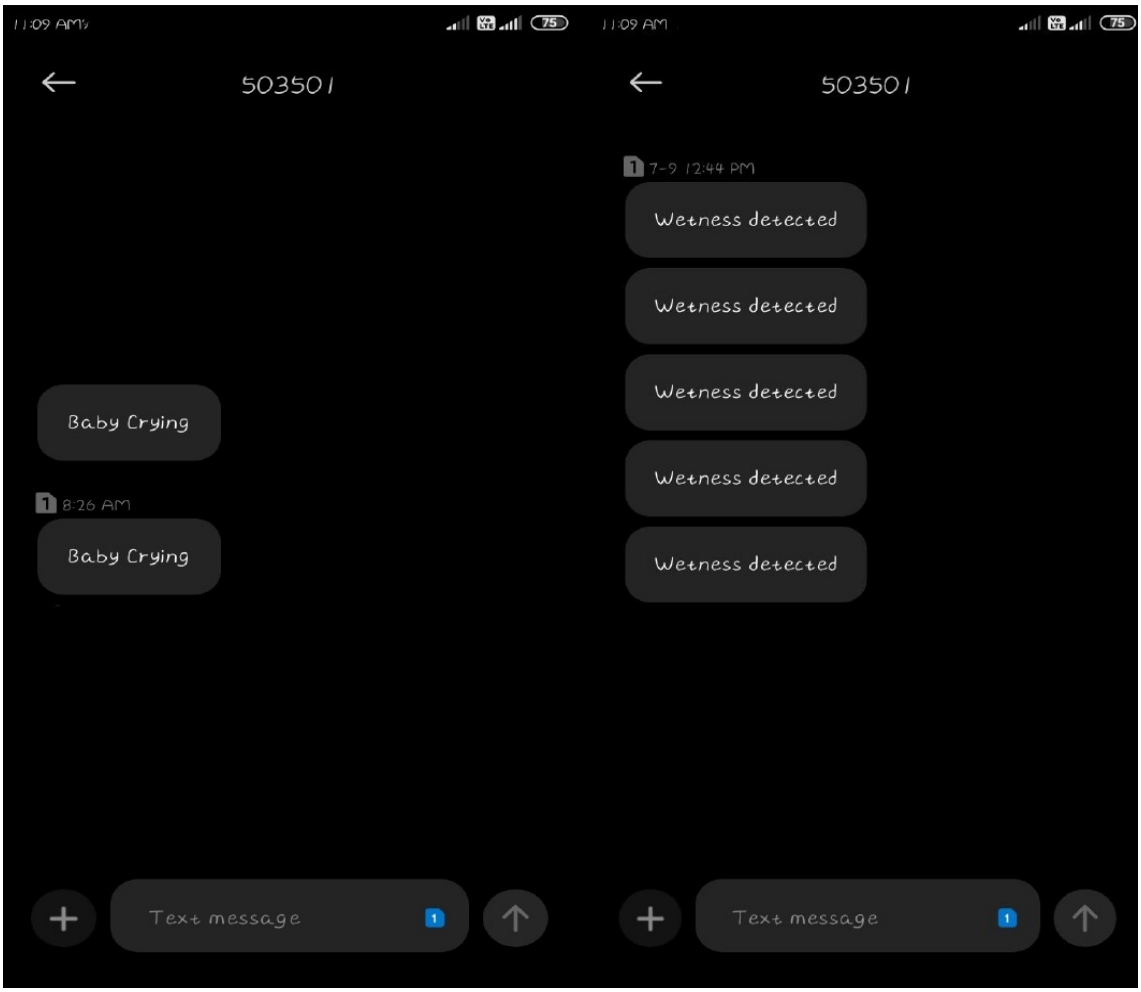

Figure 5.2: Notifications

Chapter 6

CONCLUSION AND FUTURE SCOPE

Today's lifestyle is fast paced. All are busy with their work, especially women have to handle their household activities and office works. After long working time, they have to take care of the home as well as baby. Today's life is made easier when all the things get automated. This can be achieved using Internet of Things Technology. Internet of Things brings the smartness among the devices.

Baby care is hard problem worldwide. It is very important duty as they are our future. Though mother's lap is best for baby, considering the need of present world and knowing the significance of baby care, this system is designed. This system is economical and easy to operate which helps working parents to manage their work

Normal cradle system doesn't help parents and baby. In this project smart baby cradle creates a bond between parent and child. Their attention and care was also surrounded with baby. To the help of various sensors cradle works automatically.The senors to achieve the smartness of cradle with additional features to the cradle.

This cradle was capable of detecting the baby cry, mattress wet, and the cradle swings automatically.The notifications received through parent's devices and so parent can give their care and attention to baby immediately. The device can be used to minimize the workload of the parents and nurses in home and hospitals respectively.

There is also large amount of opportunity that opens up in order to modify the system further to extend the level of security using other different sensors, using cloud computing technique and machine learning to extend the further research. The IoT has transformed our everyday lives at a significant exponential rate. The idea of connecting the information recorded from surroundings using complex sensors and sending it to mobile device shows the vast possibilities of how IoT can influence the lives of people through smart devices what they are called these days. We have already seen the reach of IoT in medical, security, environmental and many other fields. For example –The Running hand or wrist gear that measures all the vital statistics of the body and sends it to your device in real time and you can easily monitor your performance.
And, more features like IR(Infrared) camera for night vision can be an extension of this system. Also other client applications i.e. applications for ios etc. can be designed for this system

Chapter 7

CODING

7.1 Source Code

```
define sound 2
define m1 4
const int rain = A1;
include ”DHT.h”
define DHTPIN 3
define DHTTYPE DHT11 // DHT 11
DHT dht(DHTPIN, DHTTYPE);
float temp_val;
float hum_val;
int s1;
void setup()
// put your setup code here, to run once:
pinMode(sound,INPUT);
pinMode(m1,OUTPUT);
dht.begin();
digitalWrite(m1,HIGH);
Serial.begin(9600);
```

```
void loop()
// put your main code here, to run repeatedly:
s1=digitalRead(sound);
Serial.print(s1);
if (s1==0)

digitalWrite(m1,LOW);
//
delay(5000);
digitalWrite(m1,HIGH);
Serial.print("Sound ");

temp_val = dht.readTemperature(); /* Read Temperature */
Serial.print("Temp : ");
Serial.print(temp_val);
delay(10);
Serial.print("");
hum_val=dht.readHumidity();
Serial.print(" Hum : ");
Serial.println(hum_val);
float rn = analogRead(rain);
Serial.println(rn);
delay(500);
```

7.2 babycradle.py

i. import sys
import glob
import serial
import pyttsx3

def serial_ports():
if sys.platform.startswith('win'):
ports = ['COM
result = []
for port in ports:
try:
s = serial.Serial(port)
s.close()
result.append(port)
except (OSError, serial.SerialException):
pass
return result

In[2]:

ports=serial_ports()
print(ports)
if len(ports)¿0:
portname=ports[0]
else:
print("No Devices Connected")

In[3]:

```
import time
import serial
import pymysql

db = pymysql.connect(”localhost”,”root”,””,”line_detection” )
ser = serial.Serial()
ser.port = portname
ser.baudrate = 9600
ser.bytesize = serial.EIGHTBITS number of bits per bytes
ser.parity = serial.PARITY_NONE set parity check: no parity
ser.stopbits = serial.STOPBITS_ONE number of stop bits
- ser.timeout = None
ser.timeout = 1
ser.timeout = 2
ser.xonxoff = False
ser.rtscts = False
ser.dsrdtr = False
ser.writeTimeout = 2
try:
if ser.isOpen():
ser.close()
except:
print(”error”)
try:
ser.open()
except Exception:
print (”error open serial port: ” + str(e))
exit()
```

In[4]:

```
import pymysql
def savedata(sql):
db =
pymysql.connect(host='localhost',user="root",password="",database="line_detection"
)
c = db.cursor()
c.execute(sql)
db.commit()
c.close()
db.close()
def getvalues(sql):
db =
pymysql.connect(host='localhost',user="root",password="",database="line_detection"
)
c = db.cursor()
c.execute(sql)
val=c.fetchall()
ret=""
if len(val)¿0:
ret="Error"
else:
ret="ok"
print(val)
db.commit()
c.close()
db.close()
return ret
```

In[ ]:

```
from datetime import datetime
import requests
if ser.isOpen():
try:
ser.flushInput() flush input buffer, discarding all its contents
ser.flushOutput()flush output buffer, aborting current output
numOfLines = 0
outp=""
ap=1
cnt=0
while True:
try:
svalues=ser.readline().decode('utf-8').rstrip()
print(svalues)
if svalues!="":
print(svalues)
dat=datetime.now()
dt=dat.strftime("
tm=dat.strftime("
va=svalues.split(':')
print('hello')
print(va[3])
try:
iva=float(va[3].strip())
if iva¡260:
print("hello")
url = "https://www.fast2sms.com/dev/bulkV2"
payload = "message=Wetness
```

```
detectedlanguage=englishroute=qnumbers=9747087491”
headers =  ’authorization’: ”bBQM-
FiU6AKGScRCnsEZ2DYmL1zNxoq4rtOvy3fhTJe5kX9lawpxuBqAekHn7sWEYP8L1Z
’Content-Type’: ”application/xwwwformurlencoded”,
’CacheControl’: ”nocache”,
response = requests.request(”POST”, url, data=payload,
headers=headers)
print(response.text)
except Exception as ex:
print(ex)
pass
if ’Sound’ in svalues:
print(’Motion detected’)

url = ”https://www.fast2sms.com/dev/bulkV2”
payload = ”message=Baby
Cryinglanguage=englishroute=qnumbers=9747087491” headers
=  ’authorization’: ”bBQM-
FiU6AKGScRCnsEZ2DYmL1zNxoq4rtOvy3fhTJe5kX9lawpxuBqAekHn7sWEYP8L1Z
’ContentType’: ”application/x-wwwformurlencoded”,
’Cache-Control’: ”nocache”,
response = requests.request(”POST”, url, data=payload,
headers=headers) print(response.text)
”’
if ’wet’ in svalues:
”’

except Exception as e:
print(”except”)
print(e)
```

```
pass
ser.close()
except Exception:

print (”error communicating...: ” + str(e1))
else:
print (”cannot open serial port ”)
```

Chapter 8

SCREEN SHOTS

Here I add some sample screenshots of our smart baby cradle system which includes,

- IoT Device
- Temperature , Humidity and Moisture rate
- sound detection sms sent
- Notification - baby crying
- wetness detection and sms sent
- Notification - wetness detected

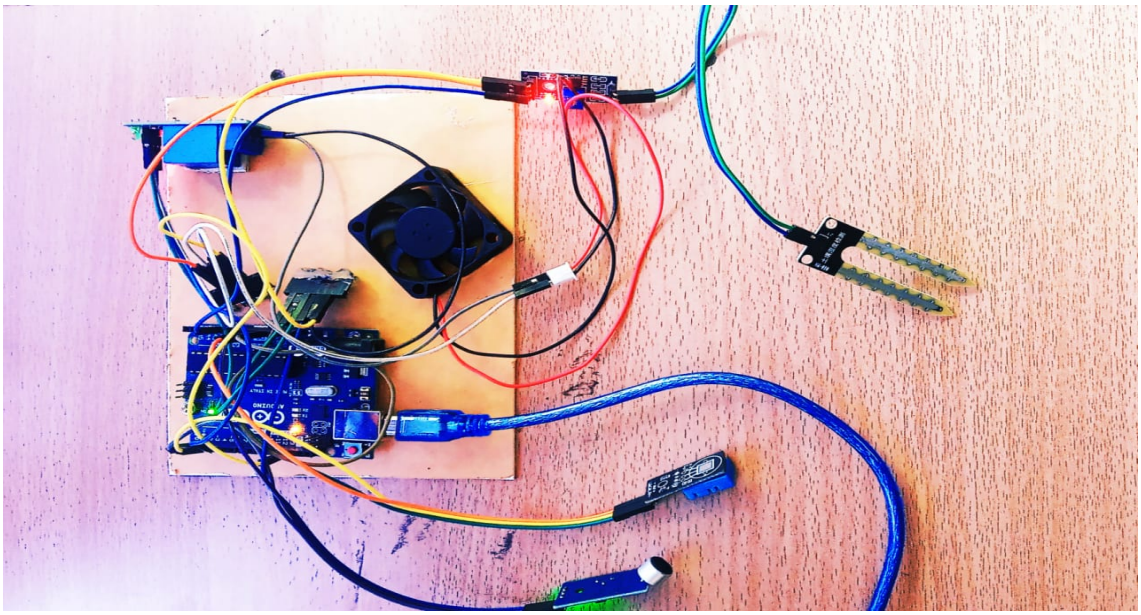

Figure 8.1: IoT Device

Figure 8.2: Temperature , Humidity and Moisture rate

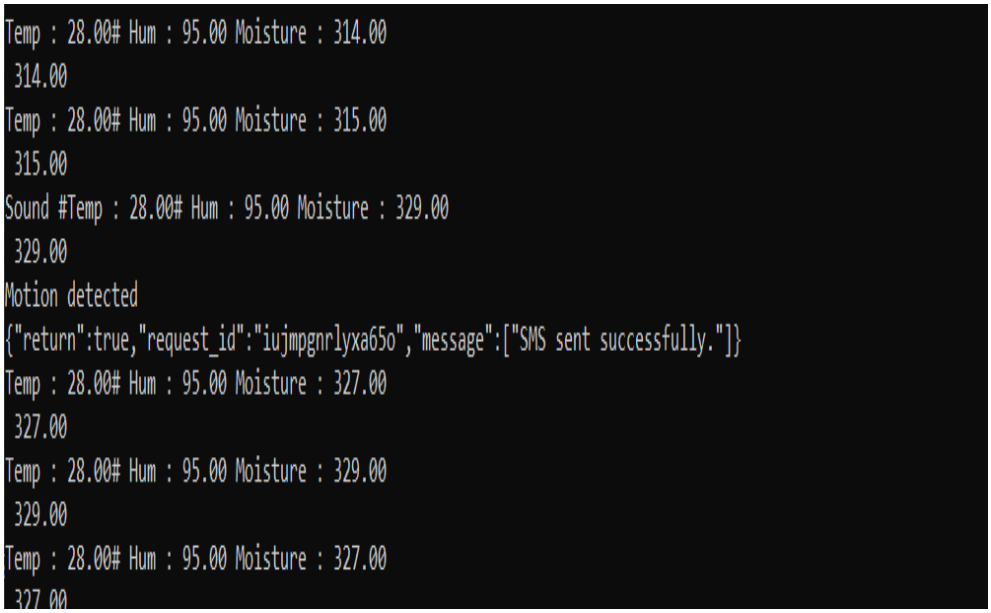

Figure 8.3: sound detection and sms sent

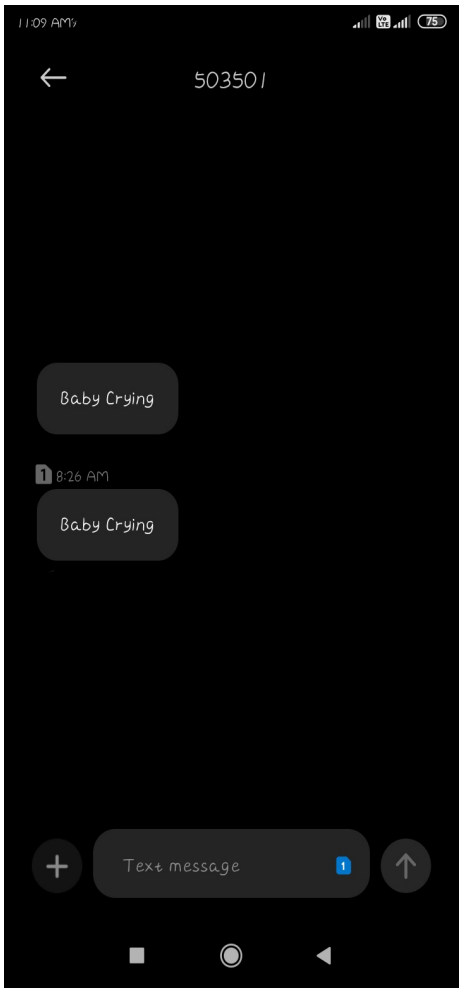

Figure 8.4: Notification - baby crying

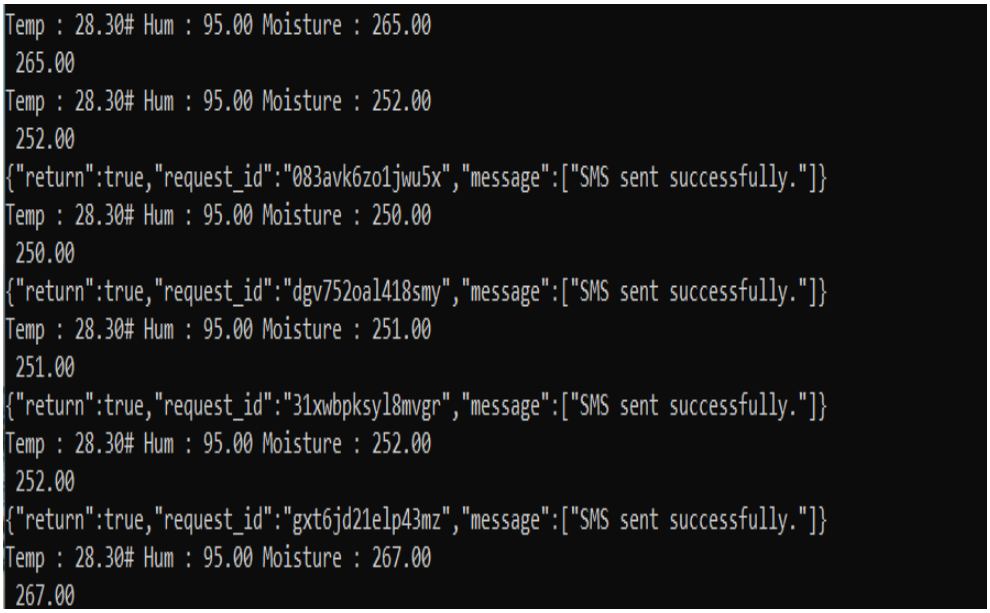

Figure 8.5: wetness detection and sms sent

Figure 8.6: Notification - wetness detected

Chapter 9

REFERENCES

[1] Rachana M S, Sanjana M Nadig; “S-MOM: Smart Mom On The Move”, 2nd international Conference trends in Electronics and Informatics(ICOEI),2018

[2] Madhuri P Joshi, Deepak C, “IoT Based Smart Cradle System with an Android App for Baby Monitoring.”

[3] Amrutha Chore, Shahrukh Barmaky, Saiyad Hussain, Pratiksha Rane “Intelligent Cradle”,IJRASET, October 2017

[4] Mohamed V, Abdeldine M S Abdelgeder; “ Automated Alarm System for Diaper Wet Using GSM”, 2014 IEEE 17th international Conference on Computational Science and Engineering.

[5] Marie R. Harper, La Mirada, Maxine R. Blea:, “Automatically rocking baby cradle”, US3769641, Date of Patent: Nov. 6, 1973.

[6] ”IOT Based Baby Monitoring System Smart Cradle”,Senoj Joseph; Ajay Gautham.J; Akshaya Kumar; M.K Harish Babu,03 June 2021

[7] ”Internet of Things-based Baby Monitoring System for Smart Cradle”, Varsha P Hotur; Adi Thejas N. R; Abhishek P; Chethan R; Adithya Bhatta B, 27 September 2021