VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM 590018

Internet of Things Project Report on

"Smart Cradle"

By

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Under the Guidance of

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IoT Application Development carried out at

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2017-2018

BMS COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the Internet of Things project titled "**Smart Cradle** " has been carried out by **Abhilash S Kulkarni(1BM15CS002) , Ajay S (1BM15CS008), Jahnavi Singh (1BM15CS043)** during the academic year 2017-2018.

Dr Jyothi S Nayak
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DECLARATION

We, Abhilash S Kulkarni(1BM15CS002) , Ajay S (1BM15CS008), Jahnavi Singh (1BM15CS043), students of 5th Semester, B.E, Department of Computer Science and Engineering, BMS College of Engineering, Bangalore, hereby declare that, this IoT Application development work entitled "Smart Cradle" has been carried out by us under the guidance of Dr Jyothi S Nayak, Associate Professor, Department of CSE, BMS College of Engineering, Bangalore during the academic semester Aug-Dec 2017.

We also declare that to the best of our knowledge and belief, the development reported here is not from part of any other report by any other students.

Signature

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INTRODUCTION

India has a large population of working parents. Considering the recent debate on paid maternity leave and competition in the professional sphere, women seeking to get back to work post delivery at the earliest could benefit from an efficient, economical monitoring tool for their newborns.

Objective of the project:

The smart cradle project endeavours to soothe the transition of working women back to work post delivery by facilitating their work from home productivity. It helps the caretaker monitor the infant without having to suspend all other activities.We seek to create a low cost, user friendly cradle.

Abstract :

The smart cradle is an automatic cradle that reduces the need for constant human monitoring of an infant. It is equipped with two PIR sensors and two noise sensors that perform the sensing functions . If motion is detected by both sensors, that is, if the infant is restless, the servomotor rocks the cradle gently, lulling the baby to sleep thereby absolving the need for immediate human intervention. The caretaker can proceed with their chores undisturbed. In the event that the child does not rest and/or quiets down , a call as well as a warning (SMS) is sent to the caretaker saying that the infant needs their attention.

LITERATURE SURVEY

Sl.No	Name of the Project or Product (Existing)	Commercial or Non-Commercial	Features
1.	Butterfly Automatic Cradle	Commercial	Automatic swing
2.	R Lullabies	Commercial	Automatic swing music

1.Butterfly Automatic Cradle priced at 13000INR is a non portable automatic swing cradle. It prevents insects from entering thereby ensuring a peaceful sleep. It however,lacks the feature to notify a caretaker to alert them about an agitating infant.

PROPOSED PROJECT FEATURES AND ITS ADVANTAGES:

1. Automatic Swing: Reduce human effort
2. Motion monitoring: While it's normal for an infant to exhibit movement once in awhile when sleeping, continued movement could be an indicator of a stressor. It is imperative that immediate action be taken in case of a seizure. Hence the motion monitoring feature of our project helps prevent such fatalities.
3. Noise monitoring : A wailing infant may be hungry or may have suffered from a bout of bedwetting. If the caretaker is engrossed in work they may not hear the baby's wails. The gsm module alerts them by sending a call and a message to the registered phone number.
4. Minimised cost
5. Extension: moisture sensors to check for bed wetting, heart rate monitor to monitor the health of the baby and speakers to play music.

HARDWARE AND SOFTWARE REQUIREMENTS

Hardware requirements:

1. GSM 900A
2. Arduino Uno board
3. PIR sensors 2
4. Noise sensor 2
5. Servo motor
6. Power source (12V)
7. Jumper Wires
8. Cradle Structure

Cost analysis :

1. Arduino Uno : Rs. 1400
2. GSM 900A : Rs. 1000
3. PIR sensors : Rs. 320
4. Noise Sensors : Rs. 300
5. Servo Motor : Rs. 200
6. Cradle Structure : Rs. 1000 (approx)
7. Miscellaneous costs : Rs. 1000

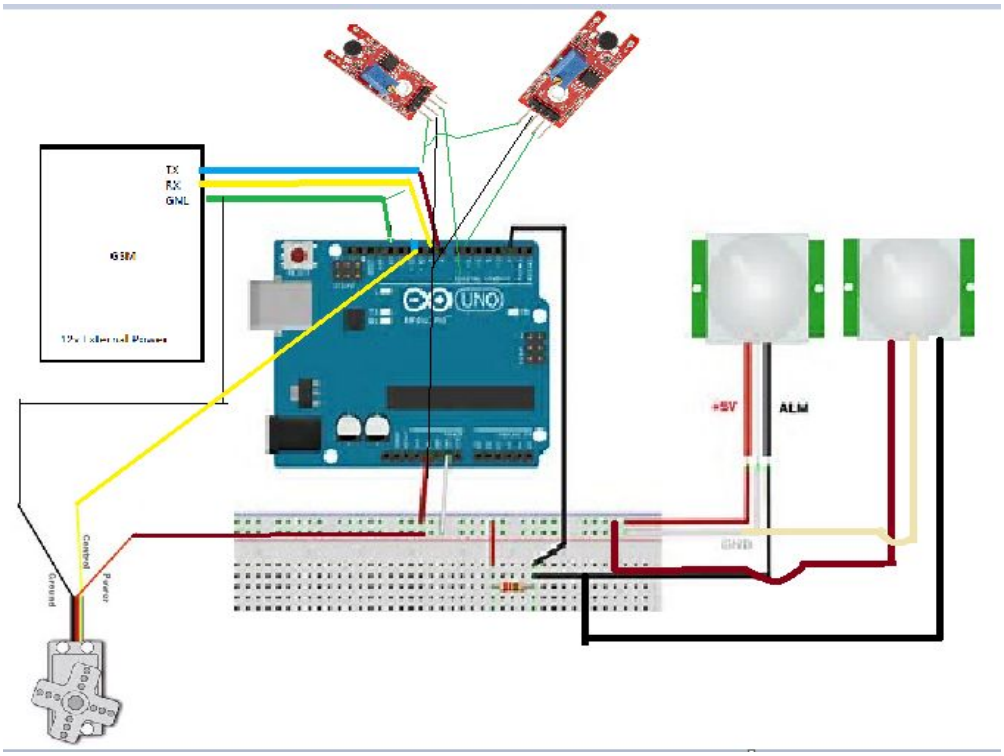
The cradle can be manufactured in less than Rs. 6000 compared to cradles available in the market which start from Rs. 12000.

Software Requirements :

Only Arduino Sketch has been used for programming the arduino board.

DESIGN

Architectural diagram



Operating the Smart Cradle :

1. The microcontroller arduino uno is powered on when the infant is placed in the cradle.
2. The sensors and actuators attached to the arduino uno come into play.
3. When the motion is detected by the motion sensors and the noise is not detected, the motor sways the cradle but when both are detected the cradle calls the caretaker as well as sways the cradle.
4. The actuator, servomotor is attached to a rope that functions like a pulley to sway the cradle as required.

Source code:

```
#include <Servo.h>
#include <SoftwareSerial.h>
SoftwareSerial cell(9,10);
Servo myservo;
int pos = 0;
int pirPin1=6;
int pirPin2=5;
int noisePin1=7;
int noisePin2=8;
int pir1_flag=0;
int pir2_flag=0;
int noise1_flag=0;
int noise2_flag=0;
int flag_noise=0;
int calibrationTime = 30;
void setup() {
  cell.begin(9600);
  delay(500);
 Serial.begin(9600);
  pinMode(pirPin1, INPUT);
  pinMode(pirPin2, INPUT);
  pinMode(noisePin1, INPUT);
  pinMode(noisePin1, INPUT);
  myservo.attach(11);
  Serial.print("calibrating sensor ");
  for(int i = 0; i<calibrationTime; i++){
       Serial.print(".");
       delay(1000);
    }
  Serial.println(" done");
```

```
    Serial.println("SENSOR ACTIVE");
    delay(50);
  }

  void loop(){
   pir1();
   pir2();
   noise1();
   noise2();
   if(noise1_flag==1 || noise2_flag==1)
   {flag_noise=1;}
   else
   {flag_noise=0;}
if((pir1_flag==1 || pir2_flag==1) && flag_noise==1){
    gsm();
    servo();
   }else if((pir1_flag==1 || pir2_flag==1)){
    servo();
   }
   delay(5000);
   pir1_flag=0;
   pir2_flag=0;
   noise1_flag=0;
   noise2_flag=0;
   flag_noise=0;
  }
  void pir1() {
   if(digitalRead(pirPin1) == HIGH){
     Serial.println("Motion detected PIR-1");
     pir1_flag=1;
  }else{
   Serial.println("Motion not detected PIR-1");
```

```
        pir1_flag=0;}}
        void pir2() {
        if(digitalRead(pirPin2) == HIGH){
          Serial.println("Motion detected PIR-2");
          pir2_flag=1;}
       else{
        Serial.println("Motion not detected PIR-2");
        pir2_flag=0;} }
        void noise1(){
        if(digitalRead(noisePin1) == LOW){
          Serial.println("Noise detected sensor-1");
          noise1_flag=1;}
       else{
        Serial.println("Noise not detected sensor-1");
        noise1_flag=0;} }
    void noise2(){
        if(digitalRead(noisePin2) == LOW){
          Serial.println("Noise detected sensor-2");
          noise2_flag=1;}
       else{
        Serial.println("Noise not detected sensor-2");
        noise2_flag=0;} }
void servo() {
        int i=0;
        for (pos = 90; pos <= 180; pos += 1) { // goes from 0 degrees to 180 degrees
          // in steps of 1 degree
          myservo.write(pos);  // tell servo to go to position in variable 'pos'
          delay(15);  // waits 15ms for the servo to reach the position         }
        while(i<4){
        for (pos = 180; pos >= 0; pos -= 1) { // goes from 180 degrees to 0 degrees
          myservo.write(pos); // tell servo to go to position in variable 'pos'
          delay(15); // waits 15ms for the servo to reach the positions        }
```

```
  for (pos = 0; pos <= 180; pos += 1) { // goes from 0 degrees to 180 degrees
    // in steps of 1 degree
   myservo.write(pos);  // tell servo to go to position in variable 'pos'
   delay(15);  // waits 15ms for the servo to reach the position                    }
  i++;}
for (pos = 180; pos >= 90; pos -= 1) { // goes from 180 degrees to 0 degrees
    myservo.write(pos); // tell servo to go to position in variable 'pos'
    delay(15); // waits 15ms for the servo to reach the positions            }}


void gsm(){
   cell.println("At+CREG=1;");
  cell.println( "AT+CLIP = 1;" );
    Serial.println("CALLING.....");
    cell.println("ATD+9108168557;");
    Serial.println("Contacting caretaker");
  delay(20000);
  Serial.println("CALL ENDED");
}
```

Conclusion

In the present study, an intelligent baby cradle system was developed. The cradle was capable of detecting the movement of the baby and initiating cradle swing to soothe the infant back to sleep. Additionally, in the event of a crying or wheezing infant, the developed device is capable of sending SMS and calling the caretaker. The device can be used to minimize the workload of the parents or babysitters in home.

References:

www.gsmarena.com

Internet of Things(A hands on approach) 1st edition, Vijay Madisetti, Arshdeep Bahga

www.circuitstoday.com

www.tutorialspoint.com/gsm