INSTITUTE DE TECHNOLOGIE DU CAMBODGE

GENIE INFORMATIQUE ET COMMUNICATION

Subject: Computer Architecture & Internet Programming

Smart Room (IOT)

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Content

Smart Room

I. Introduction

These days people's life become easier and easier. People love finding out the modern technology in order to reduce their enforcement and make it be more conveniently. For instance, they create robot, computer, smart phone, smart device etc. All of these ubiquitous are still not smart enough in our living condition we still wasted much money on electricity waste each year. Then, we create smart home which indicates the control system of every light in the house that it switch off or on and using sensor to detect motion to open light automatically otherwise we have sensor to notify the temperature in room. We anticipate saving a lot of money annually by using our divide. How can it save much money? Let go to deep detail below:

II. Problematic:

1. Energy consumption:
   - Energy info:

     According to U.S energy Information in 2016:
     - o Residential utility customer was 10,766 kWh per year,
     - o 897 kWh per month.

     According to Cambodia National statistic 2016
     - o Residential utility customer was a rise from 1,322 GWh in 2014 to 1,527 GWh in 2015 and continue went up each year.
   - Wasting energy:

     According to Lawrence Livermore National found
     - o In 2012, 39% wasting energy on home appliance
     - o **75,000 average American homes**
     - o **Lost at least 130$ billion dollar per year**

2. <u>Rise in house: According</u>
   - o Electric shock
   - o Explosion
   - o Light on without needed.
3. <u>Wasting time and hard to calculate the monthly electrical usage</u>
4. <u>No live time control in household appliance</u>
5. <u>No auto switch of or set schedule</u>
6. <u>No fire alarm</u>

III. **OBJECTIVE:**

All of these problems below, it push us to find out the cost-less divide which can apply as smart home to control the light and another electricity component. It will provide a lot of advantages such as:

- Reduce the risk of electrical explosion
- Saving more energy, money and time
- Give more convenient, comfortable and reliable to user
- User can observe and far-distance control to their household appliance
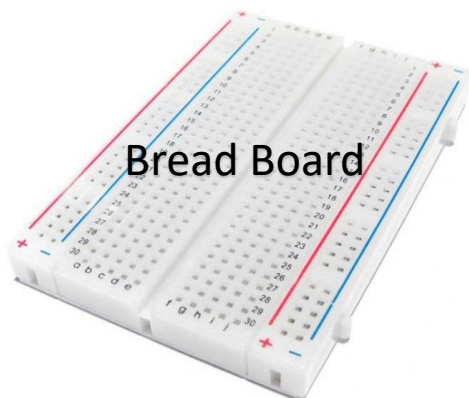
IV. **PROCESS:**
a. **Team Role:**

Name	Arduino code	Web+ Arduino connection	Web design	Database	House architecture	Support
CHIM Sopheaktra	✓	✓		✓		
VONG Tith	✓	✓	✓	✓	✓	
BLAND Vibol			✓			✓
KRY Culsa			✓			✓
MICH Mongkul					✓	✓
CHOU Seakny			✓			✓

b. **Working processing plan:**

c. **Equipment:**

Bread Board

Intel@ Galileo GenI
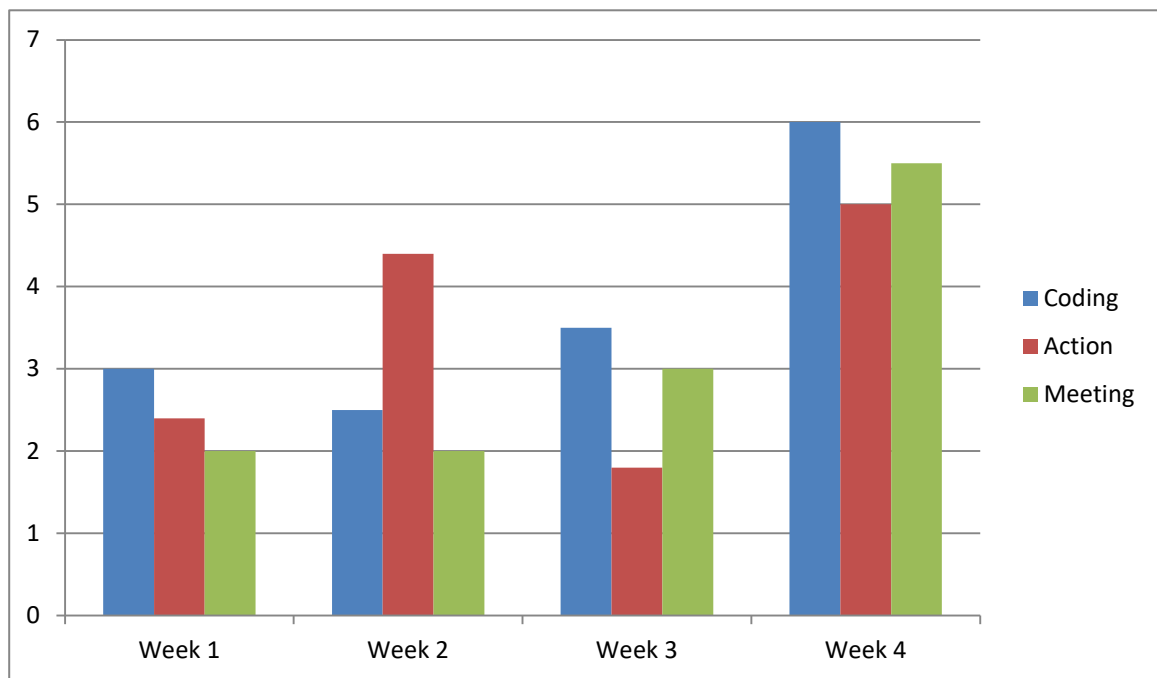
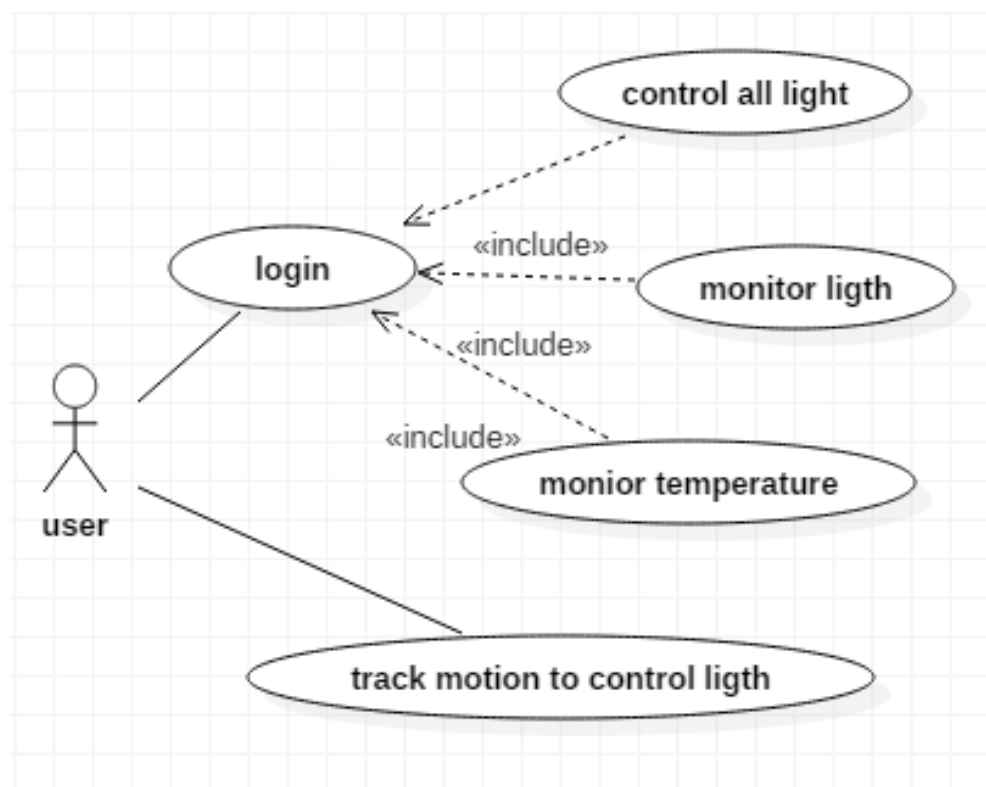LED Light

Bread Board Wire

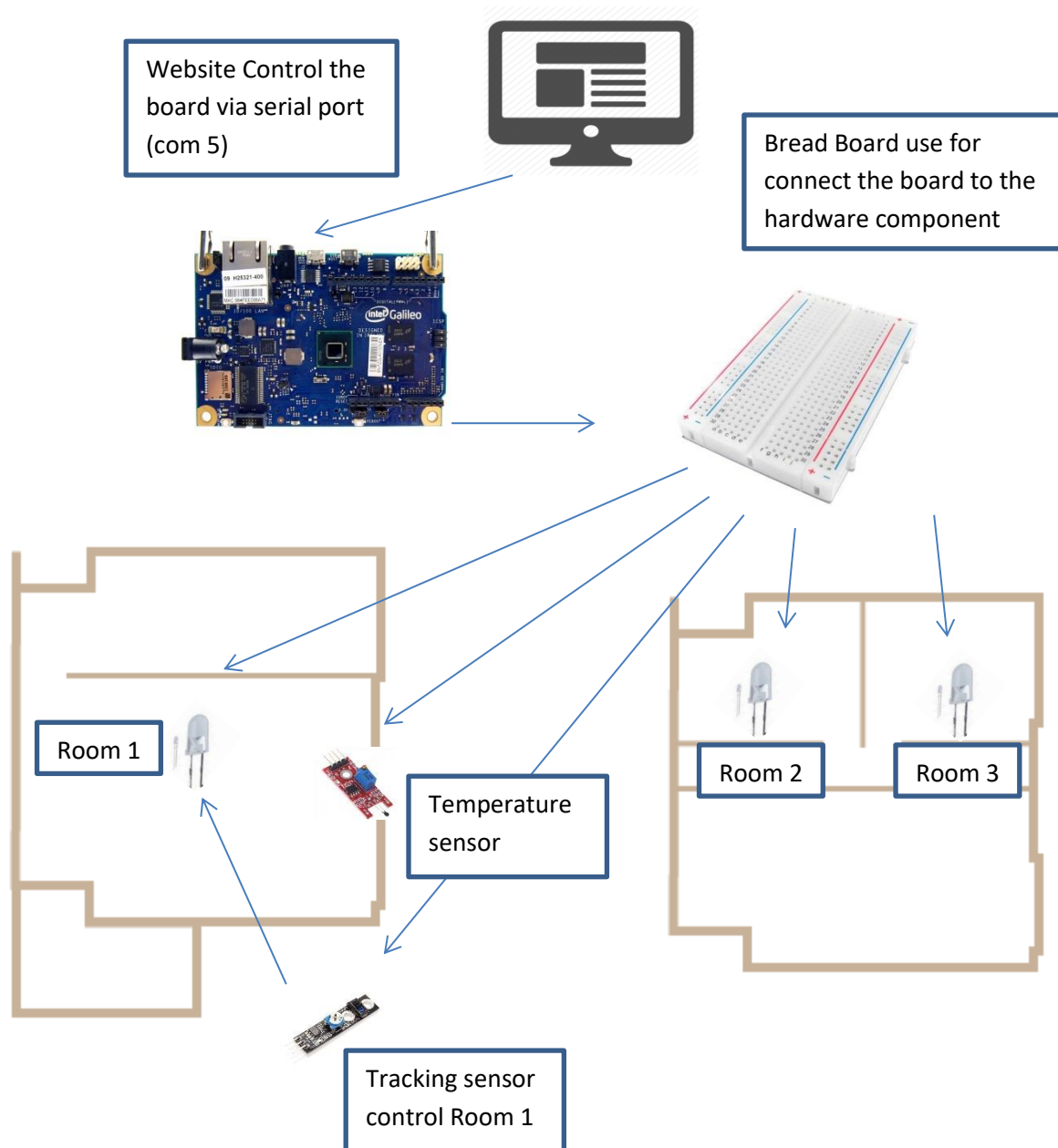
Temperature Sensor

Tracking Sensor

Component detail:

1. **Breadboard:** a thin plastic board used to hold electronic components (transistors, resistors, chips, etc.) that are wired together. Used to develop prototypes of electronic circuits, the boards can be reused for future jobs.

2. **Intel @Galileo gen 1:** is the first in a line of Arduino-certified development boards based on Intel x86 architecture and is designed for the maker and education communities. Intel released two versions of Galileo, referred to as Gen 1 and Gen 2. These development boards are sometimes called "Breakout boards".

3. **Breadboard wire :** is the kind of wire that use to connect component to board, and use to transmit the electricity from one to another device

4. **LED light:** is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated.

5. **Temperature Sensor:** This is the same temperature sensor as stated in a previous step, but this one outputs a digital signal instead of analog signal.

6. **Tracking Sensor:** This sensor uses an infrared emitter and receiver to check whether there are any obstacles in front of it. This can be useful for a robot.

d. USE CASE DIAGRAM

e. PROJECT ARCHITECTURE:

Website Control the board via serial port (com 5)

Bread Board use for connect the board to the hardware component

Room 1

Temperature sensor

Room 2

Room 3

Tracking sensor control Room 1

We must have:

1. **Web application**: which allow us to control the light, and another appliance like fan and air-conditioner. In this application allow user to know when the light is on or off as a real time, especially it alert us when the temperature is low and it automatically calculate the monthly electric payment.
2. Chip **intel @Galieo gen1** can connect to web application through **USB-Client** . This board allow user to code the control any analog and digit port by depending on the code in **Arduino.** It has 13 digital port and 6 analog port.
3. **Sensors:** in this case are play an important role to make our smart project to became smart room.

f. TECHNOLOGY

Our project cannot be done these technologies

V. Implementation

a. Functionality on Arduino

1. Code for Temperature sensor:

```
analogtemp = analogRead(A0);
double temp = Thermistor(analogtemp);
Serial.print(temp);
delay(1000);
```

2. Thermistor function for covert to Celsius:

```
double Thermistor(int RawADC) {
  double Temp;
  Temp = log(10000.0*((1024.0/RawADC-1)));
  Temp = 1 / (0.001129148 + (0.000234125 + (0.0000000876741 * Temp * Temp ))* Temp );
  Temp = 273.15-Temp ;          // Convert Kelvin to Celcius
   //Temp = (Temp * 9.0)/ 5.0 + 32.0; // Convert Celcius to Fahrenheit
   return Temp;
}
```

3. Code for control the lights & Tracking sensor:

```
void loop() {
    track = digitalRead(A1);
  if(track==HIGH && astatus==0){
      aVal=0;
      analogWrite(aPin, aVal);
      Serial.write("of");
  }
  else if(track==LOW && astatus==0){
      aVal=255;
      analogWrite(aPin, aVal);
      Serial.write("on");
      delay(10000);


  }
  // put your main code here, to run repeatedly:
  if(Serial.available()){
    input=Serial.readString();
    if(input=="a"){
      aVal=255;
      astatus=1;
    }else if(input=="aa"){
      aVal=0;
      astatus=0;
    }
    if(input=="b"){
      bVal=255;
    } else if(input=="bb"){
      bVal=0;
    }

    if(input=="c"){
      cVal=255;
    }else if(input=="cc"){
      cVal=0;
    }

    input="";
    change=1;
  }
  if (change) {
    change=0;
    analogWrite(aPin, aVal);
    analogWrite(bPin, bVal);
    analogWrite(cPin, cVal);
  }

  analogtemp = analogRead(A0);
  double temp = Thermistor(analogtemp);
  Serial.print(temp);
  delay(1000);
```
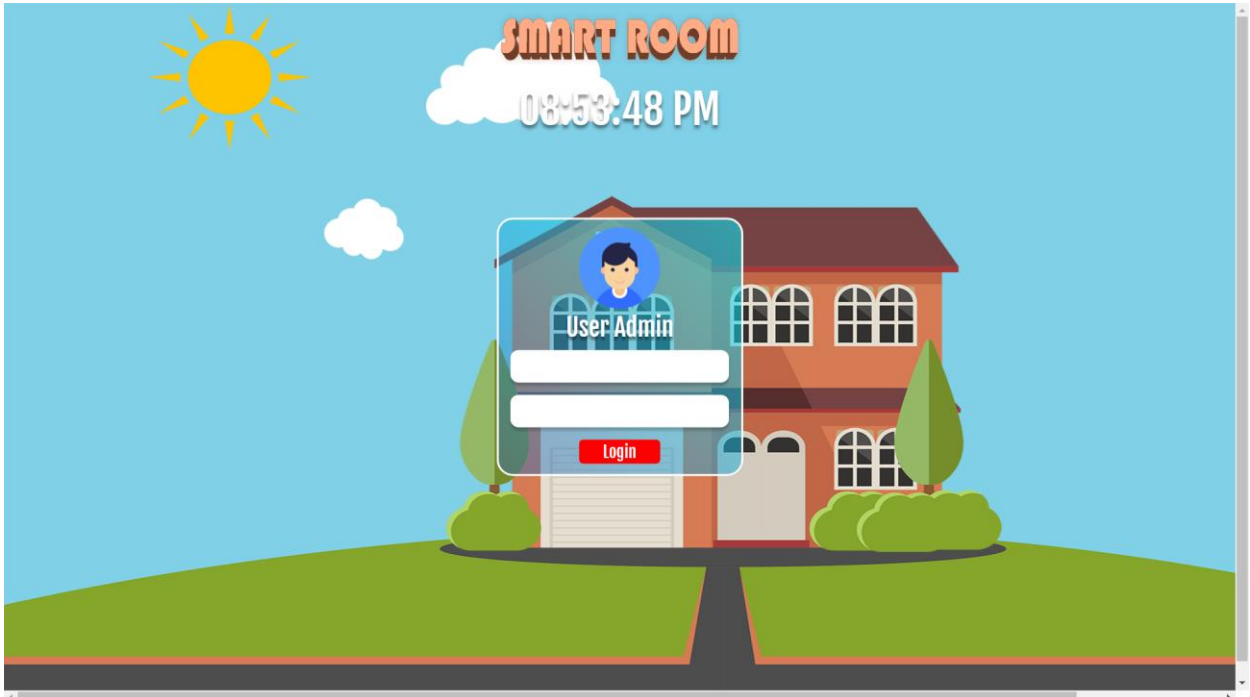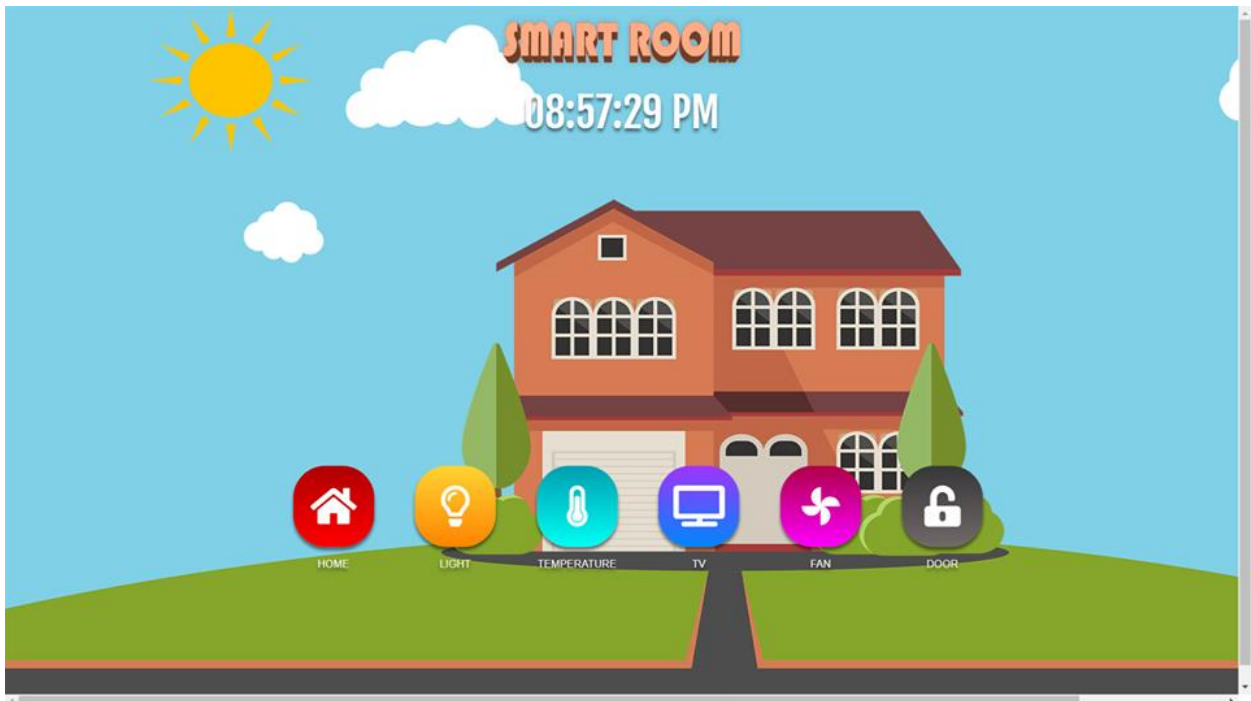
VI. **<u>Introduction of UI:</u>**

In the case we use PHP, HTML, JAVASCRIPT, CSS to builds the web site for controlling
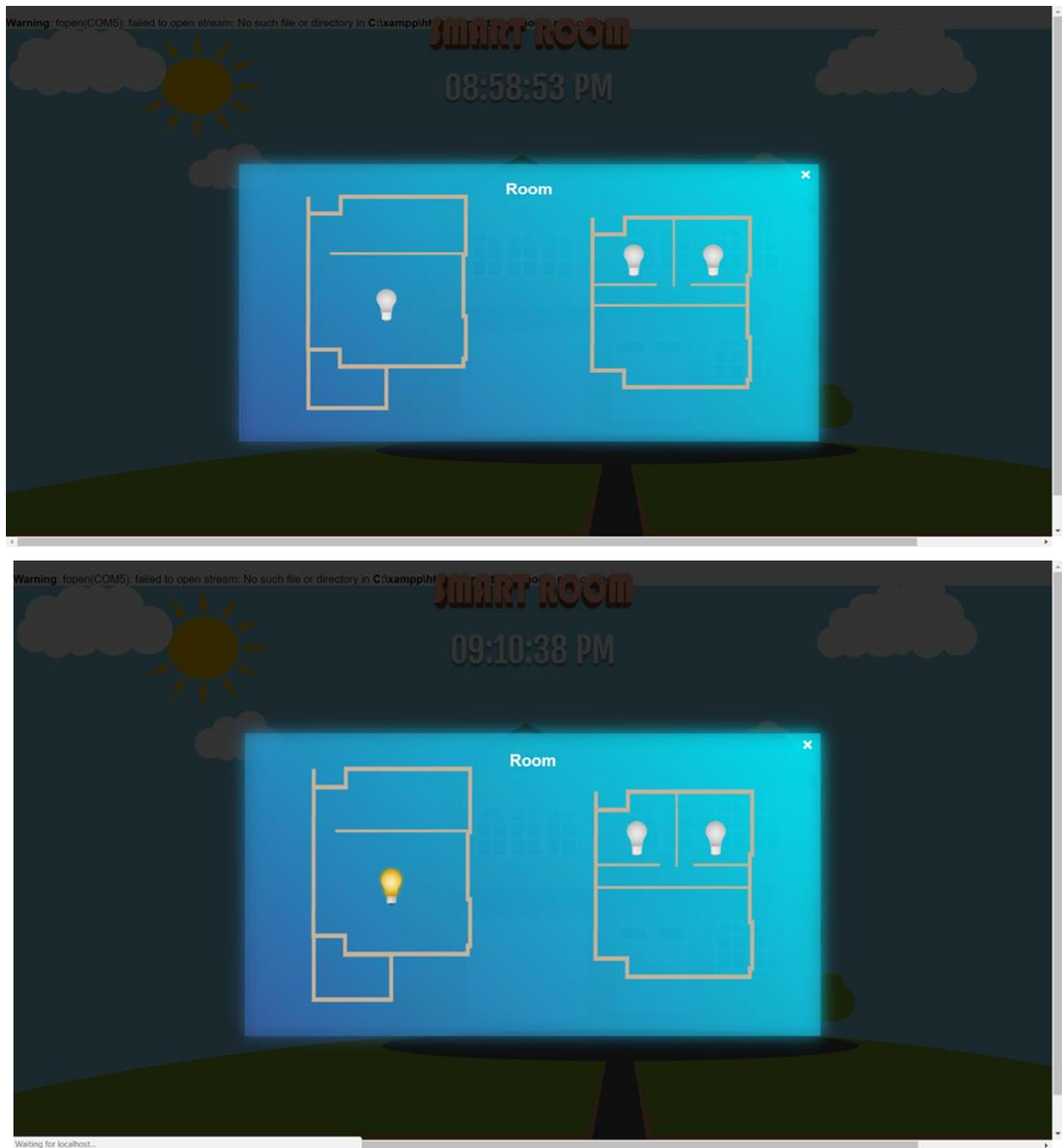

In this page, allow only house owner to login to control the light and another house appliance. The password has been encrypting with 256 bit RSA key.

Here it is our home page, in this page user can control on light, temperature, Tv, fan and door and it show live time.

Light off

In this home page, user can go direct to watch the light mode on or off direct by clicking a home button. It will show us the plan with the real time mode. We can control the light by click on the light icon, if it is switched off it will contain any lightless neither it will perform with brightness.
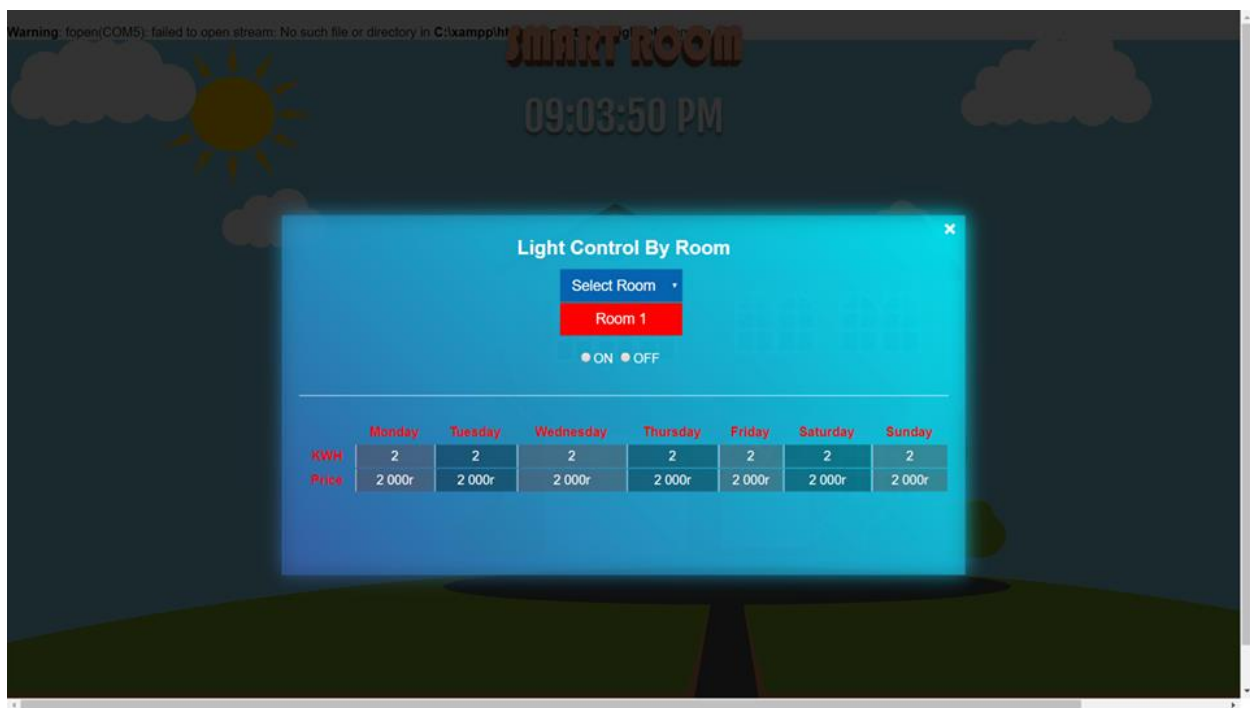
In this page, we can control the light by room number and especially, it will calculate the energy per day that each lamb consumed and total per month with.

For this page, user can know the real time temperature in their room, or their child home, user can control the fan and it will turn on automatically if the temperature is hotter unusually by temperature sensor detection.

For the tracking sensor, it work when there is person has the movement near the front door, like he/she try to unlock the door and then light inside the house will automatic turn off. In addition, user can set up the schedule for turning off the light in what time they preferred like (turn on at 6pm and switch off at 6am in the morning.

For the future vision we want user can pay a bill by using our application and we want the alarm fire to police station and send the message to all people who are near that house and house owner.

VII. Database:
   a. Table (light): use to show the live status on or off

lid	status	ampher
1	ON	2.3
2	ON	3.4
3	ON	3.2

   b. Table (lightusage): use to

usageid	datetime	status	lid
30	2018-07-08 00:00:00	ON	1
31	2018-07-08 04:00:00	OFF	1
34	2018-07-08 00:00:00	ON	2
35	2018-07-08 03:00:00	OFF	2
38	2018-07-08 00:00:00	ON	3
39	2018-07-08 04:00:00	OFF	3
42	2018-07-09 00:00:00	ON	1
43	2018-07-09 03:00:00	OFF	1
46	2018-07-09 00:00:00	ON	2
47	2018-07-09 07:00:00	OFF	2
48	2018-07-09 00:00:00	ON	3
49	2018-07-09 05:00:00	OFF	3
50	2018-07-21 09:10:43	OFF	1

c. Table (daily): use to store the energy consumption

id	date	kw
1	2018-07-01	20
2	2018-07-02	23
3	2018-07-03	21
4	2018-07-04	21
5	2018-07-05	25
6	2018-07-06	22
7	2018-07-07	21
25	2018-07-08	14
26	2018-07-09	24
27	2018-07-22	0
28	2018-07-23	0
29	2018-07-24	0
30	2018-07-25	0
31	2018-07-26	0
32	2018-07-27	0
33	2018-07-28	0
34	2018-07-29	0
35	2018-07-30	0

VIII. Conclusion:

Base on the financial in our control, we know that there are not many people can afford with the smart home device from the tech company, that wise we design the costless device that it has also equivalent ability as the expensive one, our device almost cost only 30$ so, everyone do not concern about wasting energy, house fire, low temperature in house. And it will make our life become easier and easier

Reference:

1. https://www.facebook.com/vong.tith.3/videos/1135247816615806/
   (House prototype)
2. https://github.com/VONGTith/IOT-smart-home-basic.git
   (GitHub project: PHP code + Arduino code)
3. https://www.eia.gov/tools/faqs/faq.php?id=97&t=3
   (House energy consumption)
4. https://www.erc-co.org/spooky-statistics-about-energy-and-water-waste/
   (Energy waste)