SMART LAMP

IOT Project Report

Presented by Yudong SUN, Jianyi KANG, Kamal Miri

1. Background

1.1 Problems

For common lamps, there are several problems.

Firstly, the common lamps need people's physical control. Such as turn on, turn off and adjust the light power. Secondly, the adjustment by people always means unsuitable. For example, the light power can be turned to be too bright or too dark. Sometimes people may forget to turn it on or off. Too bright means energy waste, and too dark may cause eye problem to users.

1.2 Ideas

We want to develop a smart lamp, solve all these problems. The ideas are following.

1.2.1 Easy to Use

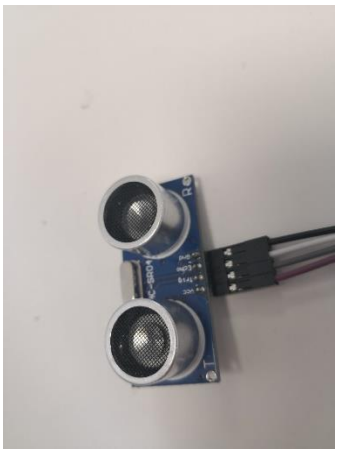
Our smart lamp should be very easy to use. The users don't need to do any operation for the lamps. It can detect people go in to this room or go out of this room. Then turn the lamp on or off. It can also detect the lightness of the room. Then adjust the brightness automatically. It can be very easy for people to use.

1.2.2 Save Energy

As a result of operating automatically, this lamp can avoid many energies waste condition. For example, people may forget turn off the light when he come out for an urgent thing. When one is focusing on his work, he may forget the time and maybe it's already in the morning, but the light still turned on.

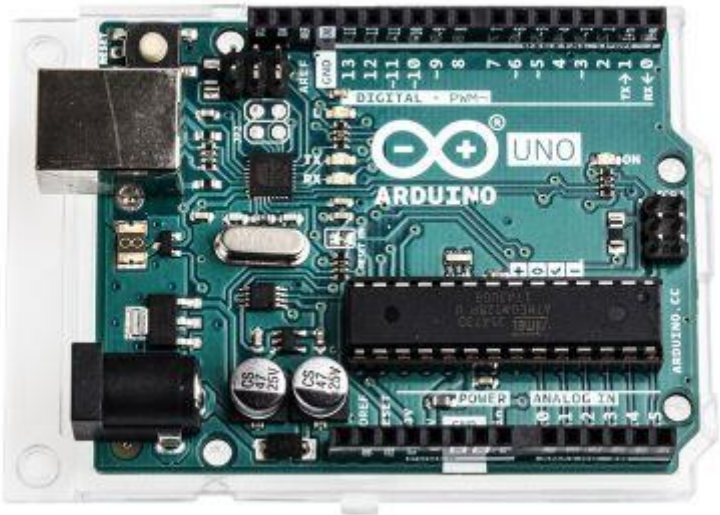
1.3 State of the art

HC-SR04 : Detect person come in or come out



AC-S901 Bright LED.
Because this one can change the brightness of the LED.
And it is easy to control.
https://www.aliexpress.com/item/Free-Shipping-1pc-S901-LED-light-module-electronic-building-block-pink-white-red-blue-yellow-green/1987195830.html

Arduino



Luminosity Sensor- TSL2561
https://www.hotmcu.com/luminosity-sensor-tsl2561-p-187.html
when the brightness change, this sensor may change the voltage.

2. Business Plan

1) Activity & Domain :

- there is a strong need of this type of products .
- the solution envisaged meets this need and is sufficiently attractive to trigger an act of purchase;
- this need concerns a large number of potential customers;
- this activity will generate a significant turnover and will be profitable.

2) Competition :

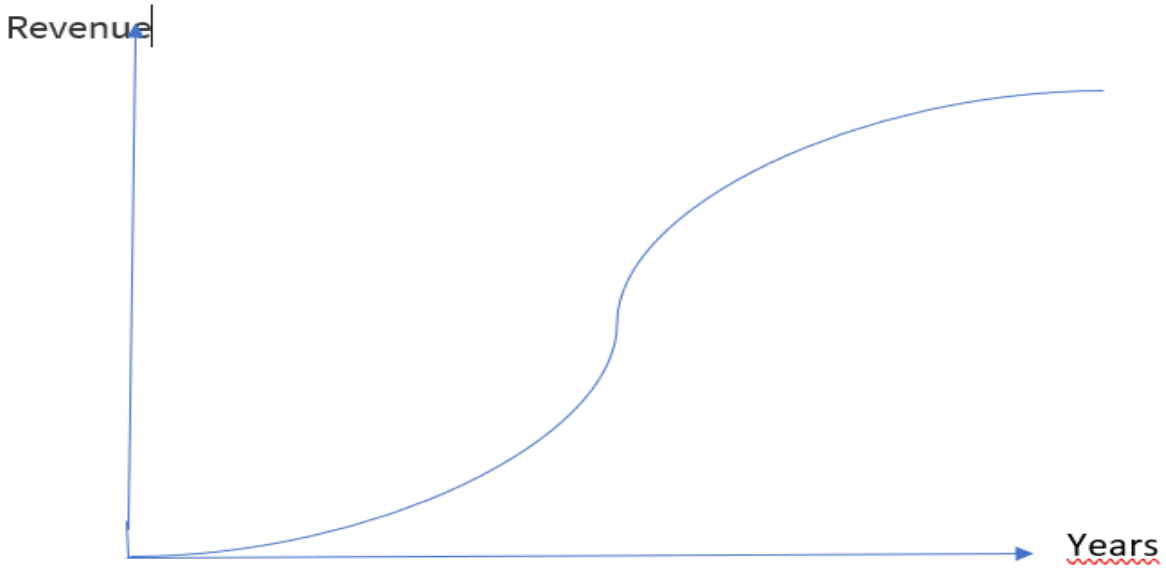
- proven or potential competitors are identified , such as :
- AwoX , european leader in connected lighting .
- PHILIPS.
- Xiaomi.
- Prices :

Philips Hue : 20 Euros.

Xiaomi Yeelight : 25 Euros.

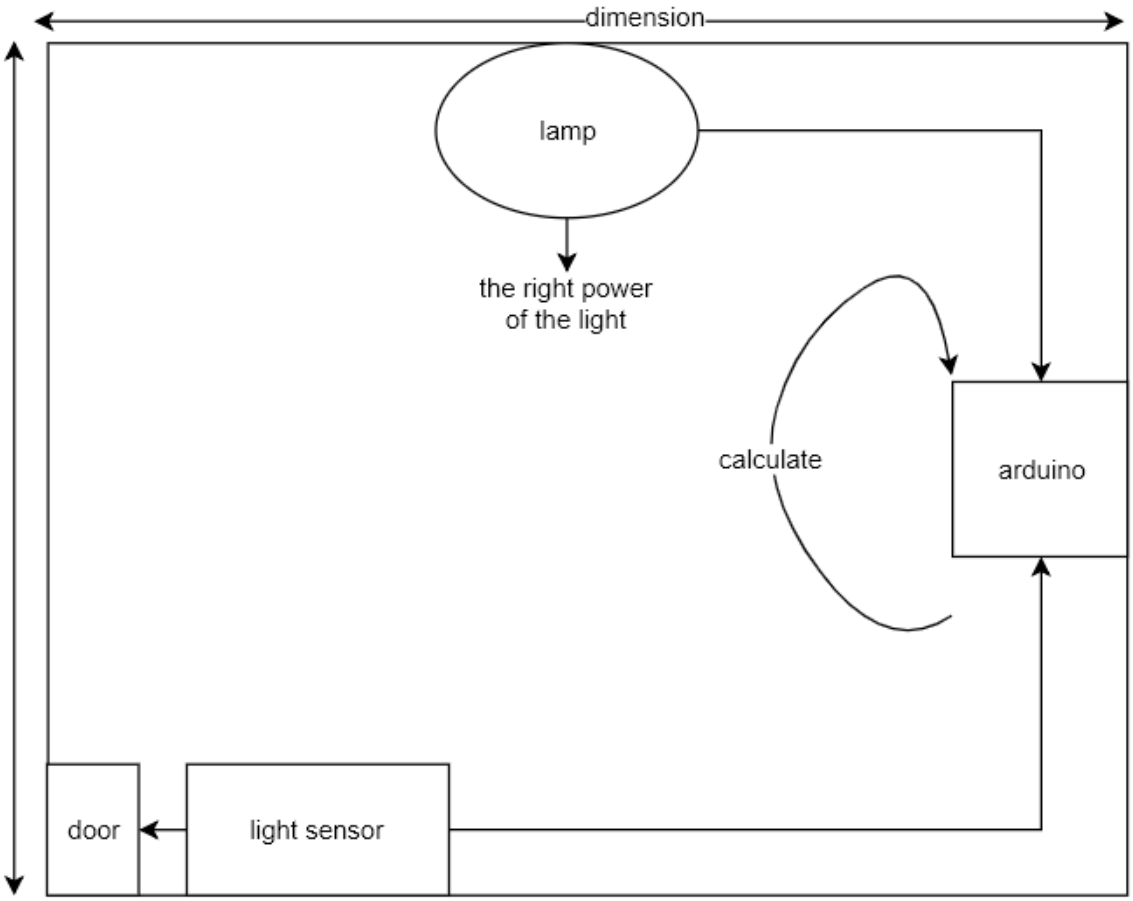
TP-Link LB130 : 45 euros.

3) Profits expectation :



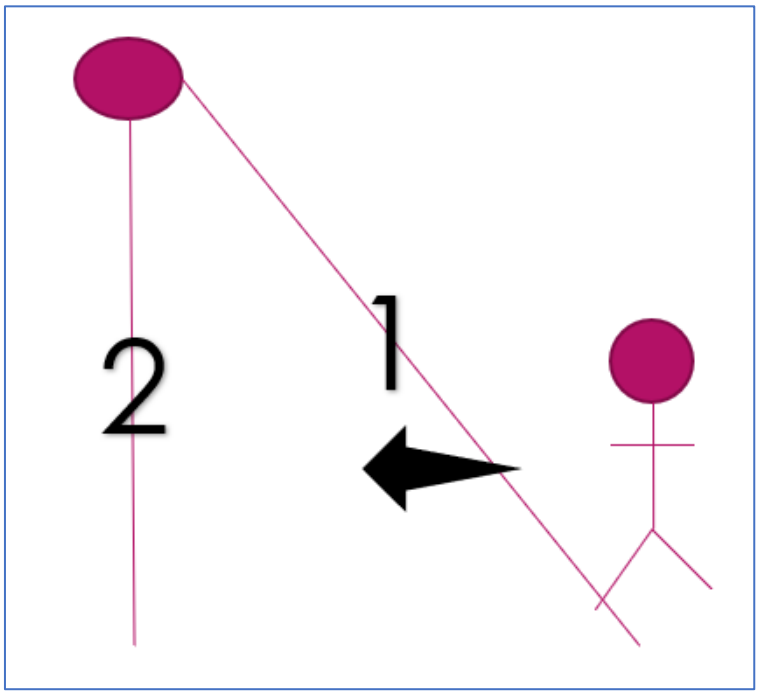
The price of our product will be around 12 euros

3. Project System Architecture Design



4. Technical Details

4.1 Design & Implement for HC-SR04



This article may introduce the loop algorithm at first. Let's think about when a person come into a room or come out from a room, the moving direction is different. So we can build a 2-times detection model to know if a person is coming into the room.

The sensor may detect 2 times per loop. Each time there will be a length value from the person to the sensor. If the value 2 is smaller than value 1, then we can infer that the person is coming into this room. Moreover, if value 2 is larger than value 1, then we can infer that the person is coming out from this room,

The algorithm main code is following:

```
void loop() {
  long cm1 = ping();
  if( cm1 < 100){
    delay(100);
    long cm2 = ping();
    long cm = cm2 - cm1;
    if (cm < 0) { // person come in}
  else{ //person come out}
}
```

4.2 Day & Night Changing Brightness

Because of several reasons, we can't get the light sensor that we want. So we think about solutions that can achieve changing brightness automatically.

If the Arduino can detect the daytime, then things can be done. For example, if it is in the morning, the brightness can be changed lower. If it is at night, the brightness can be changed higher.

But there are several problems in this algorithm. First one is that it can be hard for Arduino to detect the daytime. The teacher gave us a good advice, we can use a WIFI sensor connecting to a server, then get the accurate daytime. The other problem is that this system can never detect the weather of a day. If it is dark rainy, this system may not work as we want.

As a result, we are still finding better solutions to instead the light sensor.

5. Future Improvement

a) More available movement detection algorithm
b) Light sensor part (can solve several problems)