

SMART HOME AUTOMATION

Ajay kumar¹ , Sugam kumar rohilla² , Mohit³

1. ABSTRACT

In our country , we people face a lot of problems about our home security , comfort , resource management etc in our houses. So , there comes a need of Smart Home Automation System in our houses. The automation of household appliances will resolve the energy consumption , security issues by implementing concepts of IOT in our proposal.

2. INTRODUCTION

“Smart home” will make the life of the user easier by covering basic day-to-day tasks. The basic idea behind this project is , suppose there is a person who follows some kind of routine in his day-to-day life, like he wakes up at 6 then goes to gym, then comes back and takes a bath, then goes for his job.

Basically, There is some kind of a pattern in his day-to-day life. He uses different types of household appliances like: geyser, Tv , AC , lights etc. . So, we can reduce human efforts and unnecessary power/resource consumption by building a centralized device which can take care of these things like, this device turns on geyser 20 min. before the scheduled time of bath and then turns it off, we can use some kind of heat sensor in the home. Whenever there is no one at home the device can turn off the lights automatically, and turn on the AC according to the behavior pattern of this person.

This device first observes the behavior/routine of the customer and then acts accordingly.

This can be helpful in many ways, it can save a lot of resource consumption if the person somehow forgot to turn off the appliances. This device can turn it off and save energy as well as save the appliance.



Fig. 1 . Basic Smart Home Automation

By the help of **Machine learning concepts** smart home achieved to track down the movement of the user who is carrying the centralized smart phone in which our application will be installed and record all the activities that are done by the user in accordance with time. The application will take around 10 - 15 days of users data as training data (creating our Dataset) and then it will train our prediction model.

The target audience will be anyone who needs comfort and security in their life. There are few components in our project that are :-

→ Smart Home has built different devices for different household appliances.

→ These devices will be connected to an app by which the user can control the appliances according to his/her ease.

→ We will build an app which fetches the data given by the devices, this app is to be installed on the customer's smartphone, through this app the customer can control the appliances

→ We will also build a website through which a customer can get a more detailed idea of smart home and get smart home application (for smartphone).

3. LITERATURE WORK

There are many smart home automation currently in usage, but, the novelty of this smart home lies in the usage of machine learning that provides extra comfort to the user.

Smart Devices This is a multiple functionality project. We can build different devices for each household appliance.

→ Smart light.

→ Smart geyser/AC.

→ Smart switch.

→ Smart security lock.

These devices are connected to the centralized app and they transfer real time data to control the appliances.

Machine Learning

We implemented machine learning at two places in this model.

At first we created a predictive model for automation of household applications and then we used machine learning for face recognition in a smart security lock system. we created forecast model for automation and for face classification we used cascade classifier

4. METHODOLOGY

The basic principle that was followed in this project was to make power efficient and highly responsive devices, keeping in mind that we have to apply machine learning models to predict the usage of the devices. So the connection between machine learning and devices has to be done very carefully.

4.1 Components

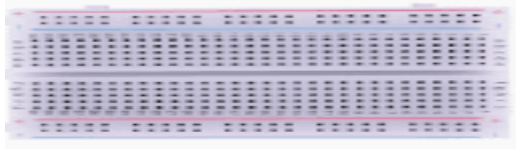
4.1.1 Arduino Nano

Arduino Nano is small in size , can be fitted onto a breadboard and it is based on ATmega328 (Arduino Nano 3.x).



4.1.2 BreadBoard

The ProtoBoard is generally used to make a connection between different electric components using wires.



4.1.3 RTC Module

Real time clock module is used for keep in record the date and time.



4.1.4 Step Down Module

It is used for converting household A.C supply to 12V D.C supply.



4.1.5 Connectivity Module

ESP8266 WI-FI Module gives the microcontroller direct access to the WIFI.



4.1.6 Temperature Sensor

It is used to measure the Temperature



4.2 Algorithm

This below is the pseudo code that is used for face recognition in smart security lock.

```
Input: original test image
Output: image with face indicators as rectangles
for  $i \leftarrow 1$  to num of scales in pyramid of images do
    Downsample image to create  $image_i$ 
    Compute integral image,  $image_{ii}$ 
    for  $j \leftarrow 1$  to num of shift steps of sub-window do
        for  $k \leftarrow 1$  to num of stages in cascade classifier do
            for  $l \leftarrow 1$  to num of filters of stage  $k$  do
                Filter detection sub-window
                Accumulate filter outputs
            end for
            if accumulation fails per-stage threshold then
                Reject sub-window as face
                Break this  $k$  for loop
            end if
        end for
        if sub-window passed all per-stage checks then
            Accept this sub-window as a face
        end if
    end for
end for
```

4.3 APPROACH

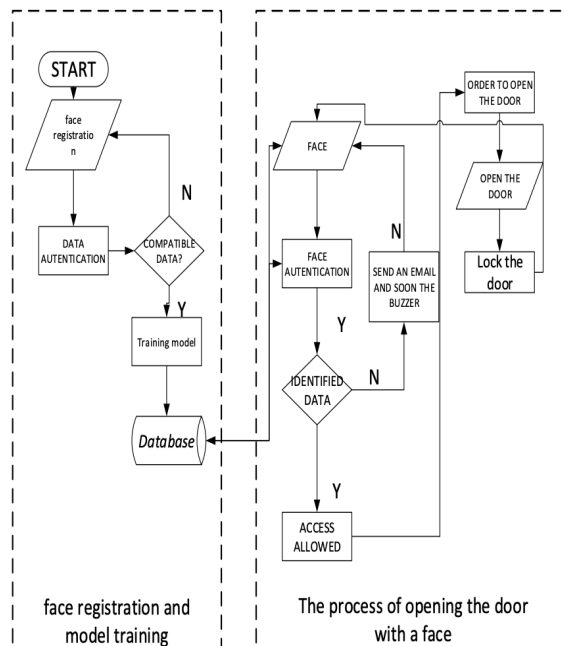
For our smart security lock system, We implement a face recognition system using the Convolutional Neural Network (CNN). Convolutional Neural Network is the most used and easiest method for face recognition with a very good accuracy. Facial Data of the owner collected and trained the model. Using that data our system will recognize if the person who requested to open the door is the owner or not. If it is the owner it will open the door. Also we can further train our model to recognize the owner's relatives and friends by providing their facial data to our model.

Well in the case, if the person is not the owner, the system provides the person's image to the owner via application. If the customer commands the system to open the door our system will open it else it will not allow that person to enter the house.

For our smart geyser, we first notice the user's daily routine for 10 to 15 days, at what time he wakes up and goes for a bath.

Using that we create a dataset of users' daily routine with features the time he woke up, the time he goes for bath and day if it is workday or weekend. Utilizing that dataset we will train our ML model using the K nearest neighbors (KNN) algorithm. The trained ML model in our system predicts the time at which the user used to wake up and come for a bath and turn on the geyser accordingly. We then test our ML model by providing some input to that, it gives us a very good output by providing 89% accuracy.

If the user does not want to bath at that time or does not want to use hot water he/she can turn off the geyser using the mobile application. Smart geyser turns off automatically as soon as it warms the water.



We implement the smart lighting system on the entry door of the room. As soon as any person enters the room the system senses that person and turns on the light automatically and gets counts of every person entering the room. If the count gets zero it will turn off the light of the room automatically. We can use that counts for our smart AC to adjust the temperature according to the number of person in the room and temperature.

5 : WORKFLOW

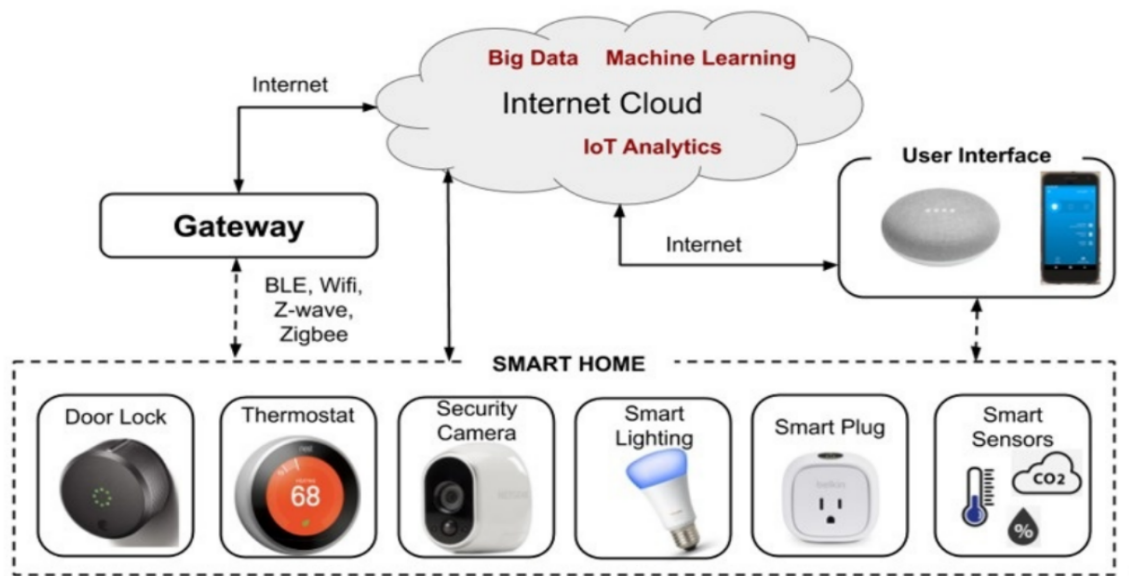


Fig . 2 The workflow of the project

The workflow starts with the client , the client first installs the app . Then the app is connected to the smart home various devices like geyser , AC , smart light etc.The connection is made between the app and the devices via bluetooth connectivity.

The app also collects data and stores it , then that data is processed by the ML learning model. The results given by the ML model to the app and app set the functions according to it.

Fig. 3 shows the final circuit and shows the fully working of the project. Cloud is also used for the storage of the data. By using it we have tried to reduce the data storage issue and increase the retrieval

of the data that is used for the ML model

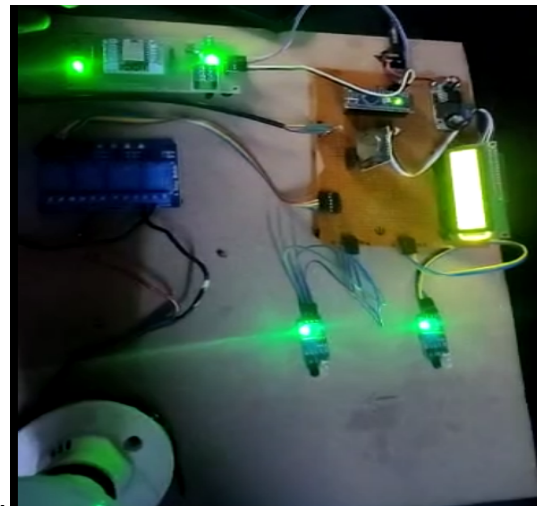


Fig 3 :Final circuit

6. FUTURE SCOPE

The regression ML model we have used can be more accurate by training it more and more with new and valid data.

so, by advertising more and spreading awareness about saving useful resources by using our application can be very helpful as we know that buying cost efficient smart home automation system are costly . We have faced a lots of issues on building our website by using a better framework for our website can make our project more appealing .

7. RESULT

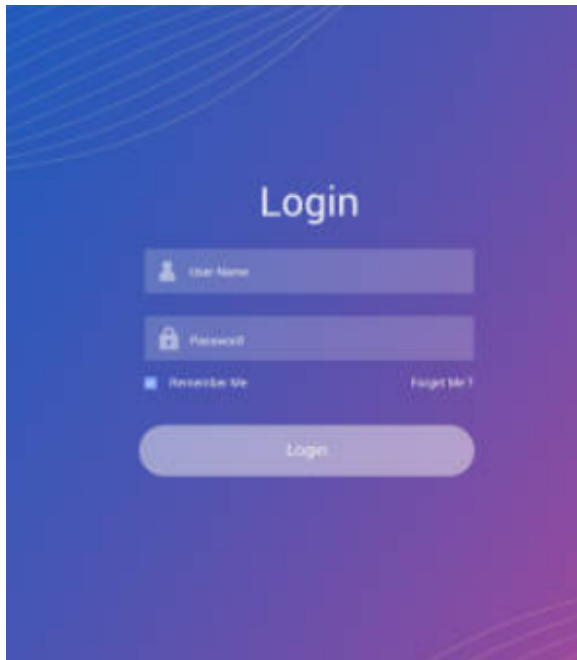


Fig 4: Login page



Fig 5: Available devices

Fig. 4 and Fig. 5 shows the web interface of the website of the project .

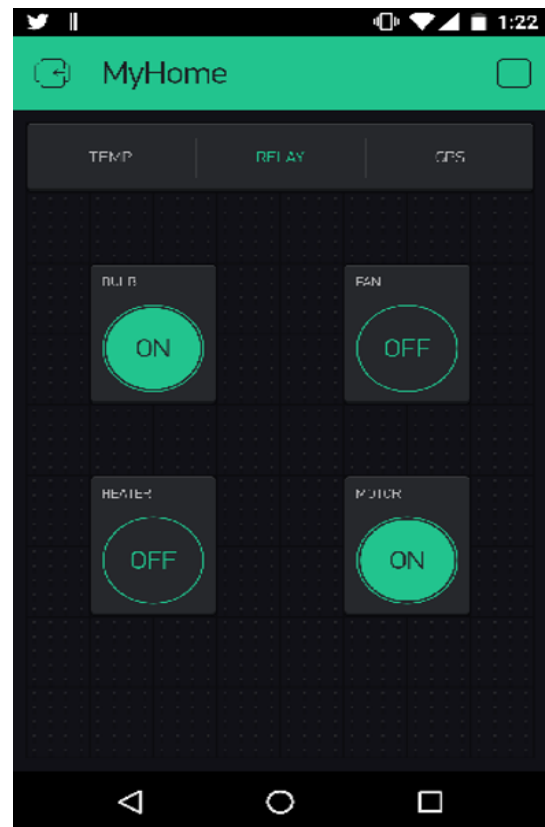


Fig 6: App interface

By going onto our website the customer will see a very interactive interface which will give more information about our product.

The website will have a buy section in it, through which the customer can get their smart home product by giving in

their inputs regarding their home and appliances, the charges will vary according to the requirements or the needs of the customer. Then we will deploy our product to the customer and follow up for feedback. The app will have control over the appliances.

So, this was the whole outcome of our product "Smart Home: - the personal touch you need in your life".

8. CONCLUSION

It is obvious that if the resources are freely available, the user will use the resources without taking any precaution. But there is a major problem nowadays that resources are decreasing day by day. So Smart Home "the personal touch you need in your life" will decrease the unnecessary usage of resources.

9. REFERENCES

- [1] Ajay Kumar, student affiliated with Netaji Subhash University Of Technology.
- [2] Sugam kumar rohilla, student affiliated with Netaji Subhash University Of Technology.
- [3] Mohit, student affiliated with Netaji Subhash University Of Technology.
- [4] Celeste Thelon, what is home automation and how does it work? : a case study.
- [5] Sitalaksmi Venka, Smart home automation, Department of Business and

Construction, Melbourne Polytechnic, Preston, VIC 3072, Australia.

[6] Naveen Hariharan, Smart homes and home automation applications and market : A case study.