Self-Sustainable Smart Home

Abdelrhman Hatem Mohamed Shawkat
Egyptian Chinese University, Egypt, 122100005@ecu.edu.eg

Supervisor: Samar M. Ismail, Dina Tantawy
Faculty of Engineering and Technology Assistant Professor, Egyptian Chinese University (ECU), Egypt

Abstract– The modern-day smart home needs to learn from its users daily usage in order to qualify as a "Smart" Home to do so we came up with the idea of introducing a smart code which can operate any appliance with no need of identifying the appliance itself in order to reduce the overall cost for the cost as the system does not differentiate between analog & digital components or appliances as long as it is an electrical device it will work fine with the system which results in a smart home that won't differentiate between smart & non-smart appliances, so the system creates a 3 level way of connection which are: add, remove and disable which simply mean that the user can user the UI to add new components easily which the system will identify or they can remove components from their property that they no longer need or for security purposes disable the component which they do not need at the moment which is a procedure done to enable the user to get access to a smart Home that understands the way they behave and output data that they can use to improve their daily routine and their overall health

Keywords—Smart Home, Self-Sustainable Home.

I. Introduction

The projects hypothesis is that the Modern-day development trends in the housing market is the usage of smart home [1], In architecture we have theories of sustainable-development so our hypothesis is that we can create a house that's not only self-sustainable but also self-developing to take part in the growth factor of Smart-Homes [2]. Which means that it will have the ability to become better with time by easily swapping components and having a system that automatically identifies the component that you initiate a connection with and the exact way that you use and interact with your home as seen in Fig.1, 2, 3 we provided a list of some of the components we tested it with in Table.1. Of course, our focus & highlight is security and rapid development of a system that can keep improving.

II. Materials

Component	Use Case
Arduino Mega OR SBC	Main processor
Node MCU	Communication Module
Motion, Light, Temperature sensors.	Example Data providers
LEDs	Provide Alert/ Notifications for the user

TABLE I

III. Aims & Methods.

The project is aiming towards creating a sustainable house that can be even built on Mars The whole idea is in the code which can work with hot swappable components no matter if they have smart functionality or not As seen in Fig.5 & Fig.6 [3], as well as using the exported data in SQL tables with Microsoft Azure to create a Machine learning algorithm which can utilize the data to learn from the users behavior of course avoiding all the possible security issues and breaches [5]. And introduce better ways to interact with their home, so it basically allows it to adapt to what you need turning it from a smart home to a helpful home.

IV. Screenshots & Renders

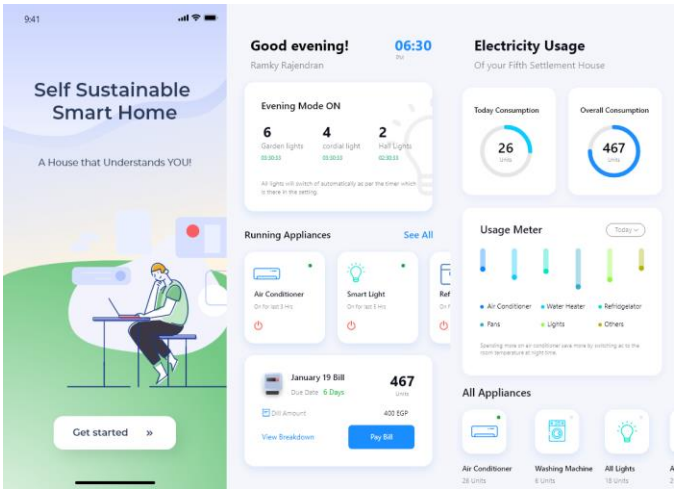

Fig.1

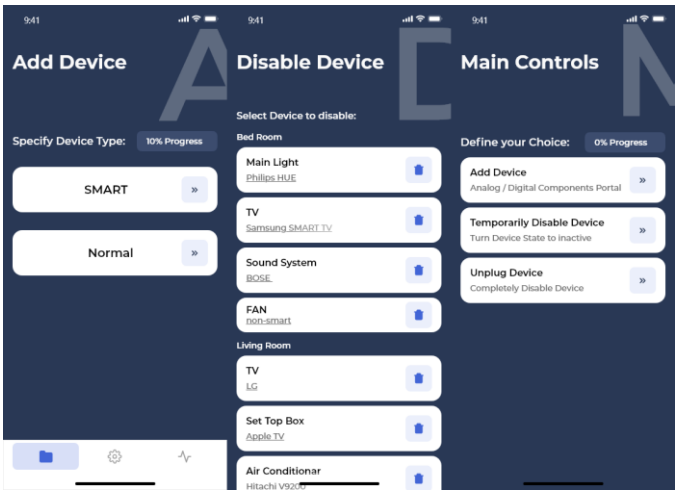

Fig.2

Fig.3

```
//#include<LiquidCrystal.h>
//#define lights A5

//LiquidCrystal lcd(1,2,4,5,6,7);
const unsigned long rebeat= 6000;
unsigned long pre =0;

int digital_static_pin[6]={2,4,7,8,12,13};
int digital_var_pin[5]={3,5,9,10,11};
int analog_pin[6]={0,1,2,3,4,5};

//int pin_st_status[6]={0,0,0,0,0,0};
//int pin_var_status[5]={0,0,0,0,0};
//int alg_status[6] ={0,0,0,0,0,0};

int digital_static_pin_con[6]={0,0,0,0,0,0};//{1,1,1,1,1,1};
int digital_var_pin_con[5]={0,0,0,0,0};//{1,1,1,1,1};
int analog_pin_con[6]={0,0,0,0,0,0};


//=====================================================
String get_status()
    {
     //////////// -1=no connected device  /// 0= there is a connected device but it is off //// 1= there is a connected device and it is on
          String msg="8";int x;
            for(int i=0;i<5;i++)
              {
                x=-1;
                if(digital_static_pin_con[i]==1)
                  x=digitalRead(digital_static_pin[i]);
```

Fig.4

V. The Model

Fig.5

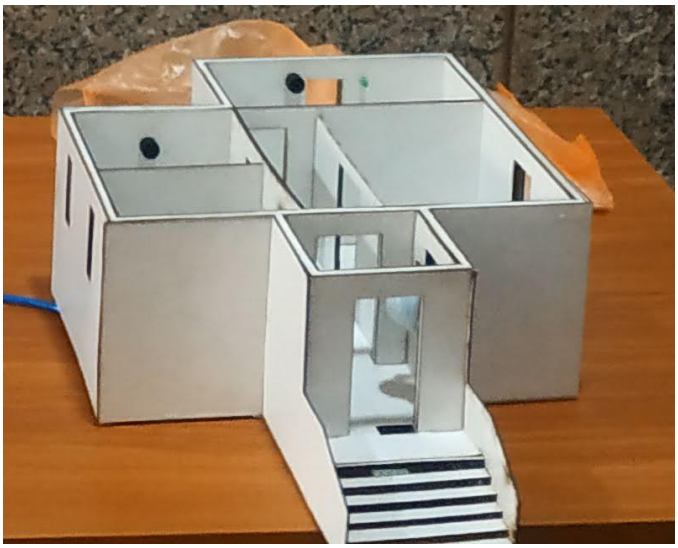

Fig.6

Fig.7

Fig.8

VI. The Schematics

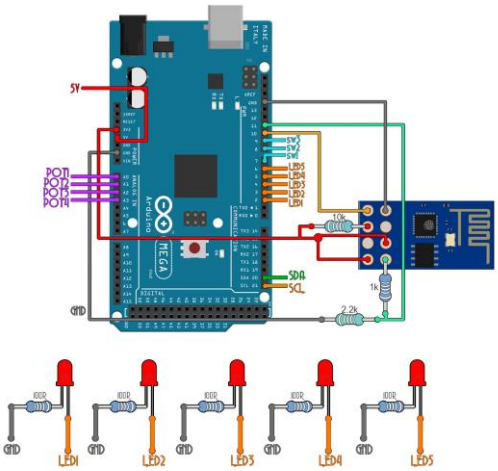

FIG.9

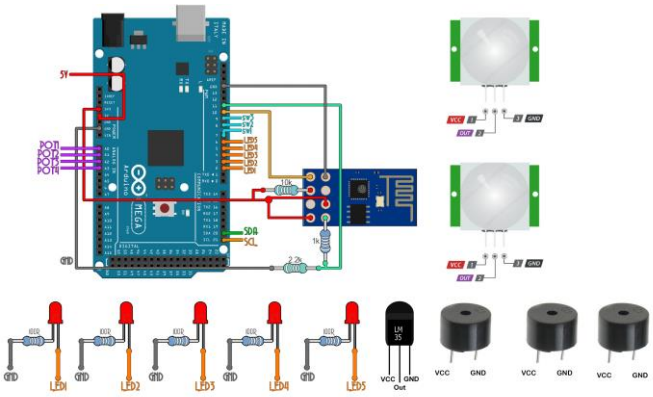

FIG.10

VII. Conclusion

What is done in the project so far is the code which identifies the components and can automatically control them without the need that the user specifies which component is he adding or to which port as seen in Fig.4, which further improves the state of security and privacy as the platform will never gain access to neither mic nor camera access. Due to time constraints further development regarding the Machine learning model and Easy to use UI experience so for now it can be controlled through the serial monitor with simple commands divided into levels which are: Add, Remove and Disable.

References

[1] Connected home products revenue U.S. 2018-2022 | Statista. (2021). Retrieved 3 June 2021, from https://www.statista.com/statistics/525878/us-connected-home-technologies-sales/

[2] Infographic: Smart Home Technology Poised for Blockbuster Growth. (2021). Retrieved 3 June 2021, from https://www.statista.com/chart/15736/smart-home-market-forecast/
[3] SISODIA, D. (2021). On the State of Internet of Things Security: Vulnerabilities, Attacks, and Recent Countermeasures. *University Of Oregon*. Retrieved from https://www.cs.uoregon.edu/Reports/AREA-202001-Sisodia.pdf.
[4] Smart home safety vs. privacy concerns 2021 | Statista. (2021). Retrieved 3 June 2021, from https://www.statista.com/forecasts/1227824/smart-home-security-safety-vs-privacy-concerns
[5] Yoon, S., Park, H., & Yoo, H. (2015). Security Issues on Smarthome in IoT Environment. *Computer Science and Its Applications*, 691-696. doi: 10.1007/978-3-662-45402-2_97