A Seminar Report

Smart Home Automation Using Intelligent Electricity Dispatch

Submitted in partial fulfillment of requirements for the award of degree.

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

by

DASARI SAI NISHITHA (160119733304)

Department of Computer Science and Engineering

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
(Affiliated to Osmania University; Accredited by NBA(AICTE) and NAAC(UGC), ISO Certified 9001:2015)
GANDIPET, HYDERABAD - 500 075

Website: www.cbit.ac.in
[2022-2023]

CERTIFICATE

Certified that seminar work entitled "**Smart Home Automation Using Intelligent Electricity Dispatch**" is a bonafide work carried out in the eighth semester by "**D SAI NISHITHA (160119733304)**" in partial fulfillment for the award of Bachelor of Engineering in Computer Science and Engineering from Chaitanya Bharathi Institute of Technology (A), Gandipet during the academic year 2022-2023.

SIGNATURE

Dr. Y. Rama Devi

SIGNATURE

Dr. M. Subramaniam

SIGNATURE

Smt. K. Mary Sudha Rani

INDEX PAGE

TABLE INDEX

FIGURE INDEX

ABSTRACT

The evolution of technology has increased the consumption of electric power locally and globally which lead to a dramatic increase in demand for electric power.Electricity consumption rate in different forms at home and commercially increased. Sometimes, it affects household appliances due to the raised demands based on conditions of load shedding, electricity shortfall, and emergencies. It includes sudden electricity breakdown due to heavy rainfall or storm. A technique is proposed that will address the issues regarding electric power shortfall and emergencies caused by the sudden breakthrough of electricity.The proposed technique automates the appliances in three main ways like locally automation, web-based, app-based automation. Experimental results show that the average accuracy of the system for local scenarios is 88.71, for web-based scenarios is 88.55 and for app-based is 88.56 respectively.

CHAPTER 1
INTRODUCTION

The technology is evolving with the passage of time and making humans lives more dependent on it. The basic needs like water, food, and shelter with other resources like power, oil, gas etc, are also indirectly becoming our necessities. Without these resources, it seems impossible to carry out our daily tasks. The severity level of this can be seen in the case of their shortfall. Like, if a country is facing a shortfall of electricity the activities of life will stick as form the small led light to heavy machines are working due to electricity. If it is not provided properly then many issues may arise, and the country will fall in heavy crises.

So, as we may have the idea that, how dependent we are on these resources, we need to save these resources by proposing and implementing such solutions that may save them. They have focused on the problem of electricity shortfall and proposed a model which will help to reduce energy consumption for home, office or any desired place. Globally gross final consumption of electricity reached 22,315 Terawatt Hours (TWh), in 2018, which is 4.0 percent higher than in 2017. Due to inadequate electricity issues, there is a need to develop a system that uses various appliances effectively and efficiently while keeping the cost of electricity minimum.

It is undeniable that technology has significantly influenced the way we live our lives. It has made our lives more comfortable, convenient, and efficient. We have become heavily dependent on technology, especially on the resources like water, food, shelter, power, oil, and gas. Without these resources, carrying out our daily tasks seems impossible.
Electricity is one of the most crucial resources that we are dependent on in our daily lives. It powers everything from small LED lights to heavy machines. When there is a shortfall of electricity, it can have severe consequences on our lives. For instance, homes and businesses may be left without power for long periods, causing disruptions in daily life. Hospitals may not be able to provide essential medical services, leading to health crises. Transport systems may fail, leading to a lack of movement and mobility.

When the shortfall of electricity or any other essential resource is not provided properly, many issues may arise, and the country will fall into a heavy crisis. For instance, businesses may face financial losses due to power outages, which may lead to layoffs and an increase in unemployment rates. The economy may suffer, and the country may experience a significant setback in its development. Additionally, the shortfall of resources may also lead to social issues such as protests, riots, and crime. It may also have an adverse impact on the environment, leading to a shortage of water, food, and other essential resources. This situation may lead to increased conflicts between countries and regions, leading to geopolitical instability.

CHAPTER 2

LITERATURE SURVEY

The dispatch model contains power structures like cooling, heating, electrical energy, responsive of desired request. The structure had many sub structures like Calculation of risk factors, giving Response ,performing according to which was demanded / requested.
Knowing the situation conditions and optimization. In this model, every sub structure is interacted with one another to get the desired result. The technique used here was to convert domestic loads into 3 major groups on the basis of controllability. The advantage of demanded power is that the loss and expense of transmission are decreased. Results from the proposed model meet the requirements of demanded requirements, and the overall performance of the model increases.

CHAPTER 3
METHODOLOGY

3.1 Proposed System

They have focussed on the power consumption problems. So they have proposed "ELECTRICITY DISPATCHER FOR HOME AUTOMATION" .This system consists of 3 automated techniques web-based, app-based, and local automation. The implementation of this model has included Arduino UNO along with sensor, switches and relay modules. For research, they have focussed on four home appliances Bulb, Fan, AC and Electric Heater. The appliances are observed under the defined conditions in three ways i.e., locally, web-based and app-based automations.

In local case, Arduino UNO is programmed in such a way that it takes the results from the sensors and act accordingly. In web-based and app-based cases, the circuit consists of Arduino UNO, relay and NedeNCU connected to appliances. A person can connect to the app or webpage make the request to ON/OFF the appliances. This request is sent to server where it will be processed and defined action will be performed. In the three cases the priority is given to the **web-based and app-based** rather than local automation.

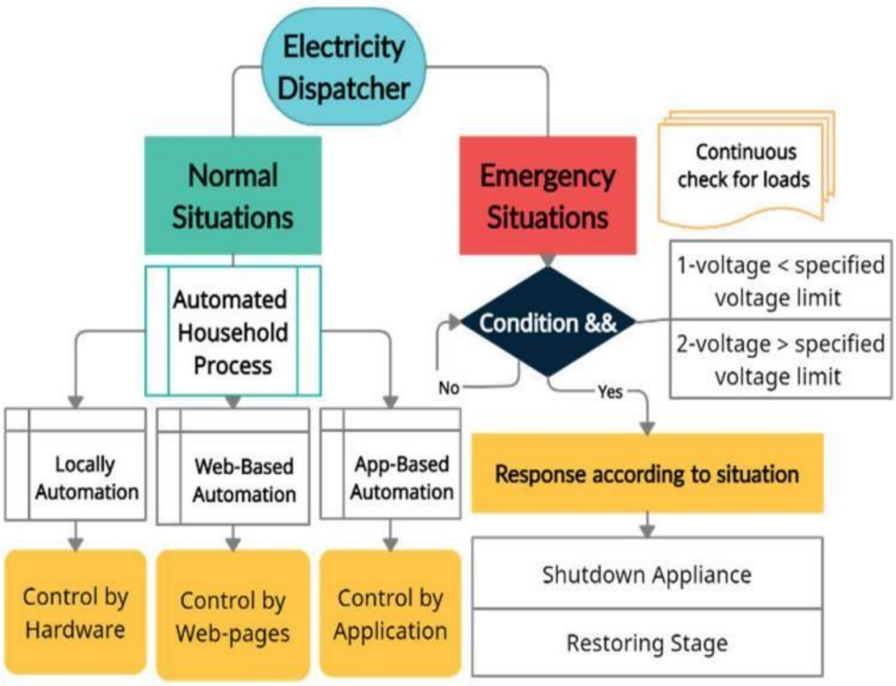

Fig.3.1 **Working model of ELECTRICITY DISPATCHER**

LOCAL AUTOMATION

In local automation, the proposed system will act smartly and make decisions on its own under the given conditions based on the sensor's response. Sensors will be attached with a microcontroller, and specific conditions will be applied to switch appliances automatically.

In this technique, we have established the hardware part consist of D6T mems thermal sensor, relay module, switches, Arduino. D6T sensor is used to detect the human presence and also used for temperature calculations.

WEB-BASED AUTOMATION

Web-based module will operate on user commands if user want to switch on or off appliances from anywhere, he/she can do it by accessing web pages. Webpages will be deployed on server and integrated with the hardware part i.e., microcontroller.

The hardware contains the Arduino Shields, Relays, Switches, Electric Appliances, Server, and Mobile phone. User will send command to the server through webpages then server will send the request to microcontroller which will process it and perform the action in form of turning load on or off.

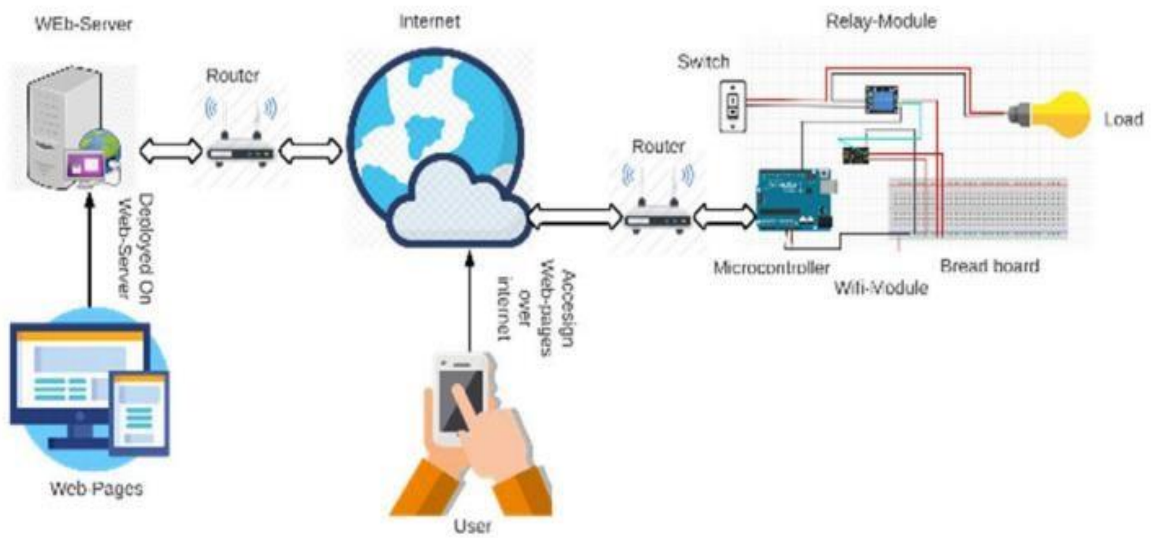

Fig 3.2. Working Model of WEB-BASED AUTOMATION

APP-BASED AUTOMATION

In this module, app is connected with a Blynk server via the internet.App server will communicate to the local router, which will act as a bridge between hardware setup consist of NodeMCU esp8266 and the app. App interface consists of buttons and pins connected to NodeMCU, giving users options to turn OFF or ON the widget according to his/her desires.

When NodeMCU is connected with the internet and power supply, the app will automatically connect with NodeMCU. When we click on the button of the app to turn ON the device, NodeMCU will get a command from the server and turn ON/OFF the device.

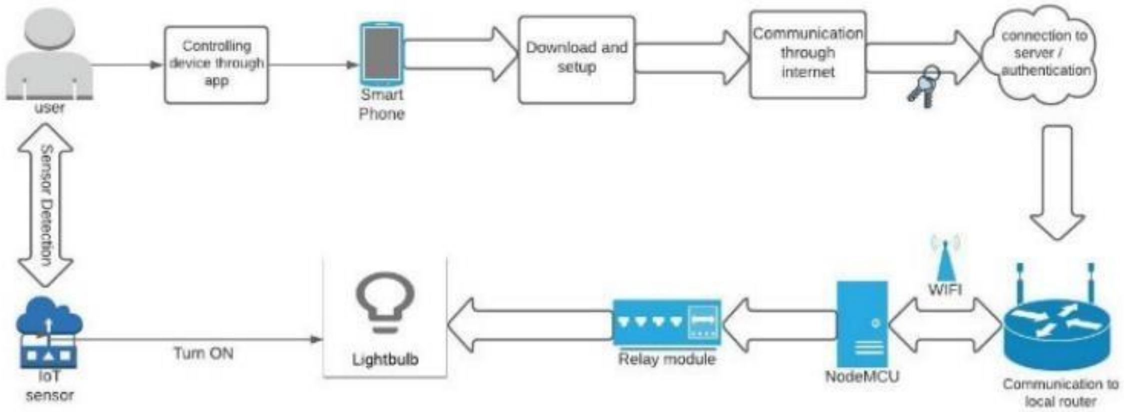

FIG 3.3 **Working Model of APP-BASED AUTOMATION**

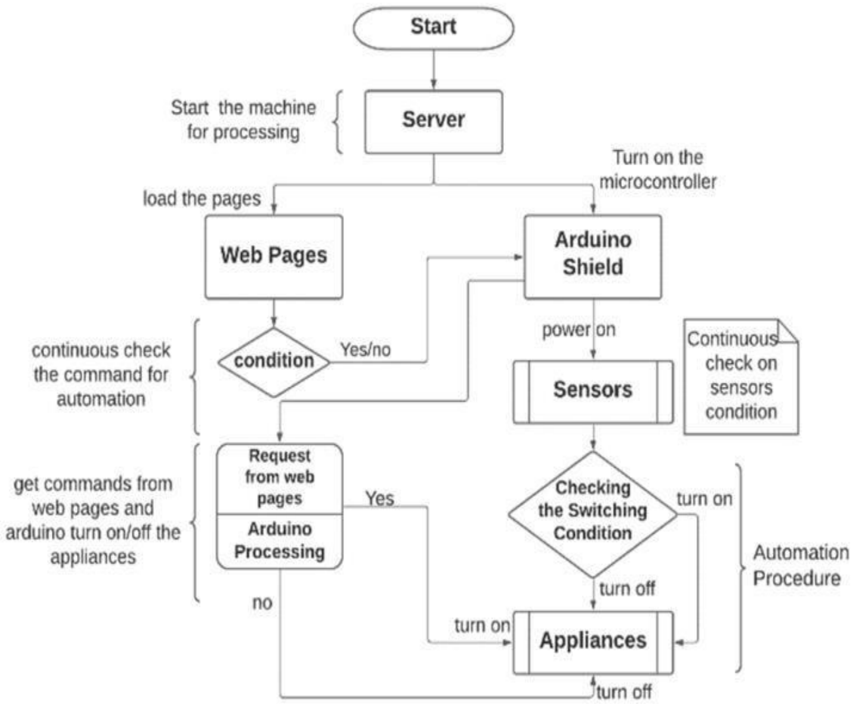

FIG 3.4. Workflow at server side in electricity dispatch model

CHAPTER 4
RESULTS

We have expected flexible, cost-efficient, user-friendly, and competent results from the proposed structure. The testing of the model has been done via the help of different procedures across the functioning of the appliances.

Exp. #	Automation ways	Response of Appliances								Pass / Fail
		Bulb		Fan		Circuit Switch				
		On	Off	On	Off	Air conditioner On/Off		Electric Heater On/Off		
01	Locally automation	Turn on bulb if human detected	Turn off bulb if no human detected	Turn on fan if human detected	Turn off fan if no human detected	AC is on If temperature is above limit	AC is off If temperature is below limit	Heater is on If temperature is below limit	Heater is off If temperature is above limit	✓
02	Web based automation	Turn on bulb If web page request	Turn off bulb If web page request	Turn on fan If web page request	Turn off fan If web page request	Turn on AC If web page request	Turn off AC If web page request	Turn on heater If web page request	Turn off heater If web page request	✓
03	App based automation	Turn on bulb If app request	Turn off bulb If app request	Turn on fan If app request	Turn off fan If app request	Turn on AC If app request	Turn off AC If app request	Turn on heater If app request	Turn off heater If app request	✓

Table4.1 D6T MEMS Thermal sensor specifications

For bulb Case Experiments #	Locally			Web based			App based		
	Time span 0.1-0.4 sec	Time span 0.5-1.4 sec	Time span 1.5-2.5 sec	Time span 0.1-0.4 sec	Time span 0.5-1.4 sec	Time span 1.5-2.5 sec	Time span 0.1-0.4 sec	Time span 0.5-1.4 sec	Time span 1.5-2.5 sec
1	93.33	86.35	85.87	92.78	87.44	84.35	90.44	88.30	83.35
2	96.98	86.87	84.81	93.98	88.74	85.09	92.67	85.98	80.89
3	94.67	89.67	82.23	96.87	87.60	83.40	91.09	85.42	85.35
4	91.67	87.39	81.40	95.22	89.11	82.30	93.21	86.56	84.39
5	93.67	88.79	80.91	91.92	89.90	81.50	94.55	87.49	84.49
6	92.67	86.99	85.55	90.99	88.83	81.38	93.57	89.30	82.43
7	91.33	88.29	84.38	94.32	90.01	80.10	90.87	86.24	81.49
8	96.35	86.79	82.84	96.33	89.79	80.93	94.81	90.05	83.99
9	97.31	89.33	83.54	97.33	86.68	80.87	93.98	87.89	84.87
10	95.67	90.10	83.51	95.67	87.79	80.57	95.01	88.79	85.76

Table4.2 Test of bulb automation across different scenarios

For Fan Case Experiments #	Locally			Web based			App based		
	Time span 0.1-0.4 sec	Time span 0.5-1.4 sec	Time span 1.5-2.5 sec	Time span 0.1-0.4 sec	Time span 0.5-1.4 sec	Time span 1.5-2.5 sec	Time span 0.1-0.4 sec	Time span 0.5-1.4 sec	Time span 1.5-2.5 sec
1	92.99	86.4	82.58	97.28	86.76	80.87	94.55	90.34	85.33
2	95.68	86.87	83.48	91.98	87.78	81.12	96.7	88.59	84.77
3	95.76	89.51	81.22	96.67	89.67	84.4	96.19	84.52	83.55
4	92.17	90.12	80.14	92.52	90.76	83.3	92.13	86.16	83.94
5	92.11	87.09	81.91	91.29	89.95	82.59	90.45	89.34	84.23
6	93.01	89.91	85.05	91.09	87.33	83.81	95.73	87.45	84.32
7	94.91	86.29	85.43	92.42	86.32	81.87	97.12	86.01	84.91
8	96.79	86.73	80.84	93.6	87.19	84.91	94.14	89.05	83.75
9	97.76	88.35	85.54	95.73	88.68	85.09	93.98	87.8	85.8
10	95.98	87.01	81.35	96.75	90.11	84.57	91.56	87.98	86.45

Table4.3 Test of fan automation across different scenarios

For switch Case Experiments #	Locally			Web based			App based		
	Time span 0.1-0.4 sec	Time span 0.5-1.4 sec	Time span 1.5-2.5 sec	Time span 0.1-0.4 sec	Time span 0.5-1.4 sec	Time span 1.5-2.5 sec	Time span 0.1-0.4 sec	Time span 0.5-1.4 sec	Time span 1.5-2.5 sec
1	92.33	85.35	84.87	91.78	86.44	83.35	89.44	87.30	82.35
2	95.98	85.87	83.81	92.98	87.74	84.09	91.67	84.98	79.89
3	93.67	88.67	81.23	95.87	86.60	82.40	90.09	84.42	84.35
4	92.67	86.39	80.40	94.22	88.11	81.30	92.21	85.56	83.39
5	92.67	87.79	79.91	90.92	88.90	80.50	93.55	86.49	83.49
6	91.67	85.99	84.55	89.99	87.83	80.38	92.57	88.30	81.43
7	90.33	87.29	83.38	93.32	89.01	79.10	89.87	85.24	79.49
8	95.35	85.79	81.84	95.33	88.79	79.93	93.81	89.05	82.99
9	96.31	88.33	82.54	96.33	85.68	79.87	92.98	86.89	83.87
10	94.67	89.10	82.51	94.67	86.79	79.57	94.01	87.79	84.76

Table4.4 Test of switch case automation across different scenarios

Scanerio	Bulb (%)	Fan (%)	Switch (%)
Locally	88.64	88.43	88.71
Web based	88.39	88.55	87.39
App based	88.11	88.89	87.07

Table4.5 Overall accuracy of ELECTRICITY DISPATCHER model

CHAPTER 5
CONCLUSION

The proposed methodology is beneficial for electricity saving as it overcomes electricity consumption, which is the main target to achieve as unwanted appliances will be automatically switched off according to given conditions. In addition, proposed technique provides convenient solutions to the user to switch devices from remotely. Users according to their requirements just one click to switch turn it on/off and not need to worry about the appliances at home or office.

Therefore, our proposed model provides ease and comfort to the user. It is cost-efficient in terms of electricity usage of hardware/software. The solution is effective and reliable as giving the real-time and effective response.

REFERENCES

[1] B. B. Umar and C. F. Kunda-Wamuwi, ‘‘Socio-economic effects of load shedding on poor urban households and small business enterprises in Lusaka, Zambia,’’ Energy Environ. Res., vol. 9, pp. 9–20, Sep. 2019.
[2] I. Tsiropoulos, W. Nijs, D. Tarvydas, and P. R. Castello, ‘‘Towards net-zero emissions in the EU energy system by 2050,’’ Publications Office Eur. Union, Luxembourg, Tech. Rep. EUR 29981 EN, 2020, Doi: 10.2760/062347.
[3] R. Wu, Z. Pan, and L. Tang, ‘‘Smart dispatch system for integrated energy systems with demand response,’’ in
Proc. IEEE Conf. Energy Internet Energy Syst. Integr. (EI2), Nov. 2017, pp. 1–6.
[4] A. Solat, S. H. Hosseinian, G. B. Gharehpetian, and S. M. Hosseini, ‘‘Optimal energy dispatch of smart home
equipped with PV, WT, and ESS using load control under RTP,’’ in Proc. Smart Grid Conf. (SGC), Nov. 2018, pp. 1– 7.
[5] H. Ziekow, C. Goebel, J. Strüker, and H.-A. Jacobsen, ‘‘The potential of smart home sensors in forecasting household electricity demand,’’ in Proc. IEEE Int. Conf. Smart Grid Commun. (SmartGridComm), Oct. 2013, pp. 229–234.