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HOME IDEATOR

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Abstract - *The aim of home automation is to act as a next generation human assistance which strives to tract the power consumption of each home appliances and make it user friendly enough to display the statistics as a virtual monitoring device. The mobile app which is developed to monitor gives information about the electricity consumption of all the home appliances stored in the database. Measuring the electricity helps to control the pole of electricity which will help to reduce its consumption. This project helps to deal with power loss and also measures the power consumption of each electronic device. This provides a user friendly interface and helps the user to know whether the device is damaged. Further more there are even more premises that the device can compare the appliances with the other available appliances connected to the same database and suggest the best efficient one*

Key Words*: *power consumption, power loss, home appliance

1. INTRODUCTION

1.1 Overview

As we all know that the consumption of electricity has become a basic necessity in today's world, as it has become most prominent part of our day to day life. But for a fact that there is no actual way to track this consumption by each home appliances, and determine its efficiency. This home Ideator is used to determine the consumption of electricity by each home appliance. It tracks through the sensors and sends those readings to the consumers smartphone via arduino. The consumer can get the data through the application designed for this purpose. The consumption data are stored in database made for those devices. Through this the consumer can keep track of the daily electricity consumption. In case of increase in electricity bill, consumer can point out where the electricity is getting wasted. Consumer can even control the devices remotely using this app. Moreover the user is entirely dependent on the rating and parameters given by the company provider of the appliances irrespective of the fact the appliance is actually meeting the parameters or not, by this device the user becomes more alert about the performance of its appliance This home Ideator even helps the user to determine the efficiency of the appliances and also suggest the best device which falls under the category which is connected to the same database.

1.2 Existing System

The existing system follows the manual procedure and electricity bill is generated accordingly. The user has no idea how much power consumption is done by each individual device and also if the appliance which is being used is efficient or not, and also if the appliance is faulty or not. There is no tract of its efficiency, durability and the number of its consumption. The user is completely dependent on its rating and its standard figures given by its company provider irrespective of whether the appliance is genuinely working accordingly to the parameters laid by the company or not. There will be no idea about daily power consumption and customer does not have any idea how to manage the electricity consumption also whether the device is working accordingly or not.

1.3 Proposed System

In this proposed system, the home Ideator tracks the keeps the track of the electricity consumption of each appliance connected to this system. It tracks through the sensors and sends those readings to the consumers smartphone via arduino. It also tracks down the faulty appliances and any abnormal activity taking place in the power consumption. Usually the parameters laid by the company during the manufacturing of each appliance while mass production is not fully accurate and hence the standard performance laid may vary. This device can determine its actual performance and the customer can keep the track if there is any increase in electricity consumption, leakage of electricity or wastage. Consumer can do so by going through the log. Consumer can even control the devices remotely using this app. Data for this application is fetched from the firebase which is a remotely accessible server and maintenance free, also suggest the best device which falls under the category which is connected to the same database. This database is form of a network in which custom number of appliances is connected which can also be compared and suggest the most efficient one falling into categories.

1.4 Objective

The objective of Home Ideator is to give a mode of innovation towards the outlook of performance characteristic of a home appliance by tracking its consumption and recording it, determining its faults and error, reducing the burden of maintaining the records of its consumption by any sorts of elaborated billing system,

suggesting a better device connected to the system and making it easier for the user to control the appliance and keep the track via an application interface.

2. BLOCK DIAGRAM

2.1 Introduction

The diagram shows the block diagram representation of this project, the chapter explains the functions of each block and their specifications.

2.2 Overview

The entire functional unit needs about 5V of DC supply, which is regulated by a buck converter which converts normal AC supply into 5V DC. There are various other components such as voltage and current sensors, relays, ESP 8266 etc. These components are interfaced with the Arduino UNO, which is able to read the parameters obtained by the sensor and input units. The input values collected by the voltage and current sensors by the simultaneous shift through the relays controlled by arduino UNO of each device is sent to the ESP 8266. When the reading of the first device is taken down by the ESP 2866, the reading of the other devices is turned off and simultaneously it goes on for reading of other devices as well. This cycling process of step by step switching of the relay is controlled by the arduino UNO. The ESP 8266 on receiving the data detects the faulty condition, power consumption, time and period of consumption and then sends the data to the firewall using the inbuilt WIFI module. The user interface application can be generated in the mobile and can used for monitoring and tracking also controlling if necessary.

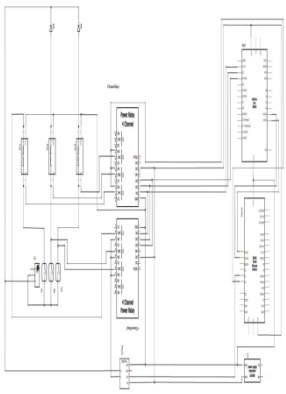

Figure 2.1 block diagram presentation

3. HARDWARE COMPONENTS

3.1 Voltage Sensor:

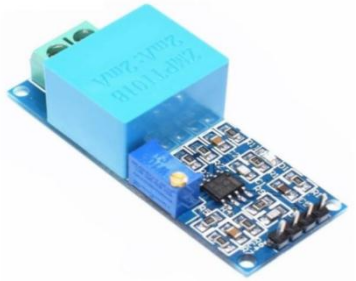

Figure 3.1 voltage sensor

A voltage sensor is a sensor is used to calculate and monitor the amount of voltage in a device. Voltage sensors can determine both the AC voltage or DC voltage level. The input of this sensor can be the voltage whereas the output is the switches, analog voltage signal, a current signal, an audible signal, etc. In this model 250V AC input single ZMPT101B voltage sensor is used to calculate the voltage across the device and it is shifter to each device through the relay for certain period of time.

3.2 Current sensor:

Figure 3.2 current sensor

Current sensor is a device which is used to measure electric current in a wire or a device. The generated signal can be then used to display the measured current in an ammeter, or can be stored for further analysis in a data acquisition system, or can be used for the purpose of control. In this model Single-Phase 5A Range AC Current Sensor ZMCT103C is used, three such current sensors are used to calculate current across each device respectively. This calculation is done simultaneously by each current sensor on their respective allotted devices, and this shifting is done by the relay controlled by an arduino.

3.3 Relay:

Figure 3.3 4-channel Relay

The relay module is a separate hardware device used for remote device switching. In this model 4 Channel DC 5V Relay module is used which is controlled by an Arduino, here two relays are used to control the shifting of voltage sensor and current sensors respectively between each device. There are four separate channels in this relay module which is connected to the sensor. This module should be powered with 5V, which is appropriate to use with an Arduino. The first to connections are the ground and power pins, you need to connect the Arduino +5v to the 4 Relay board VCC pin and the Arduino ground to the 4 Relay board GND pin. Then it's a only a matter of just connecting the communication pins, labeled IN1, IN2, IN3 and IN4, two 4 data pins on the Arduino.

3.4 Arduino UNO:

Figure 3.4 Arduino

UNO the Arduino Uno is an open source microcontroller based on the microchip ATmega328P microcontroller and developed by Arduino.cc The board is equipped with sets of digital and analog input/output (I/O) pins. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. Here the role of the Arduino UNO is that it is used to control the switching of relay for the operation of voltage sensor and current sensor and its time period for each device its determining. It can also determine which device is turned on/off at the moment its values are being observed.

3.5 ESP 8266:

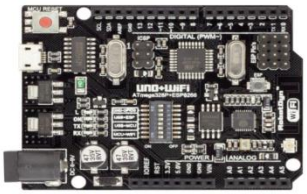

Figure 3.5 ESP 8266

It is a customized version of the classic ARDUINO UNO R3 board. Full integration of microcontroller Atmel ATmega328 and IC Wi-Fi ESP8266 with 32 MB flash memory, and USB-TTL converter CH340G on one board. All modules can work together or independently. On the board where the switch of mode of operation with 8 position. This ESP8266 receives the signal from the voltage and current sensors pertaining its data and further determining its faulty condition of the device, period of consumption along with its date, time and the entire work period, amount of consumption and its statistics. All of this data is stored in the firewall by its inbuilt WIFI module of this device.

3.6 Buck converter:

Figure 3.6 buck converter

The Buck Converter is used in SMPS circuits where the DC output voltage needs to be lower than the DC input voltage. The DC input can be derived from rectified AC or from any DC supply. It is useful where electrical isolation is not needed between the switching circuit and the output, but where the input is from a rectified AC source, isolation between the AC source and the rectifier could be provided by a main isolation transformer. In this model the supply required is 5V DC, which is fulfilled by the buck converter, which converts 12V to constant 5V as per required by the arduino UNO and ESP8266.

4. SOFTWARE ANALYSIS

4.1 Preview

Software analysis the field of system engineering and software engineering which are necessary for determining the needs or to meet the requirement of product or project. taking account of the possibly conflicting requirements like analyzing, documenting, validating and managing software or system requirements.

4.2 Role of Software

In the current project model, the data collected by the ESP8266 is sent to the database via a inbuilt WIFI module, this is programmed through Arduino based embedded C language such that the RSP8266 sends the data to the firebase for user interface by the assistance of the internet.

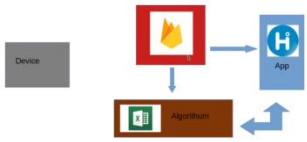

Figure 4.2 software enrollment diagram

The firebase is the platform where the data of the devices is received through the WIFI module. In this platform it shows the number of devices connected as shown in the fig 5.2 and the devices connected are called as parent-base, addition to that each database consists of the following data such as current, pictures, power, voltage and website called as child-base.

Figure 4.3 database

Any data fed to the firebase according to the working of the device can be highlighted in the child-base and is stored in the firebase. This is regarding the firebase presentation.

For the user interface, the data is represented and shown through a Home Ideator App developed by dart programming, it's a python based android program to develop mobile application. It is represented by the logo shown in fig 5.3 below.

Figure 4.4 home Ideator logo

This logo was Initiated in view to show the first two letters of the name Home and Ideator, which clubbed together to form a single symbol presented in the form of logo which also upholds the entire concept of our project.

Coming to the application characteristics, as we know this application is mobile application to monitor the database and make it user friendly, it has the following operation while proceeding to its functions and allotted options.

Figure 4.5 main page

He application required the user to sign in to the application with an already existing account or creating a new one. Basically, each user will have their own respective account for their Home Ideator. This is mainly due to maintain the record of each user connected to the similar line to compare and review other than monitoring.

Moving forward with the application, after it gets logged in there are two sectors namely Power Tracker and Shop. These two options are present for the user application. Here the Shop option is for the non-user, basically the non-user is referred to a user application which does not consist of Homes Ideator model installed.

One can always check the power consumed by the devices connected in the network and it can further help the non-user to make a considerable decision before buying any product or device looking at the statistics and the performance of the already existing device connected to the network of Home Ideator.

Figure 4.6 application page

The Tracker icon is basically for the user operating the Home Ideator model. Here in this application it takes you to the list of devices which is connected to the Home Ideator and as we click into it shows the data and consumption of each device.

Figure 4.7 sample device

Consider for a device 'A' having the data of 9W power consumption which is taking place currently and this data is being shown in the Home Ideator app, considering the company named as Syska for the above device as shown in the fig 5.6.

As we can see in the fig above the tabular called as Replacement can be seen which gives the option for the user to go through the comparable devices in that specific category by taking down all the data such as the voltage, current, power and warranty etc. and suggesting for a better device.

For example, the device which is shown here Syska bulb, but in the factors of consumption, efficiency and lifetime there can be another bulb of same or different company falling under same category. The Replacement tab suggests the user by directing it to the respective website from where it can be purchased along with the price tag and additional information about the suggested device via the website as shown in the fig 5.7

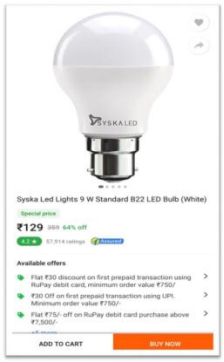

Figure 4.8 directed website

The assessment in the Replacement tab is done due to some factors conducted by the firebase. As we know that the data is collected and stored in the firebase and is monitored to the Home Ideator, it is also sent to the algorithm column which consists of an excel sheet. This excel sheet upon receiving the data tabulates the entire time duration on which the device was operating excluding the on/off period.

The algorithm is designed in such away that it checks the overall time duration and also the faulty condition and the replacement of the device is obtained by comparing it with the already existing devices in the market falling into the same category in the form of suggestion and once the replacement is ready it creates a direction towards the website for the purchase the suggested device in the device column as shown in the fig 5.6 .

4.3 Evaluation of Algorithm:

When the data of the device is stored in the excel sheet, only ratings such as voltage, current and power rating etc. and this collection of data is done periodically obtained as per the time set by the Arduino UNO for each device, and this data is stored under each cells of the excel sheet. This process will be carried out until the permitted allotted time set in the database or it can be also further proceeded until the device whose data is to be calculated gets damaged or expires.

It not only records the duration of consumption for the calculation but also notes down the time and date after each iteration known as Timestamp. It keeps in check the duration of on time and off time of the device which is termed as Turned Condition. In the addition to that, keeping in scale of the timestamp and turned condition the algorithm takes the note of the condition when the device stops working when the supply is on. This records the Fault Occurred condition with to its corresponding date and time. Therefore, the total number of working hours and days can be calculated and determined.Apart from all this, in condition where the Home Ideator is used by a different user 'B" having same or variable device 'B' falling under the same category (ex: bulb), the same procedure of data collection takes place and that device 'B' data is compared with current

device 'A' data in the algorithm. Thus, this comparison made in the excel sheet calculates the economical performance of the device termed as Average.

The Average compares the data of both the devices and suggest the most efficient one based on its total power consumption and working hours to both the user 'A' and user 'B'. And the same goes on if there are 'n' number of users connected in the line of Home Ideator. This linkage between the different users of Home Ideator is formed via Internet connectivity. Keeping in the note for the future premises the algorithm can also be designed to rank the devices based on its comparison. After the ranking takes places, it can search for the product and its availability in the digital market and direct the user towards to its corresponding website for the purchase as a suggestion through the Home Ideator application as shown in fig 5.6 and fig 5.7.

5. ADVANTAGES AND APPLICATION

5.1 Advantages

1. Consumption track: It keeps the user updated about the consumption of electricity of the respective device through an user interface mobile application which can be monitored from any place and any time. 2. Maintains Record: Due to this introduced system, the user need not keep the record of any duration of consumption and its time period over the number of hours the device has been working. 3. Update: The home Ideator keeps the user updated about the performance of the existing device, regarding any faulty condition or not. 4. Recommendation: The Home Ideator compares the number of similar devices connected to the same line used by a different user and suggests the most economical and efficient device based on its performance and also directs the user towards the websites in order to purchase that device. 5. Flexibility: This system including hardware as well as software is highly reliable. This system will satisfactorily perform the tasks for which it was designed for a specific time and in a specified environment.

5.2 Application

The role of artificial intelligence has immensely spread over to greater extend where its involvement has been crucial part of our basic human lifestyle. One such step is lead by the Home Ideator, a smart user interface technology which is introduced to peep into the performance of the devices working at our homes, work places etc.

It's the next futuristic ideology which brings us close to how one can view and safeguard the economic usage of their appliances which is being used. With the further more steps to tag it along the home assistance which can also remotely control the switching on and off the devices through a Home Ideator application.

6. CONCLUSION AND FUTURE SCOPE

6.1 Conclusion

Considering the current existing system on how we tend to not notice the performance of an appliances which we use in our daily life in our home or any required place, we lacking in threads of efficient usage of appliances having no tracker to keep us updated and evolve the concept of smart usage and monitoring of devices. This proposed system will chance the entire perspective over how user will audit the appliance, the way one will be aware the consumption taking place by each appliance and also monitor over any given place and time. Get aware of any kind of leakage, uneven performance and faulty condition and yet in the same ratio, compare it with the existing market products and also the products used by the different users and suggest the most efficient one. And all of this is monitored over a mobile application.

6.2 Future Scope

Over the years we have seen the evolution of artificial intelligence, and each time its been a step ahead of its time. One such concept is Home Ideator. We are aware of its application and characteristics, and considering it into action signifies further more updates and changes where its possible to tag along the profit/loss margin over each appliances by the calculations and comparisons made and also make an approach over the virtual assistance for the control of on/off of the appliances and also through the Home Ideator application itself from any given place and time. This futuristic concept can even further evolve and modified according to the user requirements.

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REFERENCES

[1] Mohannad Jabber Mnati, Alex van den Bossche And Raad Farhood Chisab., "A smart voltage and current monitoring system for three phone inverters using an android smartphone application" published on 15 april 2017

[2] Naveering R ., "interfacing of ESP8266 with arduino uno" published on 24 october 2019

[3] Shafinaz A Lopa, S.Hossain,M.K Hassan And T.K Chakraborty "design and simulation of dc-dc convert" at international research journal of engineering and technology(IRJET) on jan 2016

[4] Geraduras Blokdyk "firebase the ultimate step-bt-step guide" 2018