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Automated Power Depiction System Using Iot Platform

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Abstract—

Precise and well-timed expertise of electricity consumption is an imperative requirement for implementing any power saving strategy. The primary function of energy management systems is to measure the electricity utilization in the homes. Monitoring energy usage in homes indirectly offers knowledge about consumer preferences, types of activities carried out by residents, and forecasting potential energy consumption, energy saving methods and lots of other proposes. Electricity consumers are oblivious to their daily unit consumption of electricity. They know about their power consumption only when they receive the electricity bill on a cycle of 2 months to 3 Months which give consumers no possible option to control the usage of electricity as there are only limited number of methods for the consumers to know about how much units of electricity they have consumed. So, we are going to come up with a solution for the same so as to develop a method which would easily replicate the Electricity Meter reading and would also provide us with the power consumption of each individual appliance on to your phone. This helps us to compare the energy consumption and also helpful for the users to understand if their electricity usage is more or less on a need basis and can compensate or reduce electricity usage in turn reducing electricity bill.)

Keywords—Internet of things (IOT), Android smart phone, NodeMCU.

I. INTRODUCTION

The advancement of the IOT (Internet of Things) have become an additional standard as a result of its contribution to economical solutions for several real time applications. It conjointly revolves the association between M2M that are embedded with electronics, software, sensors etc., which assist users in observing and controlling devices with efficiency. In an IoT system, objects and living beings are provided with unique

identifiers with the ability to transfer the data. Nowadays, IoT is being applied in several areas like gas, water, electricity etc. to make our lives automated. Electricity is a crucial invention and its demand is also increasing at a relentless rate and is being utilized for numerous purposes such as agriculture, industries, hospitals etc. So, it is becoming additionally sophisticated to handle the electricity requirements and maintenance. Clearly there ought to be a necessity for measuring the consumed electricity. Therefore, it is indispensable to execute a technique of taking energy meter readings automatically, which can realize the power consumption management to the customers to be adjustable and manageable to save the electrical energy. Also, to take the reading of the meter, a human operator has to go turn by turn to every resident & commercial building, hence this will increase the work and potency. Therefore, the operating hours also increases to realize the complete area data reading. So, to achieve an efficient energy meter reading, reduce billing error, and operation cost, we need a system that can read the meter reading automatically at each time interval.

The right way to cope up with the problem is to understand the situation thoroughly. At first, we need to realize the quantity of energy that we tend to consume so that we begin to limit it. So, as a solution to it, we intended to construct an application using IOT, which would display the overall power consumed by the household together with the power consumed by individual appliances and conjointly enables the user to set a threshold which upon surpassing will notify the user with an alert message thus helping the user to monitor the power consumption in their house. Thus, this device uses IoT to automate the purpose of measuring consumption of power in homes, allowing for web access and digital technology.

II. LITERATURE SURVEY

In recent years, numerous papers have proposed the design of energy meter monitoring system. In [2], the author proposed a Prepaid Energy Meter based on IOT. The circuit mainly composed of an ADE7758 meter circuit, microcontroller i.e.; Atmega328p, and finally Wi-Fi module. The meter keeps the track of the number of units consumed and sends the information, as well as the cost, through the internet. If the usage of the user is approaching the set point, it will alert the user a warning. If consumption exceeds the set point, the device will switch off the battery.

In [3], the author presented a paper based on the consumption of current by using an Infrared sensor device. The Infrared transmitter is mounted in the EB meter's revolving assembly. The receiver photodiode is positioned in a specific location to determine the number of rotations thereby getting the current consumption. rotations. By determining the rotations, the current consumption can be obtained. After obtaining the current consumption, ARM processor will limit the unit given for a particular user. If the device is reduced to its bare minimum, it will intimate the consumer via alarm and LCD unit. If a person decides to update more units for him, he must contact the EB section and send a request. The required cost will be dispatched to the ARM controller through a GSM modem. Then the unit is incremented by the processor in the memory.

The author presented a remote device monitoring system on a smart phone GUI which is built on an Android Smartphone in [8]. A client logs into the app and gently presses the buttons in order to send the message instructions from the GUI to the home information center with the aid of the GSM network. The ATmega processor acknowledges the detailed command and uses wireless radio frequency to control the home appliance switches, allowing for eventual remote control of the appliances. This lecture emphasizes on the configuration of an Android terminal, the contact between the PIC and the GSM module, the implementation of the wireless module device's driver, and the difficulty of providing the required low- DC voltage for the MCU and wireless module using just one live cable. Consumers can control appliances at any time, allowing our homes to become increasingly smart and automated.

In [12], the author proposed a mobile internet monitoring of a
domestic electrical power meter using wireless communication. This is accomplished with the WSN platform's embedded active RFID tag module. The electrical power meters are monitored and identified using active RFID using the ZigBee protocol. The modules which are embedded in the power meters function as wireless sensors, thereby monitoring the power meter's electricity consumption value and transmitting the data value to the portable reader through an RF signal. The relayed signal is used to speed up certain everyday tasks, save time, and minimize the cost and error in information systems that humans can create.

A Smart Home System (SHS) is a home with a communication network that links services and electrical appliances so they can be monitored managed and accessed remotely. SHS uses a variety of methods to accomplish a variety of goals, ranging from improving everyday comfort to allowing elderly and handicapped people to live more independently. In [10], the author presented a report based on the key 4 fields for SHS: domestic automation and faraway control, temperature and humidity monitoring, fault monitoring and management, and eventually monitoring of health. The machine is constructed round the Microcontroller by using the MIKRO C program, several active and passive sensors, and wi-fi web services, all of which are used in a variety of monitoring and manage processes.

III . PROPOSED METHODOLGY

In the proposed technique, we propose a system that tracks the power consumption of domestic devices, allowing consumers to better control their energy consumption by tracking their use over time.

Figure: 3.1 Block Diagram of Iot based power depiction system.

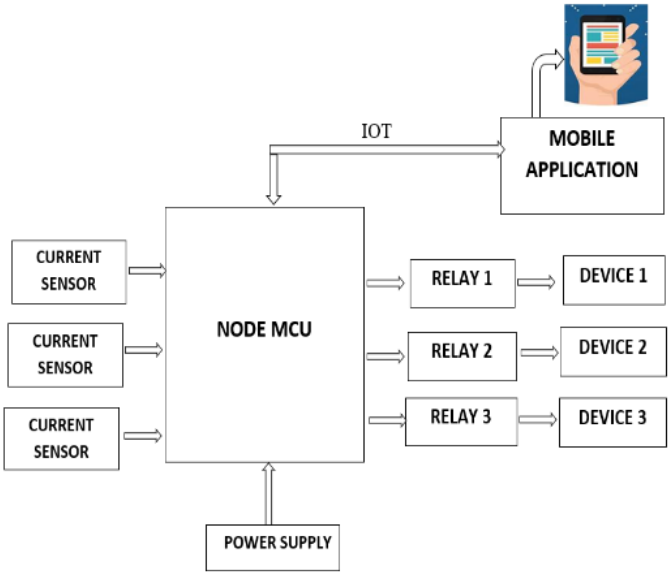


Figure : 3.1 Block Diagram of Iot based power depiction system.

The main component is the Node MCU to which the devices are interfaced. The Node MCU is a web-based software and hardware environment based on the ESP8266, a low-cost System on a Chip (SoC). The current sensors are attached to this module to determine the amount of power used by individual appliances. We're using an ACS 712 current sensor, which can work in both DC and AC and provides separation between the load (AC/DC load) and also the measuring unit, which is the microcontroller. It is a sensor which runs on 5 volts and outputs an analogue voltage and is proportional to the current measured. This provides us with the individual power consumed by the appliances. Both the values (ie; total power and power consumed by individual appliances) are then sent to the user through this module to a mobile application using IOT from where the user can easily know about the power consumption pattern in his/her household and also about the appliance that is consuming more power just by comparing the total power and individual power of appliances displayed in the app. Hence this would help them in adopting certain energy conservation methods of their choice thus reducing the usage and electricity bill. Also, relays are connected to the devices as output from the Node MCU as a provision for the user to switch on or off these appliances, when necessary, through this app.

IV. CIRCUIT DIAGRAM

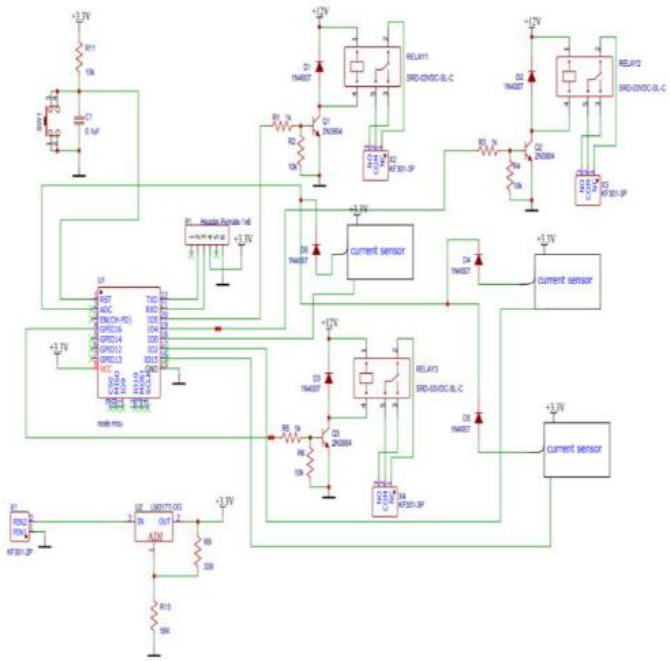


Figure 4.1 Circuit diagram of IOT based power depiction system.

4.1. WORKING

The central portion of the circuit is the Node Mcu, an open-source microcontroller to which the devices are interfaced. Note that the MCU isn't solely a microcontroller however additionally a microcontroller with a Wi-Fi indication where the Wi-Fi is already constitutional. Node MCU gives access to the General-Purpose Input/Output pins. It has 17 GPIO pins (0- 16), out of that solely 11 of them can be used because the other pins (GPIO 6 -11) are used for connecting the non-volatile memory chip. ESP8266 has an incorporated 10-bit ADC which has only one ADC channel to where the sensing element is connected. Although the Node MCU has just one ADC pin it does not limit the quantity of analog detector to 1 per module. Multiple sensors can be connected to the module through the method of multiplexing.

During this arrangement, only a sensor at a time will have an entire circuit, or only one sensor will be able to operate at a time (that is, switch on a sensor), take the values needed from the sensor, shut down that sensor then move to consecutive sensor. For this we tend to connect diodes to the sensors as they direct the current towards one direction as a result, the sensor circuits are isolated from being read. When the reading is taken, the General-purpose pin is made HIGH by sending 3V to the sensor, thus finishing the circuit. Other pins are set to LOW, so they don't send any voltage, resulting in a ground to-ground link with no current. The ADC pin is read after the voltage is sent, and the value is written, which can also be stored in a variable.

After the reading is taken the sensor is switched off and we move to the next sensor for taking the reading. Except when taking readings from analogue sensors, all GPIOs being used with them should be made to LOW. The signals given to the node MCU uses three types of output because of the presence of three relays for the purpose of switching On or Off the devices. These relays are connected to the GPIO pins of the MCU. The resistor going to the input of the relay is the current limiting resistor, a pull-down resistor is connected to the ground, and finally a transistor.

The transistor is set to switch from 3 volts to 12 volts. Next, we can sense the current by passing the phase line of ac with it. So that we can know how much energy that device has used. Then there is a 3.3 voltage regulator, which is connected to the power supply. And finally, there is a reset switch at the top. It is used to reset the microcontroller.

4 .2 FLOW CHART

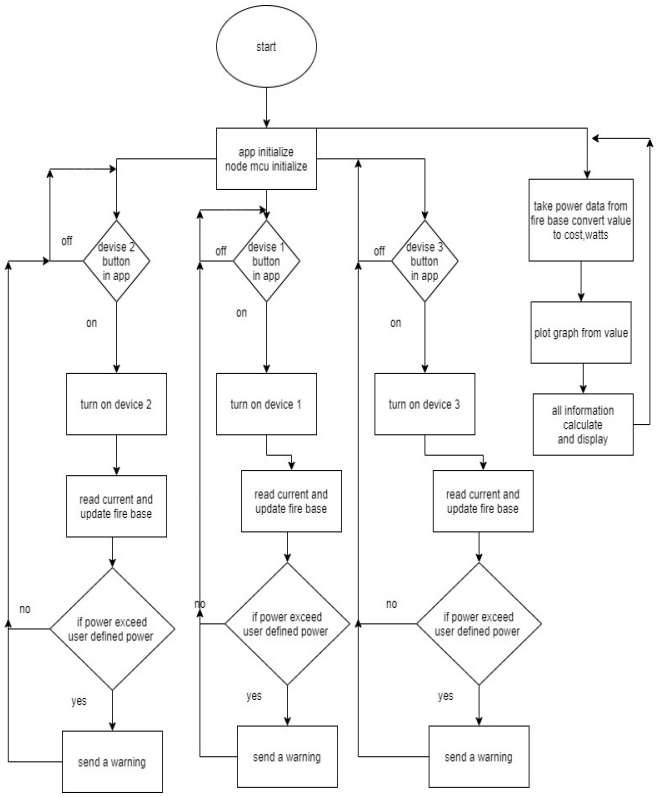
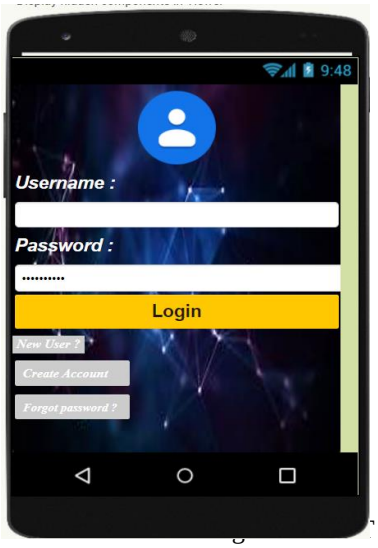


Figure 4.2 Flow chart of IOT based power depiction system .

V. MOBILE APP DESIGN .



App Inventor Blocks Editor Screen 1

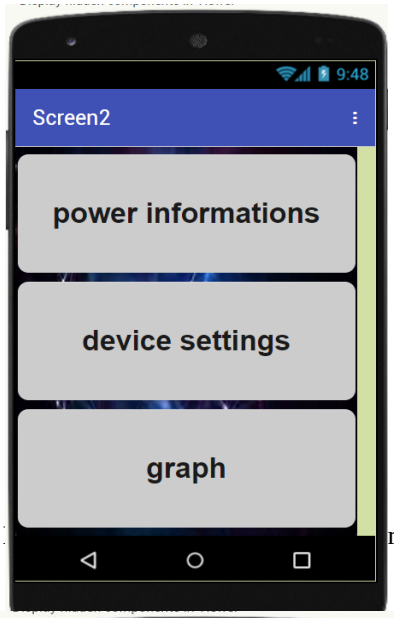


Fig. 5.2: reen 2.

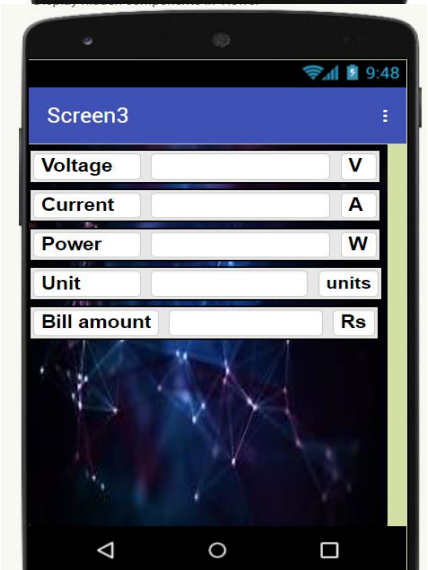
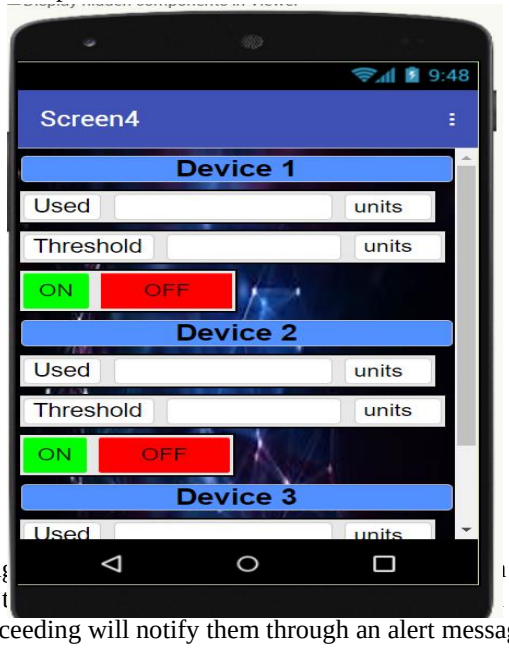


Figure. 5.3: MIT App Inventor Blocks Editor Screen 3 – User can monitor the voltage, current, power consumption unit , and also the bill amount in the text box provided.



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exceeding will notify them through an alert message.

VI . RESULTS AND DISCUSSIONS

Our Project IOT based power depiction system on Smartphone is being designed such that whenever the usage of energy exceeds the threshold value which is set by user, it will give an alert message. The monthly billing status through SMS is also being send onto the user's mobile. This implementation illustrates the definition and implementation of a modern system with low running costs, increased data protection, and reduced manpower requirements. As a result, it not only fixes the issue of traditional meter reading, but it also adds new functionality to cell phones.

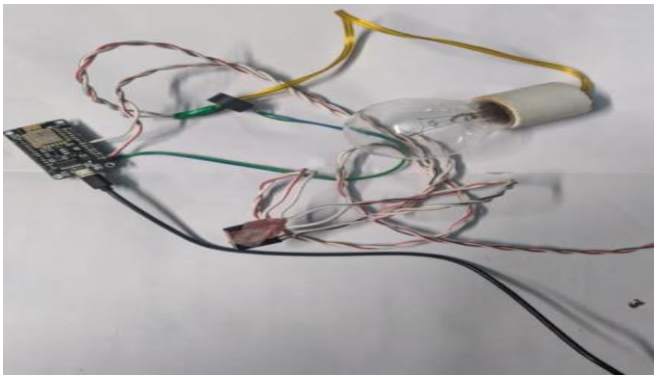
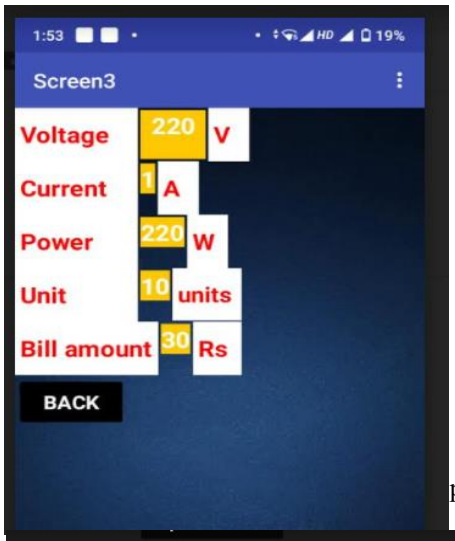


Figure 6.1 Hardware Implementation.



power information's of the devices used.

Figure 6.3 Illustration for setting threshold of devices .

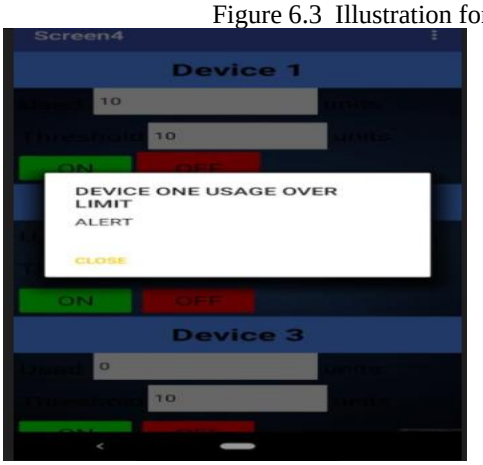


Figure 6.4 Image of alert message popup when threshold exceeds.

VII . CONCLUSION & FUTURE SCOPE

In this paper, the design of IOT Based Power Consumption Depiction System is proposed. The application which we are developing helps us to give the information regarding the individual energy consumption and also the total energy consumed by all the devices which would be easier for the user to identify which device consumes more power and there is a provision to set a threshold for each appliance and hence it will notify the user when threshold exceeds and can switch off the device when needed. Hence, it will reduce the wastage of energy and bring awareness among all.

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