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Real Time E-metering and Automation of KCT College Campus using an Android Mobile App and LAMP Technology

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ABSTRACT

Automation is the technology stemming from web of things. To make a smart world to provide comfort for human life is the main focus of the researchers. In the current automated industry Embedded systems and IOT (Internet of Things) is becoming highly efficient and mandatory to exhibit the potential market. While performing various operations, power consumption and efficiency is an important issue with the comfort level of user. The combination of embedded technology and IOT is represented by using E-controller which is the appropriate one for system's energy consumption and efficiency experiments with size factor. The main objective of the system is real time information and data monitoring of energy consumption. The proposed system introduces the implementation of IOT using embedded technology to simplistic the peripheral circuit and to lower the power consumption, thereby providing a high quality solution for a Smart Hostel Management and Information system.

Keywords – **Internet of things (IOT), PIC 16F877A, E-Metering, HTTP Protocol, LAMP Web Technology.**

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I. INTRODUCTION

The proposed project deals with the prototype implementation of automated and real time e-metering of KCT Campus. In the existing system, the electrical accessories of hostel rooms and water can monitoring of each hostel floor is done manually. This problem is overcome by using a mobile app to control the devices such as Fan, Light and Air-conditioner (AC) by incrementing and decrementing the speed, intensity and temperature of the devices respectively; thereby we can monitor the usage of electricity in hostel rooms and also monitor the empty water cans in each floor of KCT hostel using the IOT hardware platform.

II. SYSTEM FLOW

The proposed system works on the basis of below model. Sensors are the transducers, having a function of sensing the characteristics of environment. Hardware contains main controller board with various sensors attached with these. Firstly all the sensors detect its current status and this status is send towards the main controller. Controller is connected with Wi-Fi module with internet connectivity and the status is send to web application by http request. Current status values are stored into the database. If status is updated by consumer then updated values are stored in database and also these values are forwarded towards controller via internet connectivity by http request. Finally controller sends updated value to transducers and they start working accordingly.

III. PIC MICROCONTROLLER (PIC16F877A)

The basic constituent of PIC 16F877A is based on Harvard architecture. The Microcontroller used in this system is a 40 pin Dual In Line (DIP) packaged controller, operating at a frequency of 20MHz. It is CMOS flash based 8-bit microcontroller with RISC architecture that can handle 35 instructions. This PIC acts like an analyzer that will analyze a serial signal from PC and produce a PWM combined with Electronic Speed Controller (ESC) that has high current spec to control high power motor.

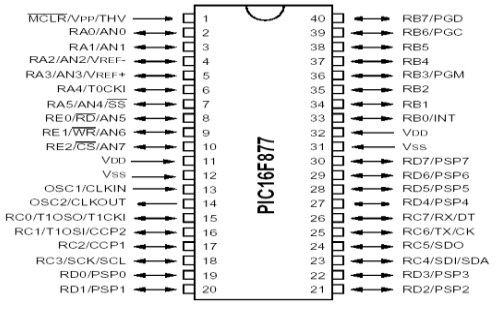

Fig. 1. Pin diagram of PIC 16F877A

IV. LOAD CELL

Load cells have to deform in order to measure the load. A load cell exhibits vibrations at its natural frequency because of its finite stiffness and spring

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behaviour. The result of ringing will be an oscillating data pattern which can be suppressed by passive means in a limited fashion thereby providing results in a better performance.

Fig. 2. Load Cell (a) Side View (b) Front View

V. DIGITAL ENERGY METER (DEM)

DEM is based on Digital Micro Technology (DMT) and uses no moving parts. So it I also known as Static Energy Meter (SEM) and its accurate functioning are controlled by a specially designed IC called Application Specified Integrated Circuit (ASIC). ASIC is implemented only for unique applications using Embedded System Technology. DEM consists of Voltage transformer and Current transformer to sample voltage and current respectively. The voltage rate will be given to the output by comparing the input data with a programmed reference data. This output is then converted into digital data by A/D converters

Fig. 3. Digital Energy Meter

VI. TEMPERATURE SENSOR (RS 256-102)

A temperature-sensitive resistor is called a thermistor. Here thermistor acts as a temperature sensor in order to sense the atmospheric temperature in order to monitor and control the air conditioner. The resistance of a thermistor decreases as the temperature rises. They are called negative temperature coefficient or NTC thermistor. Note the -t° next to the circuit symbol. A typical NTC thermistor is made up of semiconductor and metal oxide materials. More charge carriers become available and the resistance falls as the temperature rises.

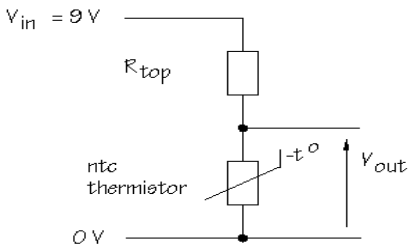

Fig. 4. Circuit diagram of NTC Thermistor

Consider the thermistor characteristics curve where on the y-axis the resistance is plotted on a logarithmic scale. Between the values of 100 Ω and 1000Ω, each horizontal division corresponds to 100Ω. On the other hand, between the values of 1000Ω and 10000Ω, each division corresponds to 1000$\Omega$and above the values of 10000Ω, each division represents 10000Ω.

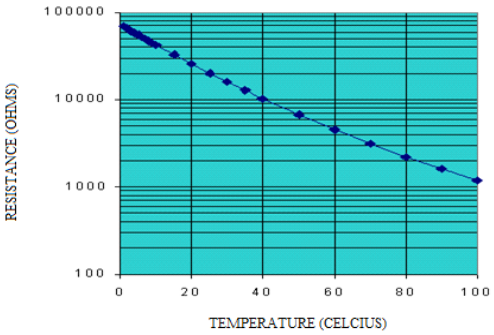

Fig. 5. Thermistor Characteristic Curve

As we can see, this thermistor has a resistance which varies from around 70 $k\Omega$ at 0°C to about 1 $k\Omega$ at 100°C. Supplier's catalogues usually give the resistance at 25°C, which were 20 $k\Omega$ in this case. When Beta value and B-value are specified, the resistance of the thermistor at any particular temperature can be calculated from the following equation:

$$R_T = R_{T_0} \times e^{\left[B((1/T)-(1/T_0))\right]}$$

Where,
R_T is the resistance at temperature in Kelvin (T= °C +273).
R_{T0} is the resistance at a reference temperature T_0 in Kelvin. When the reference temperature is 25°C, T_0 = 25+273.
e is the natural logarithm base.
B is the B-value specified for this thermistor.

Sensor devices vary considerably in resistance and we can apply this rule to make sure that the voltage dividers we build will always be as sensitive as possible at the critical point.

VII. CLOUD STORAGE

Cloud application is an application program that normally functions in the cloud. The cloud storage is

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useful for the user to monitor and manage devices and access data via Internet from far distance through a web browser. The admin and the trusted users have a login id and password to update the current data. Cloud application is an internet-based computing web application which shares resources and data to computers and other devices on demand. It is a pervasive model, providing a global access to a bunch of configurable computing resources (E.g., computer networks, servers and storage). It can be furnished and released with minimal management effort.

Using the cloud application the user can store and process their data in data centres that may be located far from the user. In the project, every user has an own E-meter with a randomly generated password code. It will be send to the registered email id from the web portal id "smarthostelportal@gmail.com". The user can login and control their smart hostel by using the meter number and password.

VIII. HYPER TEXT TRANSFER PROTOCOL (HTTP)

The protocol used to exchange and transfer sensed data is called the Hyper Text Transfer Protocol (HTTP). The groundwork of communicating data for the World Wide Web (WWW) is through HTTP. A methodized and analytical text using logical links in between the text nodes is called as Hypertext. It is a protocol with faster response output, lower battery and low bandwidth consumption. Enterprise level applications are worked efficiently by assuring accurate data transmission and distribution. It is also called as publish and subscribe protocol. It is a light weight and open standard protocol which is the most suitable for constrained environment.

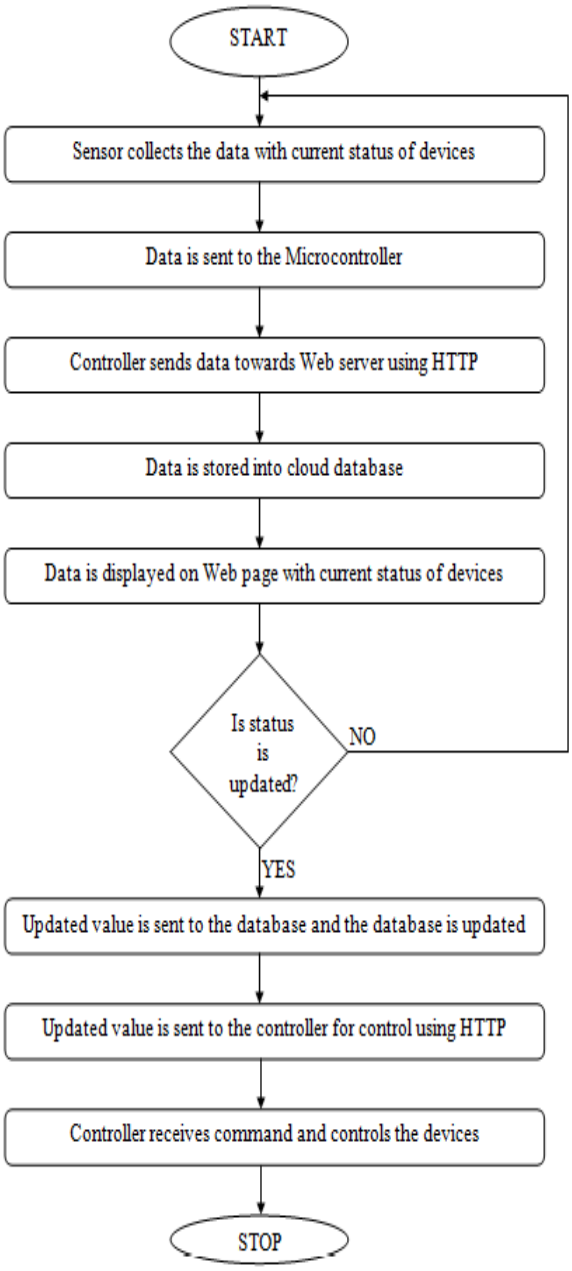

Fig. 6. System Flow Chart

IX. SYSTEM RESULTS

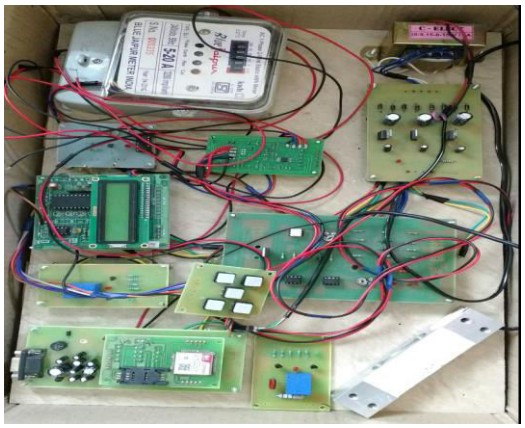

Fig. 7. Hardware Module of the System

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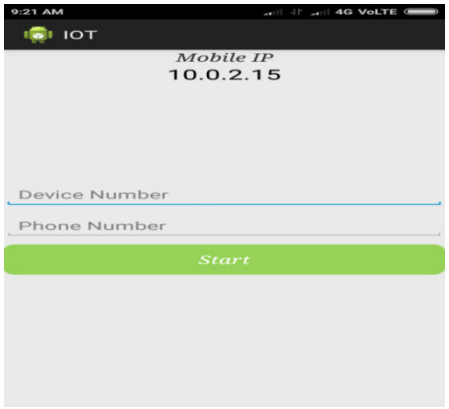
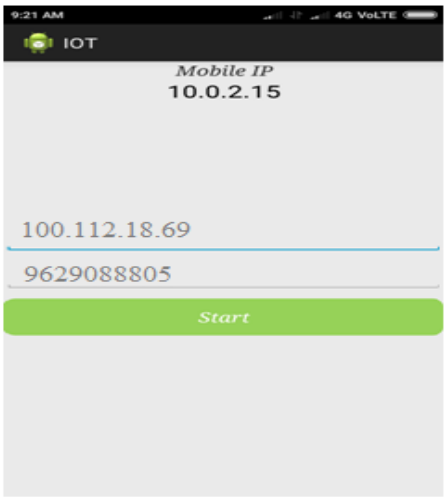
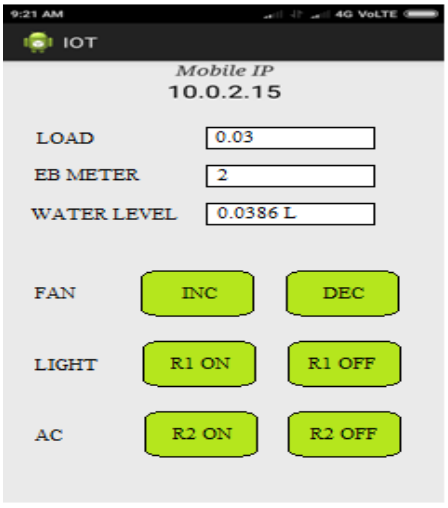


(a) Home Page of Mobile App



(b) Login Page of Mobile App



(c) Control and Monitor Page of Mobile App

Fig. 8. Android Development of the proposed system

X. CONCLUSION

The paper reviews an automated system playing a dual role of Hostel automation and real time energy controlling. The system uses an industrial purpose microcontroller, consuming less power when compared to servers there by providing comfort to the users. Based on the up-and- coming technological advances, it seems that a fully functional smart Hostel is to be expected in the very near future. Definitely it will take a long time for the people to completely leave their entire responsibility up their Hostel's system, but in the long run it will surely be incredibly beneficial for not only comfort but also for energy efficiency, utility cost reduction, Hostel safety and security.

REFERENCES

[1] Navid Mohaghegh and Mokhtar Aboelaze, "Using Low-Power Embedded Microcontrollers as Web Servers", 10th IEEE International Symposium on Parallel and Distributed Processing with Applications, 978-0-7695-4701-5/12 2012 IEEE.

[2] Yongen Liang and Shiming Wan, "The Design of Smart Home Control System", 5th ICCCNT – 2014 July 11 – 13, 2014, Hefei, China.

[3] Lei Yu, Yang Lu and Xiao Juan Zhu, "Smart Hostel based on Internet of Things", Journal of Networks, vol.7, No.10, October 2012, Page No.1-8.

[4] Zhang Xi-jun, "Design of the Embedded Web Server based on Linux", Wireless Communication Technology, China, vol.3, pp. 44-47, 2010.

[5] T.Yashiro, S.Kobayashi, N.Koshizuka and K.Sakamura, "An internet of things (IOT) architecture for embedded appliances", Humanitarian Technology Conference (R10-HTC), 2013, pp. 314-319.

[6] Jean J.Labrosse, "MicroC/OS-II The Real-Time Kernel (Second Edition), Beihang University Publishers, Peking, pp. 283-317, 2003.

[7] Kenneth D. Reed, Introduction to TCP/IP, WB47.0, Publishing House of Electronics Industry, Peking, pp. 197-317, 2005.

[8] BAO Yujun, Software basis of computer, Dongnan University Publishers, Nanjing, 211-219 (2008).

[9] N.Mohagheh, "A green cluster of low-power embedded hardware server accelerator", Dept. Of Computer Science and Engineering, York University, Sep 2011.

[10] Apache Software Foundation, "Apache HTTP server benchmarking tool" located at http://httpd.apache.org/docs/2.0/programs/ab.html, March 2012.