

## **AUTOMATIC CAMERA CLICK ENERGY METER READING SYSTEM**

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**ABSTRACT**— now a day, electricity power consumers have increased in every sector like rural, urban, residential, and commercial and in industrial area. Hence it is very important to ensure proper use of energy to generate accurate bills, invoices and try to reduce the frauds. electromagnetic watt meter reading done by human operator requires huge number of labor operators. they may be prone to reading error, also has errors while recording what was read, during data entry. it is hard to access the meters at rural accounts, indoor meters and meters with obstacles. To avoid this here we are going to introduce automatic meter reading concepts (AMR) which automatically collect the consumption of energy and then the system transfer that collected data to a central database for billing. because of this expenses are reduced on meter reader, his periodic trips to each house to read a meter in case when in the first trip reading is not available. With this automation speed, accurateness and effectiveness has increased. Here transistor logic (TTL) serial camera is used to capture the image and wirelessly transfer this to server personal computer (pc) where it undergoes processing to extract digits and with reference to previous month data base new bill is generated with tariff consideration.

**KEYWORDS**—AMR; camera; energy meter; gsm; zigbee.

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### **I. INTRODUCTION**

In these days in every sector, there are number of customers which use the electricity but they are not satisfied with the services provided by power distribution companies. Also electricity authority and the government realizes problems occurring in the existing transmission network, such as increasing cost due to poor operational efficiency, environmental impacts and an ongoing demand for energy. This traditional energy meter billing techniques uses huge number of readers and also long working hours to gather complete data and to prepare bill. Sometimes the energy meter is placed in a location which are not easily accessible, also if door is closed reading can't be taken in first visit and the reader have to revisit that house. Manual billing is sometimes restricted and is slowed down by bad weather condition. Printed bill may get lose in the mailbox. In developing country like India due to increase in population and industrialization for reading meters, huge number of human operators and long working hours are required. Because of this cost of energy provider for meter reading increases, hence Automatic Meter Reading (AMR) concept is used where automatic collection of meter reading is possible also it reduces meter re-read, has more data accuracy, and allows frequent reading, accurate billing and real time customer service. AMR technique is of automatically collecting the consumption of energy from energy meter devices and transferring that information to a central database server for billing purpose.

The concept of AMR was first invented by AT&T, in 1962, but it was not working proper. After more working on it AT&T developed phone system-based AMR services but cost of it was so high compared to monthly cost of a person to read the meter. A Sensor monitoring system was developed by Theodore George in 1972, which has meter reading capabilities for all utilities, also a U.S patent is given for this technology in 1974. In 1977 first fully automated, load management system and commercially available remote meter reading was developed using IBM series computer as it was pre-internet. AMR was in full swing in the year 1985, when the full-scale implementation of AMR was done on energy meters. Radio based AMR system was designed in 1986. Distribution line carrier AMR units were used when the meters are inaccessible. With solid-state electronics, microprocessor, microcontroller technology advancement has done in AMR systems and made it more reliable cost-effective product. In next section II the literature survey over the previous techniques of meter reading is done. Section III, describes the proposed approach of meter reading with the system block diagram at both user side and at the server side. In section IV the current state of implementation and results achieved are presented. Finally conclusion and future work is summarized in section V.

## II. PROPOSED SYSTEM DESIGN

### A. Problem Statement

The Electricity Board has got used to the manual process and they go along with it even though there are many concerns associated with it. Because of the human errors after getting faulty bill, it is problem of user to get it corrected from the energy supply board. In that case customer has to visit the office, stand in a queue and get it corrected. The problem is just because of human intervention. To avoid human intervention in the billing process, in this new generation, an automatic reading meter system is on verge to use.

### B. Proposed Architectures

In this paper, proposed system is discussed as automate the energy meter reading system with the use of camera. This camera is place in front of energy meter of each house to capture image.

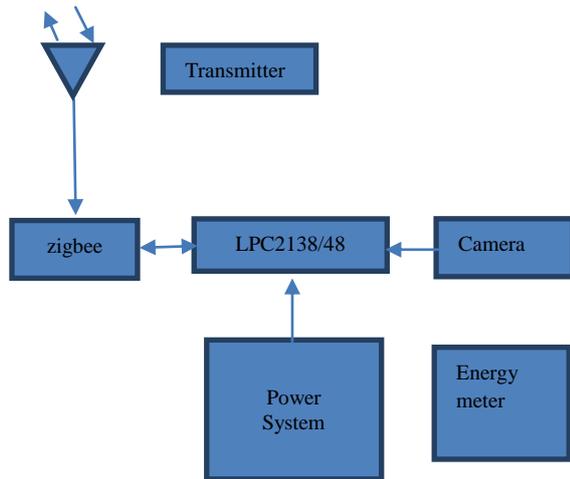


Fig: block diagram at user side

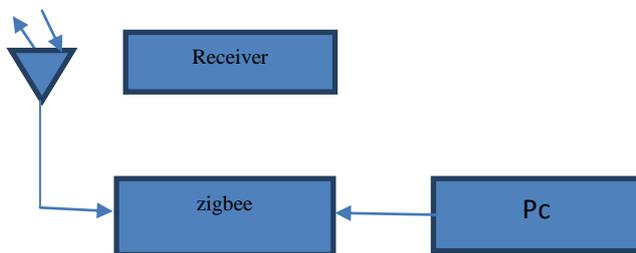


Fig: block diagram at server side

*Objectives of the proposed work are:*

1. To get knowledge of different energy meter Reading systems.
2. To study and understanding different techniques and the models used by researchers for energy Meter reading systems.
3. To take necessary actions in order to make the solution reliable and robust.
4. To avoid human intervention in the billing Automatic meter reading system collects reading of energy meter automatically and transfers it to central database station where it undergoes processing for bill generation. It shows that, serial camera is used to take photo automatically without human interruption from the command given by server to capture image. LPC 2138 is used as a interfacing device. Further this image is transferred wirelessly to server PC. It is an effective mean of data collection. Because of automation in meter reading and data transfer time and cost both are saved with advantage of accuracy. It describes that at server side image is received wirelessly. To transfer this data from consumer's energy meter to the central station, various communication technologies can be used such as mobile technologies, radio frequency, powerline transmission, or telephone lines etc., but here ZigBee is used as a communication media. Now this captured image undergoes preprocessing in Mat Lab at the server side and database is updated with new reading, in account to this reading with reference to previous reading bill is generated for the presentmonth and acknowledged to the customer with

the help of mail, message or print form. This system allows frequent meter reading, billing is improved i.e. instead of only print bill through mail box, now SMS and email of bill is also generated.

Algorithm

1. Start
2. Initialize camera and start communication
3. Capture image with camera
4. Send image to PC
5. Recognize characters/numbers from image
6. Calculate Bill
7. Display GUI with image, Units consumed and Bill amount.
8. Now with respect to previous reading GUI will Show the bill.
9. Stop

#### **IV. IMPLEMENTATION OF SYSTEM**

Here we are discussing the practical requirements and performance metrics of AMR system used for energy meter reading system.

##### **A. Input for the system**

The input for this whole system is nothing but the image captured by camera when it got command to capture it.

##### **B. Hardware and software configuration**

###### **Hardware requirements**

Microcontroller : ARM 7(LPC2138)  
Communication module : ZigBee  
Display : LCD  
Processor of PC : Pentium IV, 2.6GHz.  
Hard disk : 20 GB  
Devices :Energy meter, Camera.

##### **b) Step up of system**

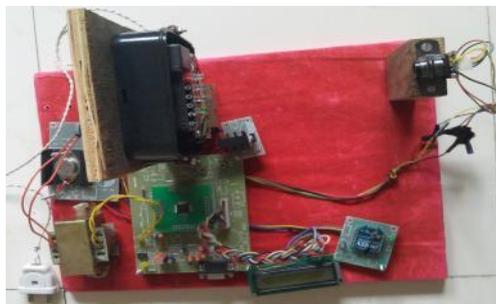


Fig 3: Actual step up of system

Fig.1 shows the actual setup of system where serial camera C238R is attached in front of energy meter, which will take the photo of meter when 'capture image' command is given from MATLAB software. This image is transferred to PC through ZigBee using ARM LPC2138 as an interfacing device. Now this meter image undergoes preprocessing in MATLAB, to extract separate digits of the meter reading. These digits are correlated with real numbers and meter reading is displayed at the GUI. For correlation of actual numbers a database of 0-9 numbers is prepared and using grid technique each separated digit is recognized as a final number. Now to calculate bill previous reading is subtracted from this reading and multiplied with tariff here it is taken as 4Rs per Unit, to get actual bill amount which is also displayed on the GUI.

##### **B. Results of work done**

The final project GUI is as shown in below Fig.2 which indicates capture image button press will capture the image of energy meter which is shown below capture button, the meter reading character recognition will extract the digits and finally meter reading is shown. After calculation of previous meter reading with actual meter reading along with tariff will show the result.

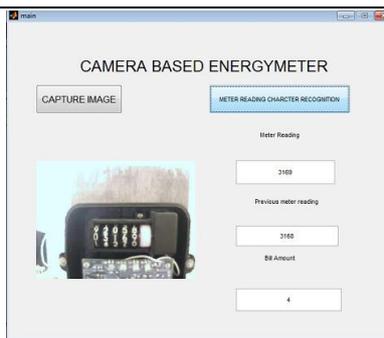


Fig. 4. Actual setup of the system

For extracting the digits following procedure is done as, if 3172 is the reading of energy meter then then this reading will be captured image. Now only that reading part is cropped as shown in Fig. 3. Then apply canny algorithm on it as in Fig.4. Apply threshold on it. And after segmentation digits will get separated as in Fig.5. Which are further correlated with previously stored database of 0-9 numbers and digits are recognized.



Fig 5. Cropped image



Fig 6. Use of canny algorithms



Fig. 7. Image after thresholding



Fig 8. Segmented image

For taking different readings rotate the disc of the meter placed at the end of the digits which will change the reading display other meter.

## V. CONCLUSION

In this paper, with the help of presented proposed system it is possible to avoid meter reader visit and revisit to each house to take reading. Also if consumer gets faulty bill he has to go to energy provider office to correct it and be in long queue. This is avoided hereby taking photo of meter reading with camera located in front of meter and sending these readings to server wirelessly, keeping the database updated which is hard to maintain nowadays manually. After changing the reading of meter 50 times we are getting correct digit recognition 48 times thus 96% accuracy is achieved with the help of serial camera and both camera and zigbee are working properly and giving results within 2-3 minutes, instead of a human to collect reading 1 day and then large processing hours.

In future to reduce cost it may be possible to use single camera for each society or whole apartment meter room.

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