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# Verification and Authentication of Electrical Metre Reading (IOT)

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**ABSTRACT**: Electricity plays a major role in our lives. The use of electricity is increasing every day. We use it everywhere and for different purposes that we cannot imagine our lives without it. As in some places now also where the technique of digital meter is not implemented, in those places electric meter reading technique is most useful. As the existing method of manual electric meter reading is not applicable with the increasing consumption of electricity and has a lot of disadvantages like time consumption, more human resources and is prone to lot of errors.The difference is in how to collect and process information that both traditional meter reading and electric meter reading follow. Automated Meter reading follows the process of reading the values of electrical meter by using a camera that takes a photo of the meter, recognizes the digits, and then stores the output in a text file.

## I. INTRODUCTION

Electrical Meter Reading (EMR) [1] recognition system is an image processing technology used to identify the values in the electrical meter. The various applications where the EMR recognition system is used in the Electricity board for domestic and commercial current consumption, in the factories like thermal power station, steel, wind mill etc., where the reading of machineries is necessary in certain frequency of time. There are many issues that should be resolved to create a successful and fast EMRR system [2] such as poor image quality, damages in the body of the meter, processing time, and background details and complexity. The need of EMRR system is increasing for many reasons such as reducing the manpower for talking the reading frequently. Automatic meter reading combines the mechanical rotary-type counter with its related technologies. The system has completely changed the old tradition where the energy company sends a utility employee to collect data from a meter that is located on a customer's property. The data collected tells the utility company how much of the utility the customer consumed in a certain period of time. This system would automatically collect data from a meter remotely and then transfer the data to a database, which results in a bill to a customer. Thereby it saves a lot of manpower which in turn would save money for the company that then can pass the savings on to the customers [6].

### 1.1 LITERATURE SURVEY

The smart meters that are available in the market vary depending upon the data that has to be monitored and the communication system that is used to send the data to a central station. GSM based communication system provides a global approach for the meter and efficient way of transmitting the data, it also provides other services like SMS (Short Message Service) and GPRS (General Packet Radio Service) for requesting and retrieving reading from individual houses back to the energy provider wirelessly. The low cost, simple setup, wide operating distance, less human intervention are some of the other salient features of this GSM based system[5]. Another system is Zigbee based system, ZigBee is a collection of communication protocols used to build small personal networks using low power digital radios. and is based on IEEE 802.15.4 standard. ZigBee based device is restricted to 10 - 100 meters and can be further extended using a mesh network of ZigBee devices. The rate of ZigBee is definite with 250 Kbit/s, best suited for intermittent data transmissions from a sensor or input device. The ZigBee digital power meter is a single phase digital kWh power meter with embedded ZigBee modem which sends the power usage reading using information back to the energy provider wirelessly[6]. SCADA (Supervisory Control and Data Acquisition) is a system operating with coded signals over communication channels so as to provide control of remote equipment. It is a category of software application program for process control, the gathering of data in real time from remote locations in order to control equipments. SCADA refers to the combination of telemetry and data acquisition. SCADA includes the collecting of the information via a RTU (remote terminal unit), PLCs (programmable logic controllers) and IEDs (intelligent electronic devices), transferring it back to the central site, carrying out any necessary analysis and control and then displaying that information on a number of operator screens or displays. A system using SCADA isolates and precisely locates faults

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and optimize for energy saving. Centralized monitoring and control to manage multiple facilities from a single location and remote software administration for better control is possible. Systems using SCADA are prone to network attacks

## II. PROBLEM DEFINATION

Manual meter reading systems using electromechanical meters are installed within the premises of residential or commercial consumers and information about the units of consumption of electricity are collected on a monthly basis. However, this present convention has the following disadvantages: Manpower must be hired to go from household to read energy consumption, record data and communicate with a receiving module. Use of manual meters could translate to meter reading mistakes and errors of leakage

## III. ARCHITECTURE DIAGRAM

**Phase 1:** Image Preprocessing

**A. RGB to Binary:** In this method, RGB to gray-scale conversion is adopted, in order to facilitate the meter extraction, and increase the processing speed. Color image (RGB) acquired by a digital camera is converted to gray-scale image based on the RGB to gray-scale conversion technique. The basic idea of this conversion is performed by eliminating the hue and saturation information while retaining the luminance. The following equation shows an optimal method for RGB to gray-scale conversion. Lu = 0.299 * R + 0.587 * G + 0.114 *B. Using a threshold value of 127 the grayscale is converted to a binary image.

**B. Image Noise Removal** Because of the noise could appear on the image after the binarization, noise reduction algorithm must be applied to reduce the noise. We chose to apply Morphological operations.

**C. Cropping Reading Area** In this step, the binarized image is processed to crop the part that has the meter reading only. We made use of the Connected Regions Algorithm to crop the reading area. In this method we scan the image for regions with high density of white pixels. Such a region is found and a black pixel boundary is drawn around this area and the image is cropped .

**Phase 2: Image Segmentation:** This stage is where the actual digits are segmented. This is done using the VEDA algorithm. The VEDA algorithm starts scanning the image vertically from the left it continues doing so until it finds the first white pixel. Once found it marks the first pixel and continues scanning the image until it finds a complete vertical line of black pixels. The latest white pixel scanned vertically is used to create a box around the scanned area to extract the digit.

**Phase 3: Digit Recognition**

**A. Creating a dataset** for the digits: We have taken a sample of 10 images for each digit from 0-9. This sample will be used to train the neural network.

**B. Feature Extraction** of Samples In this process we take a digit sample and extract it features to form a vector of 108 x 1. The sample image is divided into 9 regions. Each region has been extracted with 12 features thereby 108 features are extracted of a single sample.

**C. Creating an input** and target matrix To train the neural network we created an input matrix of 108x100. (108 features of 100 samples).This input matrix was mapped to a target matrix of 10x100.Inside the target matrix the 10 rows of the first column consists of the digit '1' which indicate that the first 10 samples are of the digit zero '0'.So on the next 10 columns consists values for digits 1-9.

## IV. CONCLUSIONS

The purpose of this project would be to develop an application which would enable a customer to take a meter reading at his residence without the need of a person to manually take the reading. Also the app could enable the customer to keep a track of the consumption. The application could also be used to generate a bill based on the difference in the units of consumption between two consecutive months. This will be a faster process than the traditional method as customer gets the bill as soon as the meter reading is verified.

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