

## ANDROID BASED METER READING USING OCR

Sonali Thonge, Vrushali Veer, Shobha Nale, Nayan Chondhe  
Department of Computer Engineering,  
Marathwada Mitra Mandal's College of Engineering  
Pune, India  
vrushaliveer17@gmail.com, sonali25thonge@gmail.com

**Abstract:** *The current procedure of meter reading & generating bills are complex tasks of Power distribution company (PDC). In followed manual process, meter reader captures images. Store all the captured images and after capturing, all images are submitted to the PDC. PDC generate bill for each image then again going home to home that bill is hand over to customer. This process take 10-15 days, which is complex and time consuming. We are supposing the alternate system which reduces the manual work, the system includes Android application is used to simply capture the image and immediately send to the PDC server, at server side after receiving that meter image, image processing is done for getting meter number & meter reading. Then bill calculation is done at server side. After that, calculated bill is send to the customer via e-mail or message. This process reduces workload of employee and company also.*

**Keywords:** *Android Based Meter Reading, Optical Character Recognition, Power Distribution Company, Maharashtra State Electricity Board.*

### 1. INTRODUCTION

The maximum part is done manually in current bill generation procedure, only bill is calculated automatically. In past, as per the assigned area given to the meter reader, he note downs all the meter readings and submitted that to the MSEB. In this system, there is lots of burden on employee and also more lengthy and time consuming process[1]. In current process, meter reader captures all the images in the given area. After capturing all meter images, he submits that images to the PDC at the end of the day. Then text extraction is done from images for calculating bill. This is also time consuming and required high configured computers.

Disadvantages in existing system:

1. Highly dependent on person.

2. Unable to avoid human errors.
3. Sometimes billing is done by assumption.
4. Bill generation process takes lots of time.
5. Not efficient for monitoring and controlling overloads.

But ABMR application uses technology like android and web application. Where android application is used for capturing image and instantly sends to the server. At the server side, quickly image extraction is done and bill is generated and sends to customer via mail or message, which requires web application. The web application develops efficient way of communication between customer and PDC. Hence all the problems of current bill generation process can be overcome by ABMR.

## **2. LITERATURE SURVEY**

- The author proposed that, "The electricity meter reading and bill generation process can be made simpler, efficient and cost effective with the help of 'Android based meter reading using OCR' [1].
- The main aim of our system is to reduce the cost and complexity involved in process of traditional electricity billing system[1].
- As we all know that, the existing Electricity billing system is very time consuming and costly [1]. The whole process takes near about 10-15 days to generate the electricity bill and works in 5-6 steps[1]. In existing electricity meter reading and bill generation process, involves manual process for meter reading, updating the server with reading and billing customer.
- In ABMR, android application is used to get reading from the meter automatically by simply capturing the image of meter and by sending the main image along with the cropped images of meter reading and meter number to the server, bill is generated automatically on server side and is sent to the customer immediately through e-mail or SMS.

## **3. PROPOSED SYSTEM**

In our ABMR system, meter reader carries one android device and android application installed in it for the purpose of capturing the meter images. Meter reader has road map also installed in android application, so that he can also understand the remaining homes for capturing meter images. When he captures image then in map initial red light becomes green that indicates covered homes. This is very convenient way for the client side. After capturing the each single image it is sent to the server side with the authentication of meter reader, so that server can understand that received image is send by our employee.

At server side, received image is processed in some stages so that we can get the extracted text i.e. no of units used and the meter number. Server side is updated with new extracted data. With the updated data bill is generated and send to the customer through web via mail or message. In this system, web application and android application are used for increasing the performance and the integrity of the system. Fig.1 shows the System Architecture of ABMR. The same diagram is explained in implementation.

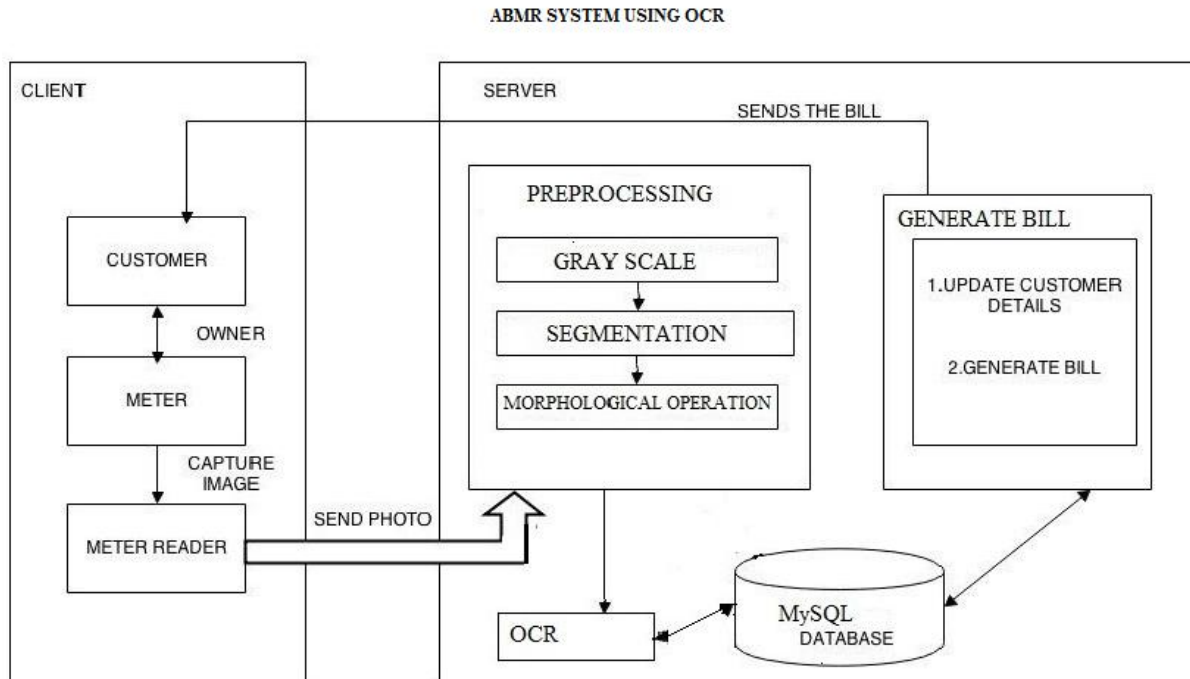


Fig.1: System Architecture of an ABMR.

## 4. IMPLEMENTATION

### 4.1. Gray Scale Algorithm

To calculate luminance signal from color image grayscale algorithm is used. In this algorithm, as per lightness values of original images colors are sorted. Then these colors are spaced equally in gray along with lightness dimensions. Thus by using grayscale algorithm, original digital image is converted into grayscale by using following formula,

$$Y=0.2126R+0.7152G+0.0722B$$

### 4.2. Segmentation/Binarization

Segmentation is one of the important method digital image processing. In segmentation, image is partitioned into number of meaningful objects. According to the image property such as Discontinuity and similarity image segmentation is divided into two categories Edge based segmentation and region based segmentation.

The images with discontinuity property of pixels uses edge based techniques. We have gray histogram and gradient based method as a two method in edge based segmentation. In edge based segmentation, we have used Otsu's algorithm because it gives satisfactory segmentation results on noisy images and reduces computational processing time. To achieve uniformity and shape measures for real world images Otsu's method is best threshold selection method. In this algorithm 2D histogram is drawn and applied on 2D Otsu to find threshold value .We compare each and every pixel value of image with computed threshold value. The pixel values less than threshold value are assigned to zero and greater than it are assigned to 1.Hence, we completed Binarization process.

### 4.3. Morphological Operation

Numerous imperfections are present in binary image, to remove these imperfections morphological operations are used. Morphological image processing is a collection of non-linear operations related to the shape and morphology of features in an image. Morphological operations depend upon relative ordering of pixel values, not on their numerous values. So, morphological operations are suited for binary images.

In morphological operation we test the location of each pixel from input image; if test is successful then new binary image is created with non-zero values of pixel. Here create structuring element which is nothing but small matrix of pixels with each pixel value as 0 or 1. Matrix dimension represents size of structuring element, patterns of one and zero represents shape of structuring element and origin of structuring element is any one pixel of image .

There are two fundamentals operations of morphological operations as:

**4.3.1. Erosion:** It erodes the boundaries of regions of foreground pixels. These operation results the areas of foreground pixel shrink in size, and holes within those areas become larger.

**4.3.2. Dilation:** It is opposite to erosion operation. Unlike shrinking operation in erosion, dilation grows and thickens the object in a binary image. Dilation is used for bridging gaps.

### 4.4. OCR:

OCR is mainly used for character recognition; also noise from input image is removed. Here we not implementing the OCR but we are using the tess4j library of OCR. Which provides preprocessing steps required in image processing?

### 4.5. ANDROID:

Android is mobile operating system based on Linux kernel and developed by Google. The android OS uses touch inputs that loosely correspond to real-world actions. We are using android phones for capturing images because they are very user friendly.

## 5. CONCLUSION & FUTURE SCOPE

By using this application we can reduce the efforts of PDC and meter reader. This system is also convenient and efficient. In current application meter reader has provided only assigned area road map. But in future this road map application can be extended by providing signal facility such as, when meter reader captures image the initial red light becomes green, which indicates that home is covered.

In future, we can design embedded device which will send meter details to the PDC automatically by using GPRS modem, which will eliminate meter reader efforts also reduces the cost for PDC paid to employees.

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