Combination of Web and Android Application to Implement Automated Meter Reader Based on OCR

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Abstract— **Meter reading and billing are complex tasks of electricity, water and gas supplier companies. The current technology of billing process uses manual process of meter reading, updating the server with reading and billing the amount for each customer. In this paper, a scheme is proposed that includes android application and web application. The proposed system will get the meter reading, update the server with reading units and inform consumers about bill units and amount. Android application is used to get the readings from the meter automatically by simply capturing the image of the meter. An OCR (Optical Character Recognition) technique is used to extract meter units from the image. The meter units are sent to the server. At server side, bill amount is calculated.**

IndexTerms— **Meter Reading, Optical Character Recognition, Android**

I. INTRODUCTION

Billing is a critical function of both the Electricity and the Water Boards towards getting a meter read. Meter reading, even though it looks simple it involves processes that can give various problems. Calculation errors, delays in system updating and fault tracking issues are the major problems that companies find difficult to find answers for.

The current procedure with regard to the billing process for electricity is not a fully automated system. It involves manual processes from the time the Meter reader starts reading the meter until the system is updated with the current reading. A meter reader visits a house, does the meter reading, and note down the units consumed. Back in the office a data entry officer enters the meter readings into the system manually. This procedure is not upto satisfactory level and has many human errors. However, to meet the problems associated with the major problems related to the Manual Billing process a mobile application is proposed in this paper. A meter image is captured from android application. Further OCR technique is applied on the image to extract the meter units. OCR is a system that provides a full alphanumeric recognition of printed or handwritten characters at electronic speed by simply scanning the form. It is a technology that recognizes and captures alphanumeric characters on a computer at high speed.

II. PROPOSED SYSTEM

The android based meter reading is the combination of android application and web application. Android application will be used by the meter reader by which picture will be taken and save it on the server. By using OCR technique values on the capture image will be extracted. This solution gives best benefits to meter readers. Meter reader from start of the day carries android device having android app. Then the server does the calculation and proceed bills are sent to the relevant consumers via email at the same instance. Whenever a fault device is seen or an illegal power usage is spotted by meter reader. In such a case, an image of that particular meter can be sent to the server.

Customers can use website to lodge any complaint of incorrect bill and meter device failure. The web application built was used for administrative purposes. An administrator can assign meter readers with a particular route having list of customers using this system and can add new employees or customers in database. Administrator can broadcast any news related to power failure during certain time and of power consumption information on web application.

But in fact anything that has a meter can be monitored with Meter Reading. You may have potential savings in your budget if you monitor your consumption and change the way you consume energy.

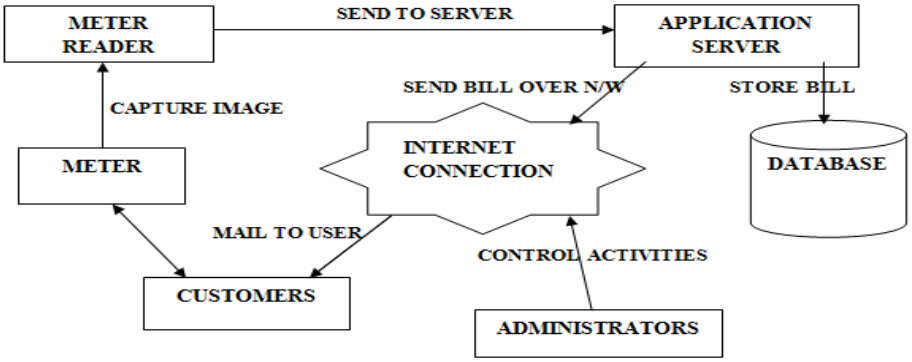

Figure.1. System Architecture

1] Meter Reader: Meter reader is an employee of the service provider company who has to capture the image. It is the trusted one from the supplier company for collecting data about the customers.
2] Application Server: Meter readers are not required to do the calculation manually. All that needs to be done is to get the meter reading and send it to the system or server as bulk. Then the server does the calculation and proceed bills are sent to the relevant consumers via E-mail.
3] Database: Database is used to store the data collected by the meter readers and the information about the customers and company employees. Company or management authority can access that database.
4] Administrator: The built Web application is for administrative purposes. An area manager/ a responsible administrator can assign Meter readers to a particular route. Technical officers will be able to keep track of the complaints / tasks assigned to them. The Electricity Board can publish any instant messages (Like sudden power drops due to maintenance purposes) without going for public media so that they can save money.
5] Internet connection: Internet connection is for sending the relevant bills to the respected customers via E-mail. Using website a customer can view bill having all details related to any of particular month. Along with that he also has an option to make payments online. Customers can use website to lodge any complaint of incorrect bill and meter device failure.

Following are some advantages of our system:

1) Main advantage of our system is we can be a part of 'save paper initiative' Because we are getting our bills via. Email this gives lot of paper saving in printed bills.
2) Quicker processing; no moving or storage of questionnaires near operator:Application is used to get the readings from the meter automatically by simply capturing the image of the meter and then performing the OCR technique which is nothing but "optical character recognition". The OCR technique is used to identify the character from an image and used this character to get the meter readings.
3) Savings in costs and efficiencies by not having the paper questionnaires.
4) Scanning and recognition allowed efficient management and planning for the rest of the processing workload: All that needs to be done is to capture the image then android app will perform operation of extracting the meter reading text from image and send to the server. Then the server does the calculation and proceed bills are sent to the relevant consumers via email at the same instance.
5) Reduced long term storage requirements, questionnaires could be destroyed after the initial scanning, recognition and repair.
6) Quick retrieval for editing and reprocessing.
7) Minimizes errors associated with physical handling of the questionnaires.

III. ALGORITHM USED

1] Optical Character Recognition (OCR)

OCR is software which takes image as an input and recognizes the text in the given image as an output. For character recognition, offline [11] or online, there are two basic types of core OCR algorithm. Optical Character Recognition (OCR) [6] is a process of converting printed or handwritten scanned documents into ASCII characters that a computer can recognize. In other words, automatic text recognition using OCR is the process of converting an image of textual documents into its digital textual equivalent. Developing an OCR is a very difficult task [20], [24]. The advantage is that the textual material can be edited, which otherwise is not possible in scanned documents in which these are image files. The document image itself can be either machine-printed, image or handwritten, or a combination of the two. The simplified image is given as input to the OCR. It recognizes the devnagari text and passes it to the translator.

The main idea of the proposed system is to extract a meter count from given meter image. This process of automatic meter number recognition is composed of four stages. The stages are as follows:
1] Image Acquisition
2] Region Extraction
3] Segmentation
4] Optical Character Recognition (OCR)

1] Image Acquisition

In first stage, the meter image is acquired using a camera. The parameters of the camera, such as the type of camera, camera resolution, orientation, and light, have to be considered.

2] Region Extraction

The second stage is to extract the meter number from the image based on some features. In the proposed system boundary based extraction is performed. First and second stages are implemented on android platform. Here we just gave a blue color box to drag on the number which will give meter number and unit number as shown in fig. 2.

3] Segmentation

In this stage, the meter image is segmented and the characters are extracted by projecting their color information, labeling them, or matching their positions with templates. In this stage, binarization is performed. Binarization is usually performed in the preprocessing stage of different document image processing related applications such as optical character recognition (OCR) and document image retrieval. It converts a gray-scale document image into a binary document image and accordingly facilitates the ensuing tasks such as document skew estimation and document layout analysis.

4] Optical Character Recognition (OCR)

In this stage, the extracted characters are recognized and the output is the meter number. Character recognition in proposed system may have some difficulties. Due to the camera zoom factor, the extracted characters do not have the same size and the same thickness. Resizing the characters into one size before recognition helps overcome this problem.

IV. SYSTEM RESULTS

Figure.2 Meter number reading using blue box

As shown in fig.2 user will first capture the image of meter box. Application will show one blue color box which be drag anywhere on the image. User will drag this box on two places first one is meter number and second one is meter reading. After this information will be send to server.

Figure.3. Image taken by device under application

The above fig shows the mechanism of taking image. When user wants to take picture of meter he/she will click on the take picture. After this user can upload this image on server by clicking upload button, as shown in figure.4.

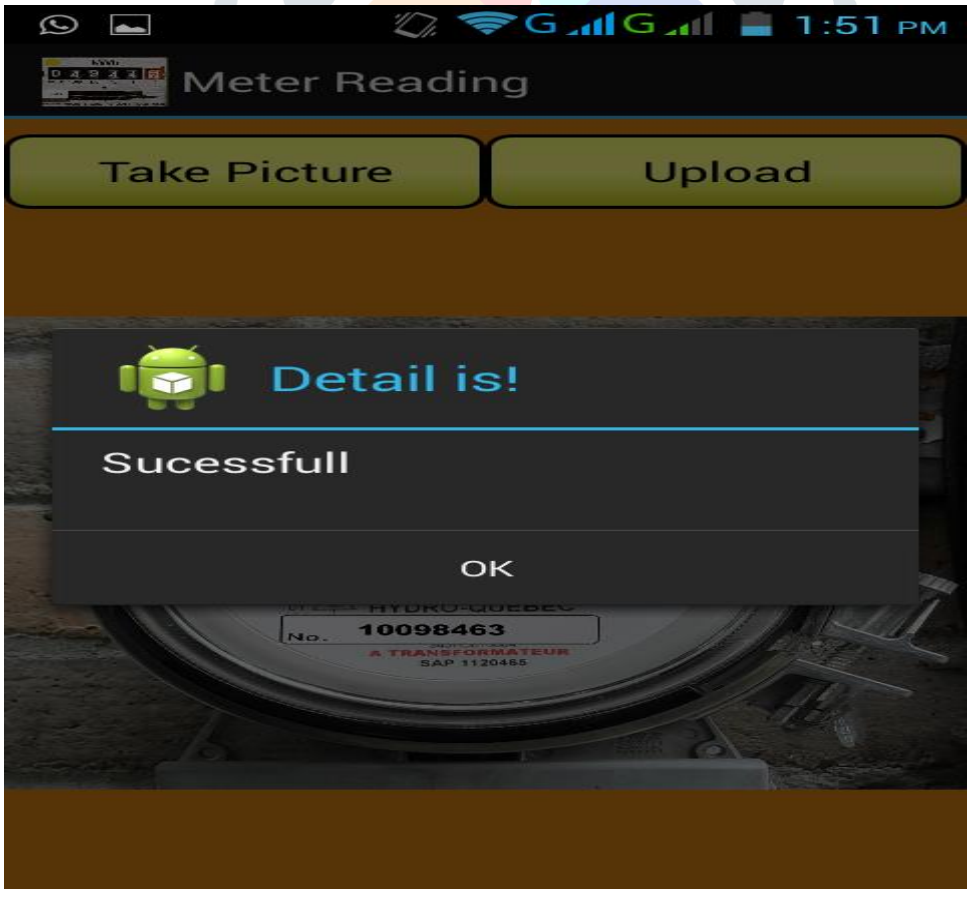

Figure.4.Final Image Submission Screen

V. CONCLUSION

Thus, simpler, accurate and efficient application is developed for reading meter using OCR technique. The current procedure of billing adds lots of burden on employees and is a time consuming process. Thus the automated system of meter reading will reduce the burden on the employees, avoid human errors and incorrectness in bill generation. With the use of automated system most of the manual processes and calculations are eliminated so that the meter readings can easily be collected more accurately to be updated to the server.

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