

# Design and Development of the Field Photo-taking and Recording System with OCR Identification Function

Shaowei Yang, Ming Wu, Wei Lan

State Grid Zhejiang Electric Power Co., LTD. Qingyuan County Power Supply Company, Lishui, Zhejiang, 323800, China

## Abstract

At present, in the process of distribution network operation and maintenance, relay protection setting, information and communication operation and maintenance and meter reading, verification and receipt, on the one hand, it needs to be checked manually, and the workload is large. On the other hand, the equipment with problems is photographed and recorded as archives, which brings great trouble to post Association and sorting. This paper uses image character recognition technology to automatically recognize the photographed meter characters and digital information in batches, The on-site photographing and recording system is developed, which can automatically name and archive the photographed photos, facilitate the rapid and automatic completion of post-processing, greatly improve the operation and maintenance efficiency, and has great promotion value.

## Keywords

OCR; Field Operation; Photo Management.

## 1. Introduction

With the rapid development of social economy, the demand for electric energy is growing, which has brought great pressure and challenges to the state power sector, making the State Grid Corporation of China issue various policies to ensure the power supply, so that the power supply can keep up with the speed of social and economic development, and ensure that the power can meet people's daily needs. Among them, the inspection and maintenance of power equipment is the top priority task of the State Grid Corporation of China. The line inspection team needs to regularly inspect the lines and equipment, and will take relevant photos and records of the equipment with problems for archiving. On the one hand, in the past, photography was simply taken with a camera and uploaded. As a result, the company did not know the specific location of the photographed equipment and the photographing time, which brought huge workload to the post document sorting [1]. On the other hand, in the process of distribution network operation and maintenance, relay protection setting and meter reading, checking and receiving, some instruments need to register the readings on the meter. Many power equipment instruments are dense and scattered. In the absence of network transmission interface, special personnel are required for statistical maintenance [2]. Relying on manual identification of paper setting list and relay protection device screen item by item, the workload is heavy, It is difficult to monitor the equipment in real time [3]. The project adopts OCR image and character recognition technology to automatically recognize the meter text and digital information, and can name and archive the photos, which is convenient for rapid and automatic completion in post-processing.

## 2. Main Functions

At present, in the process of distribution network operation and maintenance, relay protection setting, information and communication operation and maintenance and meter reading, checking and receiving, the instruments with problems are often photographed and archived. Some instruments need to register the indication on the meter. In addition, when there are many photos, the corresponding relationship between the photos and the actual scene is often unclear when archiving afterwards. Therefore, the image character recognition technology can be used to automatically recognize the meter text and digital information, and the photos can be named and archived, which is convenient for the rapid and automatic completion of post-processing.

### 2.1. OCR Image Recognition

The image recognition process of power patrol inspection in OCR is divided into the following steps: image acquisition, image preprocessing, feature extraction, text recognition, layout restoration, post-processing and peer correction.

(1) For image acquisition, the image needs to be loaded first, which can be loaded by taking photos or locally. The supported formats include JPEG, PNG, PDF, IMG, etc.

(2) Image preprocessing mainly includes graying, binarization, drying, inclination adjustment, character cutting and so on. The first step is image binarization, which adopts threshold segmentation technology and is good at image segmentation with strong contrast between object and background. The nameplate image taken by the camera can be simply divided into foreground and background areas, and the color image of the divided area is grayed. After the image graying processing, it only contains foreground and background colors. Generally, the foreground information is represented by black and the background information is represented by white [4]. The second step is de drying. The so-called de drying is to remove the noise of the image, define the noise feature on the image file, and then complete the de drying process according to this feature. The third step is to adjust the image inclination, that is, in the actual photographing link, it is often difficult for people to achieve the complete horizontal and vertical of the image, so that the photographed result image will appear a certain inclination. In order for the computer to better recognize the text information on the image, it is necessary to adjust the inclined image horizontally or vertically, and finally get a horizontal and vertical image result.

(3) Feature extraction, this step is to find out the candidate text region features in the image, divide the picture into n paragraphs, and the modification process is layout analysis. However, due to the complexity and diversity of the actual picture, there will not be a fixed optimal segmentation model.

(4) Character recognition, character recognition method, feature extraction method. It is mainly divided into two categories: one is pattern recognition, which feeds characters of various formats to OCR program to recognize and compare characters in documents. The other is feature detection. OCR program uses a set of rules to identify the characteristics of characters and numbers in electronic documents. These features include the number of slashes, crosslines, or curves.

(5) The proofreading and output of the recognition result is to correct the result according to the specific language and context, get the final editable text content and export the word format document according to the sequence of the original image document, keep the original position of the upper, lower, left and right paragraphs unchanged.

## 2.2. Live Photo Recorder

### (1) Demand analysis

Combined with the needs of on-site inspection photo identification and management, the on-site camera developed in this paper needs to have the following functions: 1) watermark function: automatically superimpose the time and GPS coordinates of the location on the photo. 2) Automatic naming: automatically identify the line name and tower number of the current position, and automatically name the photos according to the requirements of the State Grid. 3) Indication recognition: indication recognition of power equipment instruments based on OCR algorithm, including pointer type and liquid level type instruments. 4) Data import: support batch import and batch identification of line and equipment pictures. Import one or more instrument pictures (can be decoded normally, and the aspect ratio is appropriate), and output the indicator number of the picture to excel document. 5) Automatic archiving: photos are automatically archived to corresponding folders based on location and equipment.

### (2) Functional process

In order to facilitate the use of on-site inspection, this paper uses wechat applet platform to develop the system. It can be compatible with different mobile phone systems, and can call more mobile phone system functions than H5 for development, such as GPS positioning, recording, video shooting, gravity sensing, etc. it can develop richer use scenarios, with low development cost and convenient maintenance. The on-site photo recorder applet with OCR recognition function flows as shown in Figure 1. After uploading the picture, the server calls the interface for OCR recognition, and saves the picture in different scene folders according to the selected scene. At the same time, the applet will call the corresponding interface to obtain the current time and GSP location data, add the corresponding watermark to the uploaded data, rename the picture according to the scene, and display the recognition results. Batch recognition is to cycle the above operations for image recognition, recording and display.

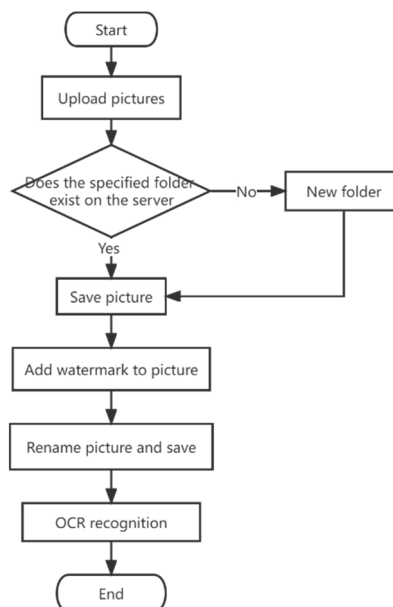


Figure 1. Design flow chart of Live photo recorder system

### (3) Function display of on-site camera recorder

The main interface of the on-site photo recorder with OCR recognition function can choose to take photos and upload pictures according to different scenes, shoot or upload from local photo albums, and upload one or more photos at a time. It plays a classified management role for photos, and provides the functions of adding, deleting and searching, as shown in Figure 2.

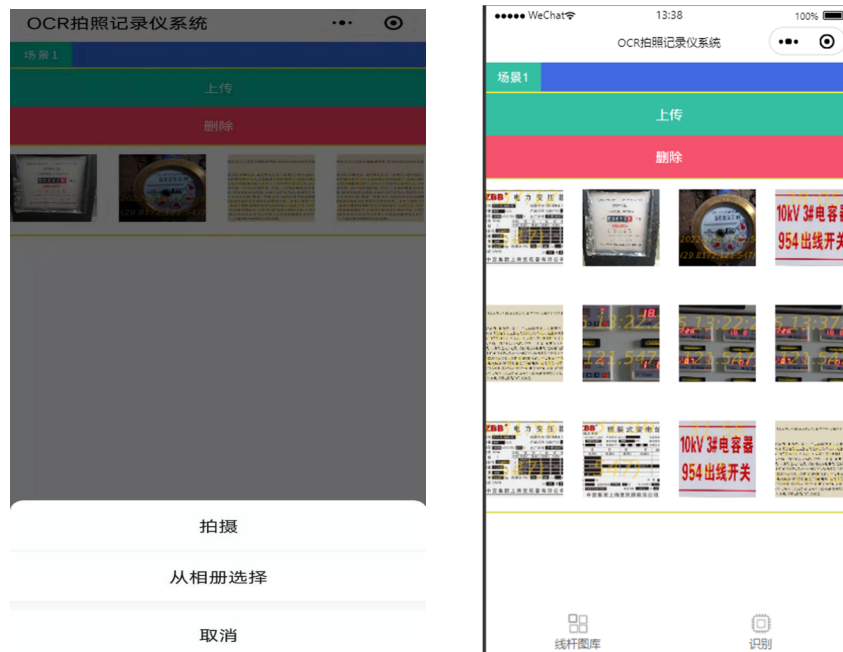


Figure 2. Picture upload mode

The field camera recorder with OCR recognition function can add watermark processing to the picture. The watermark records the GPS coordinates of the time and location, as shown in Figure 5. The file name is automatically generated according to the directory, generated by serial number + directory + GPS location + time, convenient for the search and archiving of photos.



Figure 3. Add a watermark

The field camera recorder with OCR recognition function can identify pictures in batches, display the recognition data, and have high recognition accuracy. At the same time, it automatically arranges the fields according to the recognition results, and can export the identified data into Excel files, as shown in Figure 4.



Figure 4. Batch identification of different types of pictures

### 3. Conclusion

This paper designs an OCR algorithm suitable for instrument representation number identification to provide an instrument identification algorithm for the field photo recorder with OCR identification function, enabling the recorder to identify and record different types of instrument data. Research with the function of recording, archiving of field photo recorder, make the power personnel in different work scene according to the time, location and different equipment instrument identification named archive, with batch import identification function, can batch import identification, processing and archiving, and can export to identify data, can identify the large number of pictures in the same scene, reduce each need to take pictures upload repeated action, has a great application prospect.

### References

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