

Offline Layout-Based Handwritten Data Extraction and Direct Database Loading Without the Use of Cloud Recognition Using Existing Scanner Printer Devices for Barangay Information Management Systems

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Abstract:

Barangay offices still continue to use common handwritten forms in processing resident data. This approach is still very much convenient for both residents and barangay employees. Handwritten forms are easy to use, inexpensive, and do not require computer literacy. However, after the form is submitted at the office, barangay stuffs and employees still have to manually input the data into barangay systems. This method becomes repetitive and time consuming. This is become source of human errors such as misspelled names, incomplete data, and duplicate entries, which may reduce the integrity and transparency of the data.

Things become more complicated when internet connectivity becomes unstable. Most online computer applications require constant internet connectivity to function. Without it, processing becomes slow or even comes to a standstill or worse it will not load the data.

This paper studies the current research papers about offline handwritten data extracting systems which utilizes scanner-printer devices that already exist in barangay offices. These systems recognize text entries using layout-based templates where each handwritten entry is assigned to a particular column in table inside database, without online cloud recognition. In this way, the system is also able to take scanned forms as input and load it into databases without the constant requirement of up-to-the-minute internet connectivity.

The literature review presented clearly demonstrates that such systems are able to greatly reduce both the time and error rate in encoding data. They are also cost-effective for smaller local government units because they use pre-existing hardware. In general, offline layout-based extraction and direct database would help improve on-site barangay information management without introducing complexity.

Index Terms:

Barangay Information Systems, Database Loading, Handwritten Data Extraction, Layout-based Recognition, Offline Processing

I. INTRODUCTION

Barangay represent the lowest public governance in the Philippines, but they are part of the important part units of the Philippines. For every Filipino citizen, interactions with government begin at this level whether for certification, proof of residency, or updating demographic records of individual residents. Due to its close link to daily life of

each individual, the accuracy and reliability of record management at the barangay level have practical impacts.

Despite the gradual push of current generation toward digitalization in public administration, many barangay offices continue to operate within a hybrid system, which is paper based and digital based. Documentation in the form of paper is also still entrenched with daily dealings. Practically, handwritten forms are not only considered old systems but they are still operable and present. Residents can complete them without assistance, and staff can process them using existing equipment without additional training or

assistance.

The challenge emerges after submission of the completed form of resident data. Once handwritten forms are received, personnel must manually encode the information to the computer or a system application before it saved to the database. Although this task might seem simple in terms of modernizing, it gets heavily load when the number of volumes transactions rises. The total of numerous encoding errors in the form of misspellings, omissions, repeated entries can impact the overall quality of the data in the long term. Even careful staff members cannot entirely eliminate human error in repetitive encoding tasks again. Also, the online connection further complicates the situation. Many digital solutions assume stable internet access like the extraction of raw text in the form.

However, the internet access is still not consistent in a number of rural or semi-urban municipalities. Interruptions in the workflow are caused when the connections are slow or unavailable. Offices may temporarily revert to manual processes or can result to interrupt the other work of stuff of the barangay and can cause a workload, which reduces operational efficiency and delays service delivery.

Meanwhile, the development of handwritten text recognition (HTR) technologies has also come in handy in the present generation. Algorithms that rely on machine learning especially that relying on AI generated or AI assisted system, now show a high performance in controlled conditions. However, the majority of the available implementations are aimed at the environments with stable equipment and where specialized assistance can be provided. The applications that are adapted to smaller administrative units that have fewer resources are given relatively less consideration in the existing literature.

The research presented in this study fills that gap in practice. Instead of coming up with a novel recognition algorithm, it discusses how the existing offline, layout-driven systems could be adjusted to accommodate the management of information at barangay-level. It is not theoretical novelty that is being emphasized, but rather contextual appropriateness and practicality.

II. LITERATURE AND AVAILABLE

Technology. Nevertheless, computer handwritten text reading is much different as compared to that of a printed text. The letters are printed in a very similar type, with an equal level of color shading and shape and thus are easy to recognize. Writing however, can be so unpredictable in individuals. Other than size, spacing, slant and shape of the letters can either vary or differ hence making it hard to separate and also recognize whether that particular combination of letters is actually a word or not by the computer.

Recent years have seen the new models of artificial intelligence which have significantly enhanced the handwritten recognition, the way machines perceive

handwriting. The high-powered programs implemented in most of these systems are cloud server-based. It makes them faster and easier to update the information they want. Nevertheless, they use a robust internet connectivity and in most cases they demand payment over subscriptions to the serves that may not be applicable to small offices especially in barangay.

The other type is templated or layout processing as the utilization of QR codes. Forms in this solution have very distinguishing sections of the different types of fields of forms such as name, address and date of birth. It implies that it reads one section at a time and forwards the results to the appropriate location within database. That process is easily automated by the computer since the answers are entered in designated boxes or even dictated by a word. This works well with the structured documents such as those that are in the barangay offices.

The issue is that most of the available form processing systems are configured to large firms or organizations. They might need expensive licenses, technical installation or upgraded equipment. This may not be supported by smaller local offices in terms of budget or technical support. The multifunction printers (MPF) devices are already present in most of the barangay offices. Use of these machines implies that they are able to read documents without the need of new equipment. Their solution is compatible with offline handwriting recognition software and template-based data processing to come up with an independent system that is not connected to the network and internet.

Although the technology is present in the current generation, the studies that concentrate on its application in the small local government offices such as barangays are still few. Rather than designing totally new systems, it can be more appropriate to design a localize system that can tailor the current technology to suit barangay needs and constraints.

III. METHODOLOGY

Within the framework of this research, various books, research papers and articles were checked in order to learn how offline handwriting recognition and structured form processing were done. It was not aimed at testing systems in the laboratory, but to identify solutions that would realistically work in the barangay offices.

Straight forward procedure has been created which can be undertaken in stages, yet which might require minor modifications as time goes by.

First, the form templates are created with clear boundaries to ensure the correct segmentation of each part.

Second, there is scanning of processed forms with the current multifunction printer machines. The

image files obtained are then processed by a layout recognition module which identifies preselected areas corresponding to fields in the database.

Third, the system has the offline recognition software to interpret the handwritten answers. The system is also able to send the information to the right section of the database after reading the answers.

Fourth, the staffs run through the findings and save them. In case certain words are not clear or they may be mistaken, they can correct them. Human checking has not been eliminated yet as some handwriting is not easy to read.

The various technologies were contrasted according to the precision of the scanning of wording and its precision it will extract and save the data, speed with which they operate with on-going loading of data, the need to use the internet, the cost it will incur, and whether or not they could practically be utilized in the small barangay offices.

IV. RESULTS AND DISCUSSION

The findings of the reviewed studies demonstrate that the structured method of extraction is optimal compared to the free-form recognition one in an administrative context. This has been attributed to the fact that when the text is typed in a predefined field, the level of interpretation is narrowed upon and therefore the output is more accurate.

The off line system is more functional. The administrative functions will be able to proceed even when there is a disconnection in connectivity. Besides, they are stored on the local infrastructure. This arrangement can also be dynamic to meet the data management demands of the organization.

The direct database method does not have to go through several encoding measures. This is attributed to the fact that the personnel will have to manually input the data contained in paper documents in digital documents platform and verify and rectify the information to ensure that no miss information is present at a given time. Such a strategy can lead to a considerable decrease in the daily work of the staff within a certain time frame.

Nevertheless, some problems persist. Different people write in various styles and their writing may be difficult to read. Forms are also sometimes not filled in fully, or are not legible. Due to this reason, the system might not necessarily identify everything appropriately.

Moreover, the form template is time consuming and requires fine tuning before it can be configured at the start. This is why a combined method is the most appropriate. The system will automatically read and process majority of the information although the results should be checked by the people before saving it to maintain data accuracy. In this manner, the job is made quicker yet accuracy and

responsibility are still upheld at a time by barangay office stuffs.

V. CONCLUSION

A realistic modernization approach of barangay information system is therefore offline layout-based handwritten data extraction accompanied by direct loading of the database. The expenses of implementation are relatively low with the utilization of already available infrastructure. More to the point, reliance on continuous internet connectivity is maintained to minimal levels.

Based on the literature review, the evidence is that templates enhance the reliability of the recognition in a standardized administrative environment. Although differences in handwriting and specifications of systems are factors to be considered, they can be handled by designing and validation.

In the case of modernization of the barangay setting, a substantial transformation of the available equipment is not always the requirement. Small steps, like offline structural extraction, so that it will be able to enhance efficiency and accuracy considerably. Proper adaptation of existing technology in the particular set up could prove more beneficial than the adoption of new technology.

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