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Survey on Translation of Signboard Images from Mobile Phone Camera

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Abstract— The language barrier among tourists was one of the major difficulties when travelling. The tourists can rely on mobile phone for travelling purposes. Mobile dictionary is used for word search for a better travelling guide. Android platform has gained popularity in recent years in terms of market share and number of available applications. Android makes it easier for consumers to get and use new content and applications on their Smart phones. In this paper we discus text translation application that is able to recognize the text present on sign board images taken with a mobile phone camera, translate the text from source language to destination language, and display the translation result back onto the screen of the mobile phone.

Keywords— Classification, OCR, Mobile platform, Segmentation, Translator

I. INTRODUCTION

Signboard information plays an important role in our society. Their format is often concise and direct, and the information they give is usually very useful. However, the foreign visitors may not understand the language that the signboard is written in, with the consequently loss of all that important information also they pose problems or even danger when we are not familiar with them. For example, a tourist might not be able to understand a sign in a foreign country that specifies warnings or hazards. The gaining momentum of portable mobile devices, the growing of their computational power and the inclusion of cheap digital cameras on them makes it possible to change from the classical hand dictionary translation to a new faster, comfortable and affordable way. In this sense, it is expected that a high percentage of the world population will own a mobile phone with an embedded camera, which is all that our system needs.Research in the field of Optical Character Recognition (OCR) was limited to document images acquired with flatbed desktop scanners. The usability of such systems is limited as they are not portable because of large size of the scanners and the need of a computing system. Recently, with the advancement of processing speed and internal memory of hand-held mobile devices such as high-end cell-phones, Personal Digital Assistants (PDA), smart phones, iPhones, iPods, etc. having built-in digital cameras, a new trend of research has emerged into picture [1] .We propose an Android application that detects the text information within an image taken with a mobile phone camera, extracts it, recognizes it and translates it from Marathi to English.

The rest of this report is organized as follows. Section 2 related work is presented, Section 3 formally represent the Optical Character Recognition. Section 4 presents conclusion.

II. RELATED WORK

This chapter discusses mobile applications developed for translating different language signboards using Optical Character Recognition (OCR). The work is done for English to Chinese, Japanese to English, Chinese to English, Hindi and Tamil, English to Spanish, Malay to English/Arabic and Hindi to English on different mobile platforms.There are some literature on the text recognition and translation for different languages like

Derek Ma, Qiuhau Lin, Tong Zhang (2000) developed an Android-platform based text translation application that is able to recognize the text captured by a mobile phone camera, translate the text, and display the translation result back onto the screen of the mobile phone. The application we developed enables the users to get text translate as ease as a button click. The camera captures the text and returns the translated result in real time. The system we developed includes automatic text detection, OCR (optical character recognition), text correction, and text translation. The current version of application is limited to translation from English to Chinese, it can be easily extended into a much wider range of language sets [2].

Y. Watanabe, K. Sono, K. Yokomizo, and Y. Okada (2003) reports a mobile application which translates Japanese texts in a scene into English. The application is designed to run on a mobile phone with a camera. It recognizes Japanese characters sensed by an onboard camera of a mobile phone and translates them into English. There are many texts in various scenes: signboards, marks, indicators, and so on. Quite a lot of them give us important information: instructions, warnings, explanations, and so on. [3].

Xilin Chen, Jie Yang, Jing Zhang, and Alex Waibel (2004) presents an approach to automatic detection and recognition of signs from natural scenes, and its application to a sign translation task. The proposed approach embeds multiresolution and multiscale edge detection, adaptive searching, colour analysis, and affine rectification in a hierarchical framework for sign detection, with different emphases at each phase to handle the text in different sizes, orientations, colour distributions and backgrounds. They use affine rectification to recover deformation of the text

regions caused by an inappropriate camera view angle. The procedure can significantly improve text detection rate and optical character recognition (OCR) accuracy. Instead of using binary information for OCR, they extract features from an intensity image directly. They propose a local intensity normalization method to effectively handle lighting variations, followed by a Gabor transform to obtain local features, and finally a linear discriminant analysis (LDA) method for feature selection. They have applied the approach in developing a Chinese sign translation system, which can automatically detect and recognize Chinese signs as input from a camera, and translate the recognized text into English[4].

A Adrian Canedo-Rodríguez, SoohyungKim, Jung H. Kim,Yolanda Blanco Fernández (2009) proposed a whole architecture for English to Spanish translation of the texts present on JPEG natural scene images taken with a mobile phone camera. We detect the text using the frequency information of the DCT coefficients, binarize it using a clustering-based algorithm, recognize it by the use of an OCR algorithm and translate and phonetically transcribe it from English to Spanish. The result is a useful, simple, affordable and robust system that can handle problems like lighting distortion, out of focus, low resolution and foreground-background colour variations in a very short amount of processing time, which makes its implementation very attractive on portable devices[5].

Ariffin Abdul Muthalib, AnasAbdelsatar, Mohammad Salameh, and JuhriyansyahDalle (2011) describes a project related to learning in tourism. A mobile technology is used in a translator system called Mobile-Translator. It includes also some facts on the Mobile-Translator. Then, the testing of the system is discussed in which it involved 30 international students if Malaysia. Briefly this study found that users accept the Mobile-Translator well. The mobile translator specifically for use in Malaysia, in which the native language is Malay that can be translated into either English or Arabic[6].

Nitin Mishra, C Patvardhan (2012) presents an extremely on-demand, fast and user friendly Android Application ATMA. ATMA stands for Android Travel Mate Application. This application is useful for native Tourists and Travelers who possess Android Smart phones. It enables Travelers and Tourists to easily capture the native country language Books pages, signboards, banners and hotel menus etc. The built-in OCR converts the text embedded in the captured image into Unicode text format. It also provides translation facility so that Tourists can translate the Native Language Unicode text into their own country language. This Application has an advanced search feature so that recognized as well as translated text can be used to copy, paste, share and search for travel related queries like museums, places, restaurants, books, culture, hotels, etc. There is no remote computing overhead because the application has built in OCR suite as well as Image Processing suite both installed in the Android device. It provides fast, robust and extremely high Quality performance because of having improved auto focus behaviour, continuous dynamic preview and improved noise tolerance feature [7].

III. OPTICAL CHARACTER RECOGNITION

The Optical Character Recognition (OCR) process is divided into following phases preprocessing, segmentation, feature extraction and classification. Fig 3.2 shows phases in classical OCR [8].

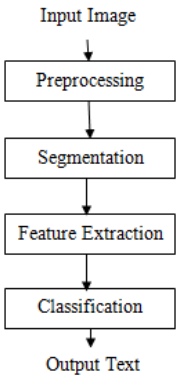

Fig. 1 Optical Character Recognition

A. Preprocessing

It smooth the digitized characters to remove noise. The smoothing implies both filling and thinning. Filling eliminates small breaks, gaps and holes in the digitized characters. Thinning reduces the width of the line. The normalization is applied to obtain characters of uniform size, slant and rotation.

B. Segmentation

Segmentation is a classifier which helps to fragment each character from a word present in a given image / page. The objective of the segmentation is to extract each character from the text present in the image. After performing Segmentation, the characters of the string will be separated and it will be used for further processing. Different character segmentation techniques has been proposed until like, Dissection Techniques, Recognition-Based Hidden Markov Models and Non-Markov Approaches, Holistic Strategies [9].

1) *Dissection Techniques*: By dissection is meant the decomposition of the image into a sequence of subimages using general features.In machine printing, vertical whitespace often serves to separate successive characters. This property can be extended to handprint by providing separated boxes in which to print individual symbols.

2) *Recognition-Based Hidden Markov Models*: The structure consists of a set of states plus transition probabilities between states. In addition, the observations that the system makes on an image are represented as random variables whose distribution depends on the state. These observations constitute a sequential feature representation of the input image.
3) *Non-Markov Approaches*: A method stemming from concepts used in machine vision for recognition of occluded objects. Here, various features and their positions of occurrence are recorded for an image.
4) *Holistic Strategies*: A holistic process recognizes an entire word as a unit. A major drawback of this class of methods is that their use is usually restricted to a predefined lexicon: Since they do not deal directly with letters but only with words, recognition is necessarily constrained to a specific lexicon of words

C. Feature Extraction

In this stage, the features of the characters that are crucial for classifying them at recognition stage are extracted. Following are the techniques for features extraction Template matching, Transformations, Distribution of points(Zoning, Moments, n-tuple, Characteristic loci, Crossings) Structural features.

D. Classification

The classification is the process of identifying each character and assigning to it the correct character class

1) *Decision-theoretic methods*: The principal approaches to decision-theoretic recognition are minimum distance classifiers, statistical classifiers and neural networks
2) *Structural Methods*: Measures of similarity based on relationships between structural components may be formulated by using grammatical concepts. Suppose that we have two different character classes which can be generated by the two grammars G1 and G2, respectively. Given an unknown character, we say that it is more similar to the first class if it may be generated by the grammar G1, but not by G2.

IV. CONCLUSIONS

In this survey, the systems like Chinese-English translation have been proposed which are useful for tourists. Optical Character Recognition is used for extracting text from signboard images. The accuracy of Optical Character Recognition depends on Segmentation phase. In future efficiency of segmentation phase can be improved.

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