Mobile Phone Book Finder

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Motivation

When a patron searches for a book in a library, they can typically retrieve the call number that would lead them to the correct shelf where their book is located. However, once they find the shelf they are looking for, finding the exact location of the book can be time consuming especially if the book is reshelved out of order, or if the person does not know what the binding looks like. In order to help alleviate this issue, our group proposes to construct a “mobile phone book finder” application to streamline the book searching process for library patrons. Such an application will be run on an Android phone and using the camera phone feature, will point out to the person where the book is located on the shelf.

Figure 1. Our bookfinder application Android application will allow users to immediately find their book on the shelf. See left as an example of an input image for our android application.

Related Work

In the past, similar works have been performed on book spines recognition. Work has been performed in spine segmentation and recognition which allows localization of book location using SURF algorithm [1]. In addition, there are works that focus on combining both text recognition and feature-based recognition in order to help detect books that include text components but lack image features [2]. In our book detection method, we also focus on performing MAP detection in RGB space, which has been performed for human skin detection [3,4]. In addition, template matching, which has been used for a variety of applications such as quality control [5], is also used here for spine recognition. Most of the previous works use a database and algorithms that are saved and run on a server, but in our project, the database and algorithms are saved and run locally on the phone.

Flow Diagram for Book Finder Application

Figure 2. Flow Diagram showing the algorithms involved in book finder application. Android application was implemented in Java. Matlab coding was used for image segmentation. The training data is preloaded into the phone after image segmentation, before the application is run.

Our project aimed to achieve a similar goal in spine recognition. Within the Android application, we will type in the title of the book we are searching for. Using the camera, aim at the shelf of interest. The application will use a multidimensional MAP detector and with the aid of training data will construct color bins performing detection on RGB data. In order to optimize both speed and performance, 16 by 16 color bins was chosen. A Sobel edge detection algorithm in addition to erosion and dilation procedures was performed on the input image into the Android to help segment the books on the shelf in real time. Finally, a template matching algorithm is performed as another level for detecting correlation of our desired spine with the input image into the Android phone.

Experimental Results

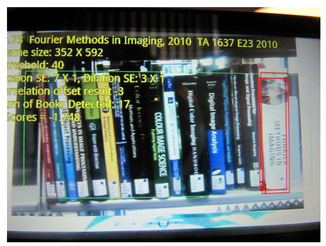

Figure 3. Example screenshot of book detection using bookfinder

Performance	Strongly detected	Weakly detected	No detection
Percentage of data set (out of 68)	65%	21%	14%

Figure 4. Data set indicates the detection after testing of 68 books within the database. Strongly detected indicates that the book was marked consistently by bookfinder. Weakly detected indicate that the book was marked though marker may have oscillated to other books for majority of time. No detection indicates correct book little or no detection.

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References

[1]. Chen, D et al *Mobile Augmented Reality for Books on a Shelf*, 2011 [2] Tsai, S et al Combining Image and Text Features: *A Hybrid Approach to Mobile Book Spine Recognition*. [3] Brand J, Mason J *A Comparative Assessment of Three Approaches to Pixel-level Human Skin-detection*, 2000. [4] Leahy, EE368 Project, 2003 [5] Aksoy, M et al *An industrial visual inspection system that uses inductive learning,* 2003 [6]Brunelli, R *Template Matching Techniques in Computer Vision: Theory and Practice*, 2009