COMPENSATION OF PARTLY PHOTOGRAPHED PAGE-IMAGES USING 3-D SHAPE INFORMATION

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ABSTRACT

In this paper, we propose a method in order to compensate contortion of page image which is caused by photographing a book opened and placed face-up (two pages opposite each other state) on the stage just above. For compensating contortion 3-D shape information of page surface is necessary to apply some geometrical adjustment. To obtain much higher resolution image a page needs to be photographed partly, in this situation each neighboring image necessarily has overlap area for the purpose of joining together. we put characters exist in overlap area to good use for seeking of corresponding points in stereo method by which 3-D shape information(3-D coordinate of corresponding points)of book surface can be obtained. If the assumption that no change of the shape of page cross section along the binding are satisfied, satisfactory compensated images were obtained and joining them together was well performed.

1. INTRODUCTION

Recently by the progress of computer performance. cost down of electric/magnetic recording media and wide spread of networking environment, digital libraries that had been only concept till a few years ago begin working practically [1]. In order to build an electronic library, first necessity is obtaining digital page images of book which have been collected up to now there. Second one is digitally archiving their contents efficiently. Some examples are given as following, general books and kinds of magazine are enough to be archived as text base information, rare or historical books are desired to be archived as high resolution images. Because in the former the very information of articles is most important of all other information like which font used. Contrastively, in the latter information such as the shape of characters, illustrations, impressions of paper, etc., are more important than contents of articles, which is perhaps well-known Bible[2]. However, in both case, high resolution image is beneficial. It is recommended to recognize character with OCR at 400dpi resolution and desired to bear the research of bibliography in the humanities. Third one is how to obtain digital page images. Now there are two devices of taking digital image, scanner and digital camera. the former is comparatively common and suitable for general books. But for the reason of scarcity and fragility of rare books the latter will be an optimum technique at the present time, comparison with flatbed-scanner which force to push tow pages opposite each other against the contact-window. Further as respects of time and cost digital camera is suitable. Accordingly, in order to obtain digital page images of book, a book placed on the stage(See Fig.1)with its unstrained posture and its pages is photographed just above. If much higher resolution images are required, it is necessary to magnify and partly photograph that join each partial image together. Images taken in this situation not form an exact rectangle but have swollen curved top and bottom edge lines and contents of the page have been contorted. This contortion cause by 3-D shape of page give bad influence with the character recognition and make it impossible to join partial images together. Thereupon, we have proposed a method for obtaining rectangular just-front view of page images from partly photographed images of some books page, using geometrical adjustment. Partial images have geometrical contortion caused by the 3-D shape of the page [3]. It is difficult to join them together without image adjustment processing. In [3] it is impossible to compensate an image excluding the case that at least top or bottom of edge of page exists in the image, in other words [3] uses information of curvature of page' top or bottom edge for image adjustment. In our research, we make better use of overlapped area which necessarily exists for the purpose of joining partial images together and pay attention to characters which exist in overlapped area of the neighboring two partial images. A method to obtain 3-D shape information for geometrical adjustment of partially photographed images is proposed.