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CONTENT-BASED IMAGE RETRIEVAL USING LARGE CENTRE REGIONS

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A Thesis submitted to the Department of Electronic and Telecommunication Engineering at the University of Moratuwa in partial fulfilment of the requirements for the Degree of Master of Engineering.

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February 2004

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Submitted by

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This Research Project was carried out at the Department of Electronic and Telecommunication Engineering of the University of Moratuwa during the period from August 2002 to December 2003.

February 2004

DECLARATION

The work presented in this dissertation has not been submitted for the fulfilment of any other degree.

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ABSTRACT

Among all the visual features used for content-based image retrieval, colour is perhaps the most dominant and distinguishing one in many applications. Therefore in this research project, the concentration was focused on the colour property of images. In this work, a new histogram refinement technique, Large Centre Regions (LCR) Refinement, and a new region representation technique, LCR Sets, based on colour regions are presented. These methods extract a selected number of largest regions around the centre of the image and match other images emphasizing this property.

Two assumptions are made. First is, that it can be assumed that the significant objects or items of an image are often located at the centre. These objects can often be characterized by their colour. Hence an image retrieval technique which extracts the colours of large centre regions of an image would improve the retrieval performance for images with significant objects at the centre. The second is, that the techniques were tested on an image database predominantly consisting of red images, but they perform similarly for other colours as well.

The presented histogram refinement descriptor, Large-Centre-Regions Vector, effectively represents large centre regions of an image. In addition to this, LCR Sets represent basic information about the shape of a region.

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In the prototype, firstly, all the regions in an image were extracted depending on the similarity of the colour of the pixels. A centre zone was defined on the image and a selected number of largest regions which overlap with this centre zone at least by 50% of the region area were selected as the Large-Centre-Regions for histogram refinement basis. In addition to large centre regions, LCR Sets represent the areas of a selected umber of largest regions lying outside the centre zone and the width to height ratio of the minimum bounding rectangle of each region. Since the largest regions at the centre are given the emphasis for matching, effect of the background can be minimized as well because most part of the background often lies outside the centre zone. Extra distinguishing capability among different images can be achieved with LCR Sets.

Experimental results of LCR Refinement show much improved retrieval performance, especially for images with significant regions at the centre. Results show 20% average improvement in ranks with LCR Refinement compared to Histogram. By combining LCR Sets with either Histogram or LCR Refinement, this can be further improved upto 26% or 22%, respectively.

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