

CONTENT-BASED TRADEMARK RETRIEVAL
USING ZERNIKE MOMENTS AND
COLOUR-SPATIAL TECHNIQUES

WAN NURAL HAWAHIR BT HJ WAN YUSSOF

MASTER OF SCIENCE
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI
MALAYSIA

2005

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USING ZERNIKE MOMENTS AND COLOUR-SPATIAL TECHNIQUES**

Dedicated to my beloved mother Fatimah Mohamad

"Thank you for everything"

WAN NURAL JAWAHIR BT HJ WAN YUSSOF

**Thesis Submitted in Fulfilment of the Requirement for the
Degree of Master of Science in the Faculty of Science and Technology
Kolej Universiti Sains dan Teknologi Malaysia**

November 2005

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Abstract of thesis presented to the Senate of Universiti Teknologi
Malaysia in fulfillment of the requirement for the degree of Master of Science

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WAN NURUL ISWAHIDU BT HJ WAN YUSOFF

November 2015

Dedicated to my beloved mother Fatimah Mohamad

Chairperson : Associate Professor Mustamad Saizul Hisham, Ph.D.

Member : Professor Mustafa Halim Dera, Ph.D.

Family : Family "Thank you for everything"

The volume of registered trademarks are increasing tremendously in recent years. This has led to the urgent need for efficient retrieval of registered trademarks to protect their from infringement, misuse or violation. By using content-based image retrieval technique, an efficient and automatic trademark retrieval system is developed. The use of content-based trademark image retrieval technique is proposed because difficulty in identifying meaningful images by using keyword-based system which is almost impossible in describing visual perceptual similarity of trademark images.

Based on the justification, a single trademark image as there may not have enough discriminative power in revealing similar visually look trademarks. Therefore, in this thesis, an integration of shape and colour feature approach is proposed. The proposed technique employs the Zernike moments and colour-spatial techniques in an integrated manner. In other words, user can specify both the shape and colour weightage contributions in the query image when searching for visually similar look trademarks.

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WAN NURAL JAWAHIR BT HJ WAN YUSSOF

November 2005

Chairperson : Associate Professor Muhammad Suzuri Hitam, Ph.D.

Member : Professor Mustafa Mat Deris, Ph.D.

Faculty : Faculty of Science and Technology

The volume of registered trademarks are increasing tremendously in recent years. This has led to the urgent need for efficient retrieval of registered trademarks to protect them from infringement, misuse or imitation. By using content-based image retrieval technique, an efficient and automatic trademark retrieval system is developed. The use of content-based trademark image retrieval technique is proposed because difficulty in formulating meaningful queries by using keyword-based system which is almost impossible in describing visual perceptual similarity of trademark images.

Based on the justification that by using a single trademark image attribute may not have enough discriminative power in retrieving similar visually look trademarks. Therefore, in this thesis, an integration of shape and colour features approach is proposed. The proposed technique employs the Zernike moments and colour-spatial techniques in an integrated manner. In other words, user can specify both the shape and colour weightage contributions in the query image when searching for visually similar look trademarks.

The Zernike moments method and colour-spatial technique are chosen because they are mutually complementary. Zernike moments method can represent global shape of trademark while colour-spatial efficiently provides the spatial and colour relationship information of a trademark image.

In this project, extensive experimental investigations have been carried out. The developed system had been tested on a trademark's database containing 1000 trademark images of various football clubs and universities from around the world. The system had been successfully developed using MATLAB[®] and image processing toolbox[®]. Each retrieval takes reasonable amount of computation time (± 6 sec. on a Pentium IV – Windows 2000 Professional environment using 240 MB of RAM). The retrieval results showed that by using the Zernike moments method alone, only global shape features of a trademark could be represented, thus resulting in a similar trademark shapes were retrieved. In contrast, by using solely the colour-spatial technique, the query results in retrieval of related trademarks based on colour aspect. Therefore, in retrieving the most relevant visually similar look trademarks, a trial and observation is proposed to be employed. A typical equal contribution of Zernike moments method and colour-spatial weightage could provide efficient retrieval of relevant visually similar look trademarks. In conclusions, an efficient and automatic trademark retrieval method had successfully been developed.

Abstrak tesis yang dikemukakan kepada Senat Kolej Universiti Sains dan Teknologi
Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

**CAPAIAN TANDA PERDAGANGAN BERASASKAN KANDUNGAN
MENGUNAKAN KAEDAH MOMEN ZERNIKE DAN
TEKNIK RUANG-WARNA**

WAN NURAL JAWAHIR BT HJ WAN YUSSOF

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Fakulti : Fakulti Sains dan Teknologi

Saiz tanda perdagangan yang berdaftar meningkat dengan hebatnya dalam tahun kebelakangan ini. Ini mendorong kepada keperluan segera bagi capaian yang berkesan untuk tanda-tanda perdagangan yang berdaftar demi melindunginya daripada pencabulan, salahguna dan peniruan. Dengan menggunakan teknik capaian imej berasaskan kandungan, ia diharap agar sistem yang automatik dan berkesan akan dibangunkan. Penggunaan capaian tanda perdagangan berasaskan kandungan dicadangkan kerana kesukaran untuk mengformulasikan pertanyaan yang bermakna menggunakan sistem berasaskan kata kunci yang mana ia agak mustahil untuk menerangkan persamaan pandangan visual pada imej-imej tanda perdagangan.

Berdasarkan pada justifikasi bahawa dengan menggunakan satu sifat imej pada tanda perdagangan mungkin tidak memberikan kuasa perbezaan yang mencukupi untuk mencapai tanda-tanda perdagangan yang kelihatan sama. Oleh itu, dalam tesis ini, pendekatan pengintegrasian antara ciri-ciri bentuk dan warna dicadangkan. Teknik yang

dicadangkan menggunakan kaedah momen Zernike dan teknik ruang-warna secara integrasi. Dengan kata lain, pengguna boleh memilih sumbangan pemberat bagi bentuk dan warna dalam imej pertanyaan apabila mencari tanda-tanda perdagangan yang kelihatan sama. Kaedah momen Zernike dan teknik ruang-warna dipilih kerana keduanya saling melengkapi. Kaedah momen Zernike berupaya menggambarkan keseluruhan bentuk tanda perdagangan sementara kaedah ruang-warna dapat menyediakan maklumat ruang dan hubungan warna bagi imej tanda perdagangan dengan berkesan.

Dalam projek ini, penyiasatan secara menyeluruh telah dijalankan. Sistem yang dibangunkan telah diuji pada pangkalan data tanda perdagangan yang mengandungi 1000 imej tanda perdagangan yang terdiri daripada pelbagai kelab bola sepak dan universiti dari seluruh dunia. Sistem ini telah berjaya dibangunkan menggunakan MATLAB[®] dan peti perkakasan pemprosesan imej[®]. Setiap capaian mengambil jumlah kiraan masa yang munasabah (± 6 saat pada persekitaran Pentium IV – Windows 2000 Professional menggunakan kapasiti 240MB RAM). Keputusan kajian menunjukkan bahawa dengan menggunakan kaedah momen Zernike sahaja, hanya ciri-ciri bentuk dapat diwakilkan, oleh itu hanya tanda perdagangan yang berbentuk sama berjaya dicapai. Sebaliknya, dengan hanya menggunakan teknik ruang-warna, keputusan pertanyaan hanya memberikan capaian tanda-tanda perdagangan yang berasaskan kaitan warna. Oleh itu, dalam mencapai tanda-tanda perdagangan yang paling relevan dari sudut penglihatan kasar, percubaan dan pemerhatian dicadangkan untuk dilaksanakan. Sumbangan pemberat yang seimbang bagi kaedah momen Zernike dan teknik ruang-warna berupaya mencapai

tanda-tanda perdagangan yang relevan. Sebagai kesimpulan, projek ini telah berjaya membangunkan satu kaedah capaian tanda perdagangan secara automatik dan berkesan.

First and foremost, I deeply thank my supervisor, Associate Professor Dr. Muhammad Saiful Huda for his work in digital image processing, providing the necessary impetus for this research. This research would not have been possible without the constant encouragement, patience and guidance from him. I would also like to thank Associate Professor Dr. Mohdali Mat Didi for agreeing to participate on my thesis committee.

I am indebted to all my colleagues for their support and encouragement during the course of my graduate study. I should also acknowledge the financial support, PANGSA-SISWAZATI, provided by the Ministry of Science and Technology for my graduate studies.

Many thanks go to my husband, Erasmahmad Affien, who provided immeasurable support and help during this project. Special gratitude to my family especially my beloved mother, Fatmahan Mohamad, my brother, Wan Huda, my six sisters, Wan Geri, Wan Zaida, Wan Husnah, Wan Faridah, Wan Farhanah and Wan Faridah, for their invocation and moral support.