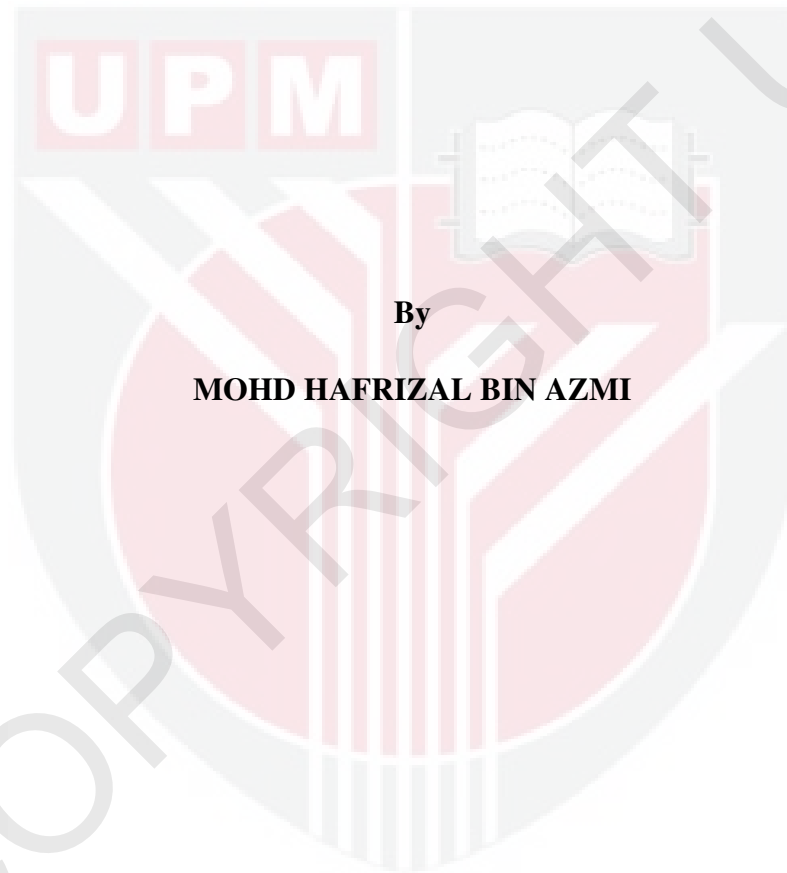**UNIVERSITI PUTRA MALAYSIA**

VARIABLE ILLUMINATION COMPENSATION FOR PIGSKIN LEATHER IMAGES USING LOCAL AND GLOBAL BLOCK ANALYSIS

MOHD HAFRIZAL BIN AZMI

FK 2012 23

VARIABLE ILLUMINATION COMPENSATION FOR PIGSKIN LEATHER IMAGES USING LOCAL AND GLOBAL BLOCK ANALYSIS

By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science.

VARIABLE ILLUMINATION COMPENSATION FOR PIGSKIN LEATHER IMAGES USING LOCAL AND GLOBAL BLOCK ANALYSIS

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March 2011

Chair: M. Iqbal Saripan, PhD

Faculty: Engineering

Variable illumination seems to be a main challenge to any automatic image processing system particularly in the segmentation and recognition part. The new intensity variations, which do not presence in the original image, may lead to a false segmentation result. In this research, we present a method to compensate the imbalance illumination in pigskin leather texture image.

The main objective of this research is to offer an alternative pre-processing tool for further image enhancement procedures that is fast, simple and robust. The method utilizes the information within the local and global area of the image. The results are promising as the output image illumination condition is improved. In addition to that, the performances are either similar or better if to be compared to other established methods.

However, the output images are affected by the visibility of the block boundaries. It happens due to the rapid intensity variation across the block boundaries, which is caused by the inaccurate residual selected for the normalization step. The next objective of this thesis is to remove the blockiness effect while still maintain the image attributes and improve the illumination condition.

Some sets of modifications are employed to the basic model of local-global block analysis (B-LGBA) in order to eliminate the blockiness effect including horizontal improvement (HI-LGBA), vertical improvement (VI-LGBA), horizontal-vertical improvement (HVI-LGBA) and vertical-horizontal improvement (VHI-LGBA).

The results produced by the enhanced LGBA illustrated that the modifications to be made are depending on the illumination trend. If the illumination is in one direction, the single modification is sufficient to remove all the boundaries. However, if the illumination is multi-directional, combined modifications are necessary, with the less-influencing direction must be dealt first.

The accuracy of the proposed method is evaluated via the error of the numbers of the segmented region counted in the output image. Most of the outputs are oversegmented due to the existence of other low-intensity pixels which are contributed by the non-uniform surface of the sample and also the blocky pattern. From our 20 samples consist of different illumination types, the HVI -LGBA and VHI-LGBA yielded the lowest percentage of the errors with 29.52% and 35.43% compared to the errors produced by the B-LGBA which is equal to 120.35%.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains.

PAMPASAN PENCAHAYAAN BERUBAH-UBAH BAGI IMEJ KULIT BABI MENGGUNAKAN ANALISIS BLOK TEMPATAN DAN GLOBAL

Oleh

MOHD HAFRIZAL BIN AZMI

Mac 2011

Pengerusi: M. Iqbal Saripan, PhD

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Pencahayaan tidak sekata menjadi cabaran utama kepada sistem pemprosesan imej automatik terutamanya dalam bahagian segmentasi dan pengecaman. Variasi intensiti baru, yang tidak wujud di dalam imej asal, boleh membawa kepada keputusan segmentasi yang tidak tepat. Dalam penyelidikan ini, kami memperkenalkan satu kaedah untuk pampasan bagi pencahayaan tidak seimbang di dalam imej tekstur kulit babi.

Objektif utama penyelidikan ini adalah untuk menawarkan satu teknik pre-pemprosesan alternatif untuk prosedur penambahbaikan imej selanjutnya yang pantas, mudah dan berkesan. Kaedah ini menggunakan informasi dalam kawasan tempatan dan global pada imej. Keputusannya adalah memberangsangkan apabila keadaan pencahayaan telah bertambah baik. Tambahan lagi, pencapaiannya adalah sama ada setara atau lebih baik jika dibandingkan dengan beberapa kaedah yang telah dikenali.

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Walaubagaimanpun, imej output telah terjejas dengan kemunculan sempadan blok. Ini berlaku kerana perubahan nilai intensiti merentasi sempadan blok adalah sangat ketara, yang mana disebabkan oleh pemilihan parameter yang tidak tepat untuk langkah penstabilan. Objektif tesis ini seterusnya adalah untuk menghapuskan kesan blok ini di samping tetap mengekalkan ciri-ciri imej dan menambahbaik keadaan pencahayaannya

Beberapa set pengubahsuaian telah dibuat ke atas model asas kaedah analisis blok tempatan-global (B-LGBA) untuk menghapuskan kesan corak blok termasuk penambahbaikan melintang (HI-LGBA), penambahbaikan menegak (VI-LGBA), penambahbaikan melintang-menegak (HVI-LGBA) dan penambahbaikan menegak-melintang (VHI-LGBA).

Keputusan yang dihasilkan oleh LGBA yang telah diubahsuai menunjukkan bahawa pengubahsuaian yang perlu dilakukan bergantung kepada keadaan pencahayaan. Jika pencahayaan hanya dalam satu arah sahaja, penambahbaikan dalam satu arah sudah mencukupi untuk menghapuskan semua sempadan blok. Tetapi, jika pencahayaan adalah dalam pelbagai arah, gabungan pengubahsuaian adalah diperlukan, dengan pengaruh pencahayaan yang lebih rendah perlu diselesaikan dahulu.

Ketepatan bagi kaedah ini diukur dengan ralat bagi jumlah kawasan dibahagi, yang dikira di dalam imej output. Kebanyakan output dibahagi secara lebihan kerana wujudnya piksel dengan nilai intensiti yang rendah yang disebabkan oleh ketidakrataan permukaan sampel serta corak blok. Daripada 20 sampel yang mempunyai keadaan pencahayaan yang berlainan, HVI-LGBA dan VHI-LGBA menghasilkan purata peratusan ralat yang terendah dengan 29.52% serta 35.43% jika dibandingkan dengan purata ralat yang dihasilkan oleh B-LGBA iaitu 120.35%.

I certify that a Thesis Examination Committee has met on 31 March 2011 to conduct the final examination of Mohd Hafrizal Bin Azmi on his thesis entitled "Variable Illumination Compensation for Pigskin Texture Images Using Local and Global Block Analysis" in accordance with the Universities and University College Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

Members of the Thesis Examination Committee were as follows:

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the Master of Science. The members of the Supervisory Committee were as follows:

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

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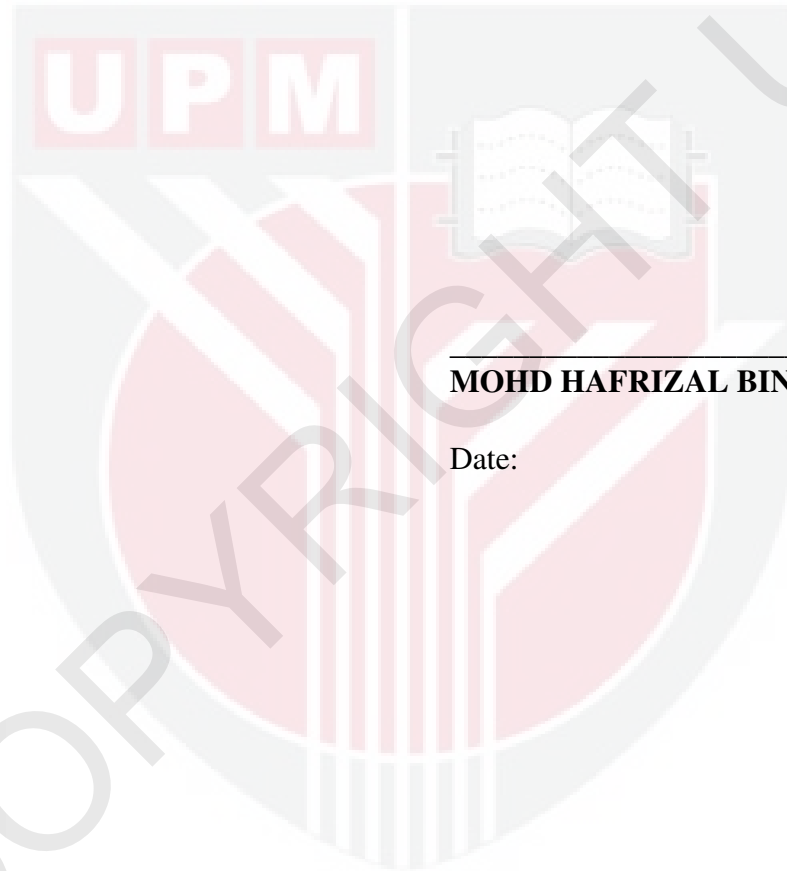
MOHD HAFRIZAL BIN AZMI

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