UNIVERSITI PUTRA MALAYSIA

FACIAL FEATURE EXTRACTION BASED ON IMPROVED HARRIS CORNER DETECTION ALGORITHM

ELHAAM BAGHERIAN

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By

ELHAAM BAGHERIAN

**Thesis Submitted to the School of Graduate Studies,
Universiti Putra Malaysia, in Fulfilment of the Requirements
For the Degree of Master of Science**

July 2011

DEDICATION

To whom made me think

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

FACIAL FEATURE EXTRACTION BASED ON IMPROVED HARRIS CORNER DETECTION ALGORITHM

By

ELHAAM BAGHERIAN

July 2011

Chairman: Assoc. Prof. Rahmita Wirza O.K. Rahmat, PhD

Faculty: Computer Science and Information Technology

The extraction of facial feature points has become an important issue in many applications, such as face recognition, face expression recognition and face detection. Segmenting the facial features' points in an image is the first important step for human face recognition, identification and verification. Problems occur in different face orientations and poses, and under varied lighting conditions, covering and facial expressions.

A method of facial feature extraction and corner detection is presented in this study to unravel these problems. The proposed technique has been developed to extract the facial features from a colored image, captured by the webcam under normal lighting condition. In order to precisely extract the facial features such as eyes, mouth and nostrils, some preprocessing steps are employed once the image is captured. Some of these steps are also used during the corner detection phase.

Experiments are conducted with a number of images from the frontal, near frontal, up and down views of the head and from different expressions such as happy, sad, surprised and

neutral. This technique is evaluated on two different standard databases, BioID and George Tech. These two databases consist of 1520 images and 710 images respectively. Each of these databases includes images with different orientations and expressions, occlusions and lighting conditions.

This technique is also tested using five different webcams; with different levels of resolution and quality and web camera specifications, in order to maintain the accuracy of the technique. The performance of the technique is judged by its accuracy on each of the features like nose, eyes and mouth. After validations and verifications are made which are based on the defined performance parameter, it can be observed that the proposed technique is more accurate and precise.

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

PENGEKSTRAKAN CIRI MUKA BERASASKAN ALGORITMA PENGESANAN SUDUT HARRIS YANG DITAMBAH BAIK

Oleh

ELHAAM BAGHERIAN

Julai 2011

Pengerusi: Prof. Madya Rahmita Wirza O.K. Rahmat

Fakulti: Sains Komputer dan Teknologi Maklumat

Pengekstrakan titik ciri wajah telah menjadi isu penting dalam banyak aplikasi, seperti pengecaman wajah, pengecaman ekspresi muka dan pengesanan wajah. Mensegmenkan titik ciri wajah dalam imej adalah langkah pertama yang penting untuk pengecaman, pengenalan dan pengesahan wajah manusia. Masalah-masalah umumnya berlaku pada kepelbagaian orientasi muka dengan kedudukan di bawah keadaan pencahayaan yang berbeza juga wajah terlindung dengan kepelbagaian riak wajah.

Satu kaedah pengekstrakan ciri wajah dan pengesanan sudut dipersembahkan dalam kajian ini untuk mengungkap masalah tersebut. Teknik yang dicadangkan ini dibangunkan untuk mengekstrak ciri wajah pada gambar berwarna, yang ditangkap menggunakan webcam di bawah keadaan pencahayaan yang normal. Untuk mengekstrak ciri wajah seperti mata, mulut dan hidung secara tepat, beberapa langkah Prapemprosesan dijalankan selepas foto diambil. Langkah-langkah ini juga digunakan semasa fasa pengesanan sudut.

Eksperimen dijalankan dengan beberapa imej dari hadapan, berhampiran pandangan hadapan, atas dan bawah kepala pada riak wajah yang berbeza seperti seronok, sedih, terkejut dan neutral. Teknik yang dicadangkan ini, dinilai berdasarkan kepada dua pangkalan data piawai yang berbeza, iaitu BioID dan GEORTECH. Kedua-dua pangkalan data ini masing-masing terdiri daripada 1520 dan 710 gambar. Setiap pangkalan data ini mempunyai gambar dengan orientasi dan riak wajah yang berbeza, wajah terlindung dan kondisi pencahayaan yang berbeza.

Teknik ini juga diuji dengan lima webcam yang berbeza; dengan pelbagai ciri seperti resolusi dan kualiti untuk mengesahkan bahawa dengan webcam yang berbeza spesifikasi, ketepatan teknik dapat dipertahankan. Prestasi teknik ini dinilai daripada ketepatan setiap ciri yang ditemui seperti hidung, mata dan mulut. Setelah disahkan dan dibuktikan berdasarkan pada parameter prestasi yang telah ditetapkan, dapat dilihat bahawa teknik yang dicadangkan lebih tepat dan jitu.

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I also want to thank all my second family members in Malaysia, including all my friends, for providing me with great friendship and experience in my academic and social life.

I certify that a Thesis Examination Committee has met on 1st of July 2011 to conduct the final examination of Elhaam Bagherian on her thesis entitled "**FACIAL FEATURE EXTRACTION BASED ON IMPROVED HARRIS CORNER DETECTION ALGORITHM**" in accordance with 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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DECLARATION

I declare that this 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 it is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institutions.

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ELHAAM BAGHERIAN

Date: 1 July 2011

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