

بسم الله الرحمن الرحيم

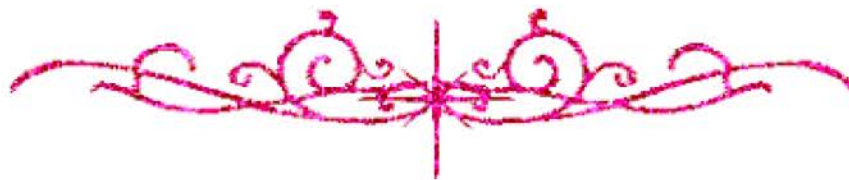


HOSSAM MAGHRABY



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم



HOSSAM MAGHRABY

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
على هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



A decorative flourish in red ink, consisting of a central vertical line with symmetrical, flowing, scroll-like patterns on either side.

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بعض الوثائق الأصلية تالفة



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بالرسالة صفحات

لم ترد بالأصل



HOSSAM MAGHRABY

6/10, 28

SURFACE REGISTRATION FOR THE ANALYSIS OF 3D ORTHODONTIC TREATMENT

By

Bloey

Ola Mahmoud Abd ElRahman ElBakry

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE

in
SYSTEMS AND BIOMEDICAL ENGINEERING

Approved, chairman
[Signature]

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

GIZA, EGYPT.

April 2007.

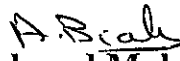
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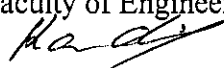
By

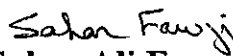
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Abstract

Image registration is a crucial step in image analysis tasks in which the final information is gained from the combination of various data sources like in image fusion, change detection, and multi-channel image restoration. Typically, registration is required in medicine, to obtain more complete information about the patient, such as monitoring tumor growth, treatment verification, and comparison of the patient's data with anatomical atlases.

Registration techniques can be based on a limited set of identified points, on the alignment of segmented structures, most commonly object surfaces, or directly onto measures computed from the image intensity values.

This work is concerned with the development of a new method for the surface registration of three-dimensional (3D) objects with a special interest in skull registration. Two main approaches are introduced to find the optimal registration parameters. The first approach is based on the iterative closest point (ICP) algorithm and the second is based on matching surface signature images.

In both approaches, at first, some points are chosen and known as critical points. The critical points are selected depending on three different criteria. The criteria are based on the distance histogram, the neighborhood condition and the principal curvatures. The different criteria resulted in various critical points and accordingly different registration accuracies. The results have shown that the one with the highest performance is the method based on the principal curvatures calculation. In the signature images approach, surface signature images are created at each critical point. By matching these images from both objects the registration parameters are found. Various image matching techniques are presented.

In the iterative approach, the ICP algorithm is applied only on the critical points chosen instead of applying it to the whole point set. This significantly has reduced the processing time while preserving almost the same accuracy of applying the ICP algorithm alone.

The different registration approaches, introduced in this research work, are applied on pre-operative and post-operative human skulls. Pre-post operative registration is essential for monitoring the treatment progress and verification. Different objects especially skulls are successfully registered. Our approaches have

shown robustness and satisfactory results in terms of both the efficiency and the time needed.