شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومـــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قَسَـــم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

DEVELOPMENT AND ANALYSIS OF IMAGE FUSION TECHNIQUES FOR SATELLITE DATA MERGE AND ENHANCEMENT

BY

Eng. Mohamed Ismail Sayed Ahmed Ismail

A Dissertation submitted to the
Faculty of Engineering - Cairo University
in Partial Fulfillment of the
Requirement for the Degree of

Doctor Of Philosophy
In
CIVIL ENGINEERING

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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I like to dedicate this dissertation to my family and my wife who supported me during the whole time of this research

ABSTRACT

Image fusion of satellite data is an important aspect of digital remote sensing processing. Satellite data are rapidly increasing covering the whole earth with different resolutions, formats, bands, and characteristics.

Multispectral and hyper spectral data must be all utilized for maximizing the benefit gained from the remote sensing imaging process. Image fusion is utilized for merging the active and passive as well as panchromatic, multispectral, and hyper spectral data using advanced image processing techniques to enhance image quality and produce better interpreted fused images. It is used for improving image sharpening and classification as well as change detection preserving as possible the accuracy of highest resolution input image.

In this research, major active and passive systems are surveyed and previous research with image fusion techniques is presented and analyzed. Different image fusion techniques are evaluated. A case study area is chosen in Kafr El-Sheik governorate in the northern coast of Egypt. Different remote sensing data are utilized, including LANDSAT, SPOT, IRS, AND RADAR images acquired at various dates. Ground control points (GCP's) coordinates are collected using GPS technique. Then, satellite images are radiometrically and geometrically corrected.

Major software image fusion techniques are analyzed including optical and RADAR techniques. Output fused images are studied and evaluated and major benefits and shortcomings are listed. A new rigorous image fusion technique is developed for image data fusion utilizing a concept similar to equivalent resistance of parallel electrical resistances. The developed model can be used for handling all data types with any band number. The user can

select input and dominant bands according to the application at hand and the gained previous experience of the user.

The developed model is tested and evaluated utilizing various satellite images covering the case study area.It has proven to be very efficient and the output fused images have better quality, more easy interpreted, and has an accuracy close to the highest resolution of the input image. A list of assessment measures is used to judge the output from the developed image fusion techniques. The developed technique is also used for enhancing high- resolution / low- quality panchromatic data (IRS images) with low-resolution / high-quality panchromatic data (SPOT images).

A new approach for multi-date change detection technique is developed to produce fast three-dates output thematic image showing variations along the three successive dates. This technique is tested using various satellite data and an output thematic legend showing change variations automatically derived based on the color combination concept.