UNIVERSITI TEKNOLOGI MARA

DERIVATION OF RADIATIVE TRANSFER PARAMETERS USING IMAGE-BASED TECHNIQUE

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Thesis submitted in fulfilment of the requirements
for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It was original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The correction of atmospheric effects is very essential because visible bands of shorter wavelengths are highly affected by atmospheric scattering especially of Rayleigh scattering. In this processes, the most important parameters need to be known is the optical characteristics of the atmosphere. The most challenge is to obtain accurate values for those parameters and limited availability of the atmospheric correction parameters in the analyses. In available atmospheric correction algorithms, lack of study has found in emphasizing the appropriate chosen of atmospheric models with specific atmospheric condition. Thus, the question was set in this study are which criteria can be used to justify which atmospheric models is suitable to be applied. This study is attempting to answer whether selection of atmospheric models is based on regional atmospheric condition or geographic location. To prove this, it will require the information from aerosol optical parameters. Therefore, in determining the appropriate atmospheric model for different urban types; the atmospheric parameters (visibility and aerosol loading) need to be estimated. The proposed method is a combination of the radiative transfer equation and dark target subtraction technique. Two important atmospheric parameters in the radiative transfer equation which are visibility and aerosol loading are estimated from the image itself to be as an input in atmospheric modelling. ATCOR-2 was used to perform different atmospheric models (maritime and urban) which can represent regional climatic condition in Kuala Lumpur and Penang Island. Dark pixel target in the scene was subtracted from visible (blue band) and near-infrared (NIR) band of Landsat image to optimize the aerosol loading retrieved from scattering and absorption factor. By relating the determined aerosol optical thickness with visibility values, urban model at the visible (blue band) on image 2005 for both sites, showed a high correlation coefficient, r^2 = 0.8720 for Kuala Lumpur and r^2 = 0.8896 for Penang Island. The results showed an agreement pattern with Forster's aerosol optical thickness versus visibility and from Tanré's model. However, maritime model and NIR band shows the opposite pattern of the established model. Thus, urban model in visible (blue band) has been chosen for both sites. Results presented in this study had demonstrated that determination of suitable atmospheric model can be outlined on four different types of urban which based on the regional climate condition. It has been shown that determined the aerosol for both sites is highly correlated to the visibility range from 10 to 50 km. Study also found that optical satellite remotely sensed image data (Landsat TM blue band) can be used to determine the visibility value through the darkest pixel atmospheric correction algorithms.

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