

INNOVATIVE SATELLITE IMAGE MAP OF R.ALKHABRTA AREA, SAUDI ARABIA USING HIGH RESOLUTION IMAGE

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ABSTRACT:

Satellite remote sensing can provide a variety of useful data for various type of research. Satellite image map is one of the products that aim to promote remote sensing. In this study, a high resolution satellite image was used to create a high resolution satellite image map over AlKhabra, Saudi Arabia. The objective of this project is to produce a satellite image map by using remote sensing technique to map the distribution of land use, land desert characteristics, and related transportation variables through space and over time. A good quality satellite data have been selected to produce a satellite image map. Processing procedure includes geometric correction, contrast stretching, filtering and area cutting. The final product of satellite image map will be maps at scales of 1:91,831.00. This study indicated that the useful of high resolution satellite image to produce a high resolution satellite map.

1. INTRODUCTION

A major advantage of remotely sensed satellite images is the regional/synoptic view of the data. The regional perspective view is enhanced further by digitally mosaicking different images collected by the same satellite to cover an even larger regional area. Another advantage is the multitemporal aspect of satellite images, which can be used to monitor changes on the Earth's surface or update an existing data set.

In this project, we are produced a satellite image map by using high resolution remote sensing data over AlKhabra, Saudi Arabia. The increasing availability of remote-sensing images, acquired periodically by satellite sensors on the same geographical area, makes it extremely interesting to develop the monitoring systems capable of automatically producing and regularly updating land-cover maps of the considered site (Bruzzone, et al., 2002). Presently, satellite image map offers valuable information for many applications, such as agricultural applications, tourism management and planning, traffic network planning, industry management etc.

The main objective of this study is to evaluate the accuracy of each classification technique to classify the high spatial resolution digital satellite images. Three supervised classification methods were used in this study Maximum Likelihood, Minimum Distance-to-Mean, Parallelepiped and Parallelepiped with Maximum Likelihood Classifier

Tiebreaker). Supervised classification of multispectral remote sensing imagery is commonly used for land cover determination (Duda and Canty. 2002). Parallelepiped with Maximum Likelihood Classifier Tiebreaker classifier was found to produce the best accuracy in this study.

2. STUDY AREA

The study area in the Arabian Peninsula, located between 12 °N and 32 °N latitude and between 20 °E and 35 °E longitude. This particular geographical position gives the area great bioclimatic diversity. Saudi Arabia physical geography can be divided into five geographic regions: (i) the Western Highlands, (ii) the Central Plateau, (iii) the Northern Deserts, (vi) the *Rub al Khali* desert, and (v) the Eastern Lowlands. The selected study area is centered on City of Alkhabra, Saudi Arabia. Figure 1 shows the study area of the City of Alkhabra and its surrounding desert terrain.

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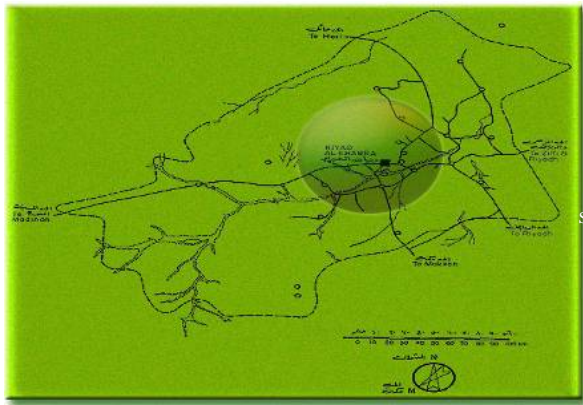
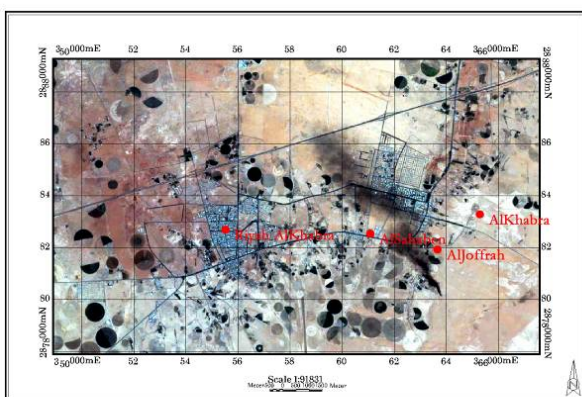


Figure 1. The study area of the City of Alkhabra, Saudi Arabia

3. DATA ANALYSIS AND RESULTS

To produce satellite image map, good quality satellite data have been selected. Processing procedure includes geometric correction, contrast stretching, mosaicking, filtering and area cutting. Band combination is made available both 321 in true color. All image-processing analysis was carried out using PCI Geomatica version 9.1.8 software at the School of Physics, University of Science Malaysia (USM). Figure 2 shown a satellite image map at scales of 1:91,831.00.



LEGEND
 Urban Area
 Road
 Vegetation
 Sand/Land

Figure 2. The satellite image map of the City of Alkhabra, Saudi Arabia

The images analysis involved three basic steps in supervised classification: the training stage, the classification stage and the output stage. Training sites were needed for supervised classification. In the training stage, the areas were established using polygons. They are delineated by spectrally homogeneous sub areas, which have, class name given. In the classification stage, three supervised classification methods were selected to classify the video images. Maximum Likelihood, Minimum Distance-to-Mean, and Parallelepiped were applied in the present study.

In the output stage, the classification map is a thematic map of the land cover over Penang Island, Penang. Many methods of accuracy assessment have been discussed in remote sensing literatures. Kappa statistic was used in this study. It is widely used because all elements in the classification error matrix, and not just the main diagonal, contribute to its calculation and because it compensates for change agreement (Selamat, et al., 2002). Kappa coefficients were generated to describe the proportion of agreement between the classification result and the validation sites after random agreements by chance are removed from consideration these data (Thomas, et. al., 2002). Three measures of accuracy were tested in this study, namely overall accuracy, error matrix and Kappa coefficient. In thematic mapping from remotely sensed data, the term accuracy is used typically to express the degree of 'correctness' of a map or classification (Foody, 2002). Figure 3 shows the flow chart for data processing of the images. The produced results in this study are shown in Table 1 and the accuracy assessment results were shown in Table 2. In this study, Maximum Likelihood classifier was found to produce the best accuracy. Finally, the land cover/use map of the desert area was classified using Maximum Likelihood classifier and shown in Figure 4.

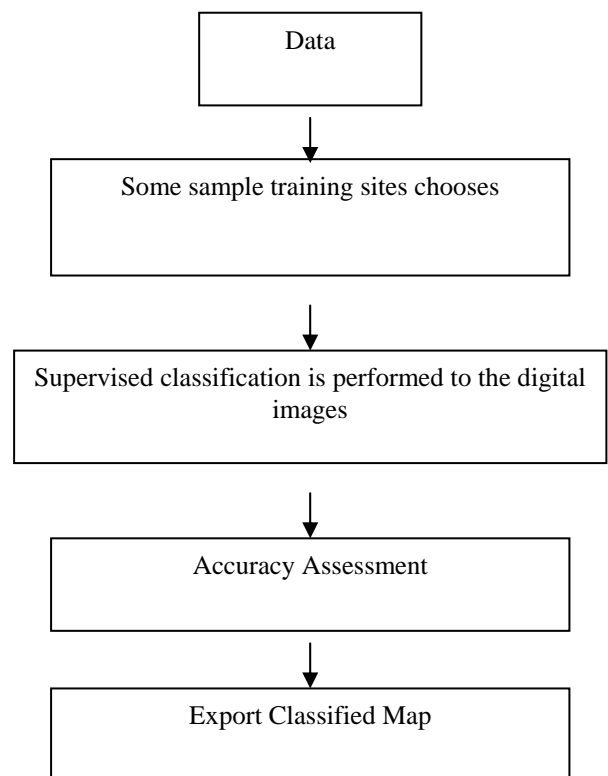


Figure 3. Flow chart for data processing of the image

Classification method	Kappa coefficient
Maximum Likelihood	0.9258
Minimum Distance-to-Mean	0.8369
Parallelepiped	0.63285

Table 1. The Kappa coefficient for the image

Classification method	Overall classification accuracy (%)
Maximum Likelihood	93.61
Minimum Distance-to-Mean	83.62
Parallelepiped	63.25

Table 2. The overall classification accuracy for the image

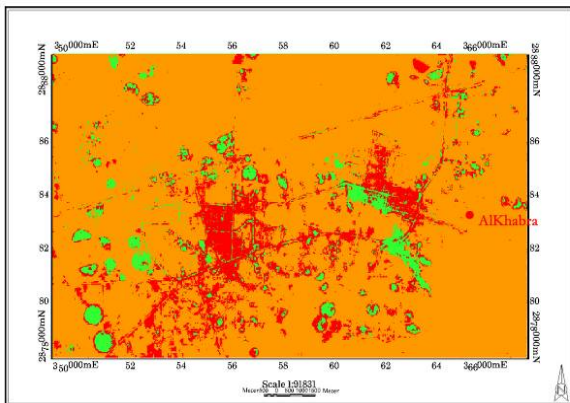


Figure 4. The satellite image map of the City of Alkhabra, Saudi Arabia [Color Code: Green = vegetation, Orange = land/sand, Red = urban area]

4. CONCLUSION

Satellite image as value-added data, is an alternative one that would be cost effective, up-to-date sources. Special requirements for digital format can also be made as that will be available at scales of 1: 50,000.00. A satellite image map at scales of 91,831.00 was produced in this study. This analysis has demonstrated the potential of a spatial approach in studying the land cover mapping. The Maximum Likelihood classifier produced high degree of accuracy. This study performed for creating the land cover map could be provides the useful for estimation of the vegetation area over Makkah, Saudi Arabia. From the result of the accuracy assessment, we were quite confident of the classified shown.

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