

*SPOT HRV-XS*

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Change Detection Using Digital Satellite Data  
Case study: The Holly City of Makkah and its Surroundings

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**Abstract**

Monitoring and detecting changes of land cover and land use are very

important in planning. Satellite data is an ideal tool to monitor changes on a regular basis. There are numbers of methods developed for using satellite data to detect changes. Among these methods is the principal component analysis (PCA).

This study aimed to evaluate the potentials of PCA for detecting changes in the City of Makkah and the surrounding areas during 1992-1998, using SPOT HRV-XS data. Another aim was to develop and test several PCA's procedures for detecting changes.

Two methods containing four different procedures were used to achieve the objectives of this study. The procedures are: (1) threshold (2) classification of all merged PCs (3) classification of selected merged PCs (4) classification of selected individual PCs.

The study concluded that threshold is the most accurate and the simplest for change detection. However, defining threshold is value is very critical and could be influenced by the user's opinion. This study also found the magnitude of changes in the study area is about 10 square kilometers. 58% of these changes is related to vegetation loss or gain. The remaining percentage is for ground construction build up.

*Mouat, et al., (1993)*

*change detection*

*Macleod and)*

*(Congalton, 1998)*

*brightness values*

*digital numbers*

*.digital satellite images*

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*visual observation*  
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*digital image processing*  
*principal components analysis* .  
*principal axis* *variance*  
 .(Show and Wheeler, 1985)  
*transformation*  
 .(Jensen, et al., 1997)  
*spectral bands* .(1997)  
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 (Byrne, et al., 1980  
 .  
 % % *accuracy level*  
 .(Fung, 1992; Macleod and Congalton, 1998; Martin, 1989; Michener and Houhoulis.)  
 .(1997)  
 .(Green, et al., 1994)  
 ) (Fung, 1992)  
 Charbonneau, et al., ) (1993(Jensen, 1981  
 .  
 .(Muchoney and  
 .(Haack, 1994



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*geometric*

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*.correction*

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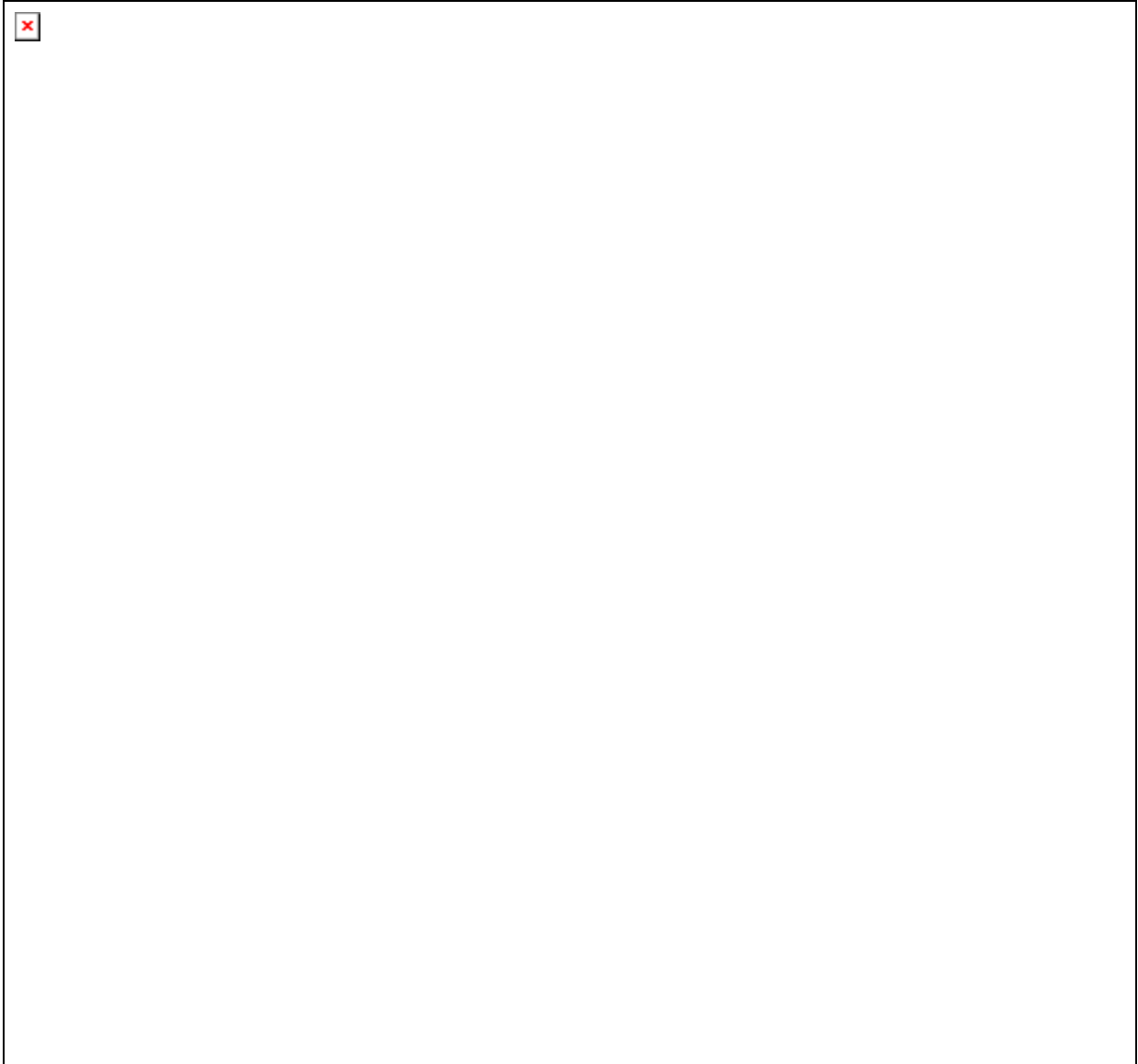
*(Hooper and Lee, 1990)*

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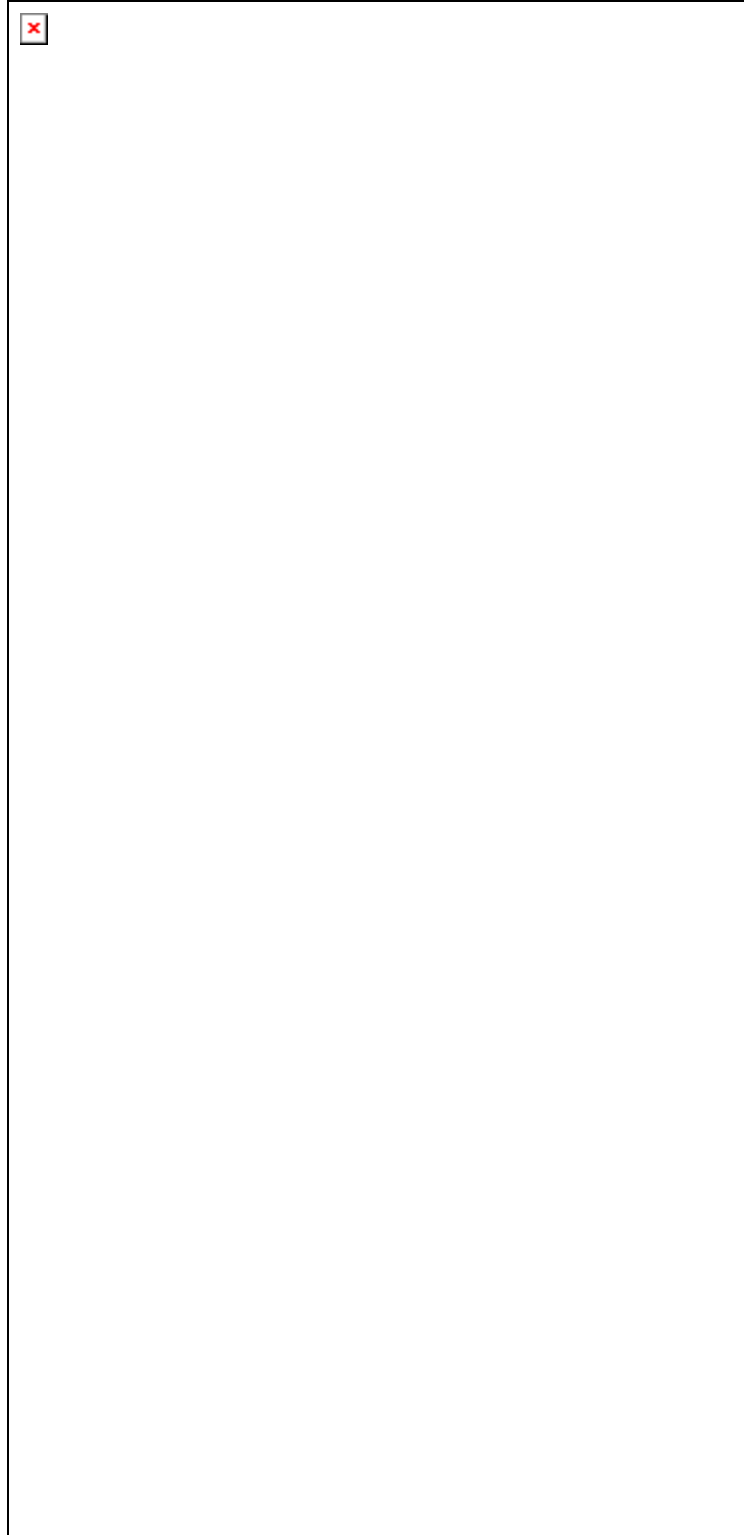
*the mean difference*

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*HRV-XS*



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*Earth*)

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*(Resource Mapping, 1998*

*color composite images*

*stretch*

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*common brightness*

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*threshold*

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*Lillesand and Kiefer,*

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Classification .٢ :

*unsupervised classification*

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*class*

*ground truth data*

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*spatial random sampling*

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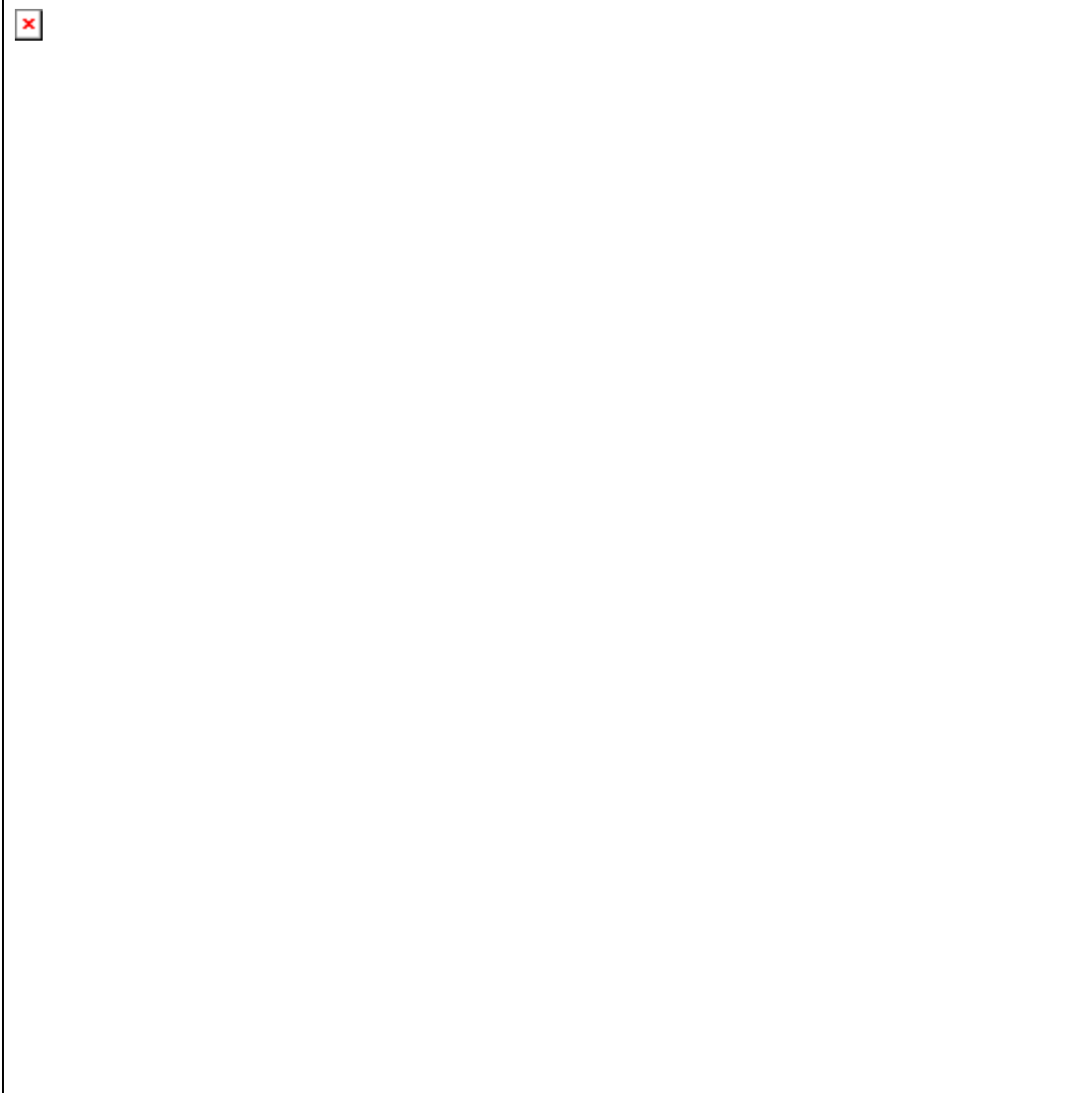
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principal component analysis

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