Technische Universität Berlin

Examination

Optical Remote Sensing

Computer Vision & Remote Sensing

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Name: .....

Matr.-Nr.: .....

Duration: 2 hours

Auxiliary Material: No

Berlin, 11. February, 2013

1 General Questions (15P)

a) What is the difference between passive and active remote sensing? (2p)

b) What characterizes **panchromatic**, **multispectral** and **hyperspectral** data? (2p)

c) 1. Give a **short description** of the three main effects describing the radiation/matter interaction: absorption, reflection, transmission. (5p)
   2. What is the relation between them? (1p)
   3. Denote two other radiation/matter interaction effects. (2p)

d) 1. What do the terms **gain** and **offset** mean? (1p)
   2. Why are the variation of **gain** and **offset** between the sensor elements problematic? (2p)

2 Data Analysis (15P)

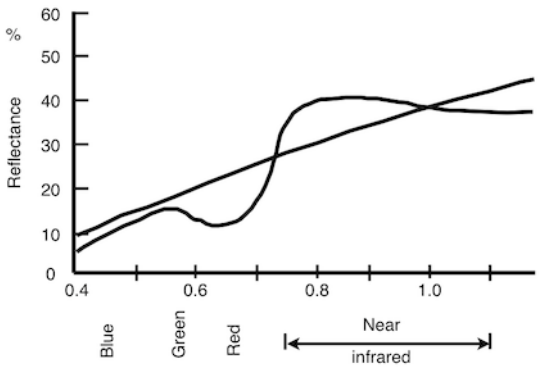

Figure 1: Measured Spectrum

a) Figure 1 shows 2 reflectance spectra. Identify both objects. (2p)

b) What is the cause of the absorption bands at about 440nm and 675nm in the reflectance spectrum of one of the two objects? (2p)

c) 1. Which wavelengths do you have to choose if you want to build a 2 band sensor in order to discriminate these two objects? (1p)
   2. Why? (3p)

d) Your sensor is working now, you have acquired data and you want to distinguish both surfaces. Suggest a method and describe it briefly. (4p)

e) 1. In your previous "classification", are you doing a spectral or thematic classification? (1p)
   2. Develop your answer by explaining the difference between both approaches. (2p)

3 Multispectral Transformation/Classification (20P)

a) Explain in detail the idea of a principal component analysis (PCA). (3p)

b) You want to analyze agricultural regions.

   1. Is PCA useful to analyze such region? *Give a detailed answer*. (1p)
   2. Is there any other way (other than PCA) to evaluate the **crop maturity** of agricultural regions? Explain the idea behind. (4p)
   3. Which properties can be measured by this method? (1p)
   4. What are the differences between this method and PCA? (2p)

c) The final goal is to perform a supervised classification.

   1. What is necessary to have before applying a supervised classification? (2p)
   2. Give, in detail, the principle of a supervised classification procedure. *No example is asked*. (4p)

d) The classification result is unfortunately quite noisy.

   1. Which filtering allow to remove misclassified pixels from the data? (1p)
   2. Explain how it works. (2p)

Altogether *50 points* can be obtained. A short and accurate style should be intented.

Pay attention to write a clear and comprehensible text. Always justify your answers!

Lot's of luck and do your best!