Technische Universität Berlin

Computer Vision &
Remote Sensing

Prof. Olaf Hellwich

Examination

Microwave and Radar Remote Sensing

Name: …..... **Matr.-Nr.**:.....

Duration: 2 hours **Auxiliary Material**: NO

To avoid misunderstanding, you are requested to write your answers in English.

Berlin, 14th July 2014

1. SAR (30 P)

a. Explain briefly why spaceborne earth observation by means of radar sensor is of interest. **(3 P)**

b. SAR Data properties. **(10 P)**
   1. *Describe the three main scattering mechanisms that a radar is sensitive to*. *6p*
   2. Describe **two objects** in a scene that leads to especially high backscattering. *2p*
   3. Describe **two objects** in a scene that leads to especially low backscattering. *2p*

c. The phase of a SAR image is not exploitable directly. **(4 P)**
   1. *Describe the two components of the SAR image phase.* *2p*
   2. *Indicate two approaches that exploits the SAR image phase* *2p*

d. Explain the following expressions, using sketches: **(3 P)**
   1. *Layover* *1p*
   2. *Shadow* *1p*
   3. *Foreshortening* *1p*

e. Indicate which system parameter(s) is(are) defining the spatial resolution and give an order of magnitude about the resolution of the nowadays satellites in : **(6 P)**
   1. *Slant range* *3p*
   2. *Azimuth* *3p*

f. *Describe a simple approach to detect oil spit in ocean.* **(4 P)**

2. SAR Interferometry (21)

a. General questions about interferometry: **(4 P)**
   1. *What is a “repeat-pass” sensor and its main application?* *2p*
   2. *What is a “single-pass” sensor and its main application?* *2p*

b. Interferometry quality **(5 P)**

1. *What is the name of the coefficient measuring the phase quality?* *1p*
2. *Denote two effects that leads to low phase quality?* *2p*
3. *Explain why these effects leads to low phase quality?* *2p*

c. Differential SAR Interferometry **(12 P)**

1. *Describe how a deformation on the earth surface might be detected using SAR Interferometry? (Give a brief detail of each step)* *4p*
2. *With what precision (Order of magnitude) can changes in the topography be measured by means of differential SAR Interferometry?* *2p*
3. *On which sensor parameters does this precision depends?* *2p*
4. *Give a numerical example of the DInSAR precision using a L-Band system with a phase accuracy of 10º.* *1p*
5. *What is the optimum baseline for DInSAR measurement?* *1p*
6. *Give at least 2 names of techniques making possible the analysis of slow surface movement.* *2p*

51 Points are available in total**.**

A short and accurate style as well as a clear handwriting should be intended.

Try to make your answers clear and concise, and answer the questions that you find easiest first.

Good Luck!