Basics and Principles of Radar Remote Sensing for
Environmental Applications

Homework #1 - SAR System

Comparison Of Three Data Providers

Peter Zweifel

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1 PROBLEM DEFINITION

GOAL   The following task was given in the assignment:

"*Task:* You are in charge of developing a new radar remote sensing software for monitoring vessels and sailboats on Lake Zurich. Before the project officially starts, you'll be required to find a suitable data provider, based on the following goals:

- Minimum distinguishable separation between targets of 8 m.
- Complete coverage of Lake Zurich."

SYSTEM NR. 1   Table 1.1 clearly shows that System Nr. 1 cannot be used, as its azimuthal resolution exceeds the prerequisites of the tasks (8m).

Table 1.1: Shows the computed values computed with the formulas given in the lecture.

Parameter	Nr. 1	Nr. 2	Nr. 3 (near-/far-range)
ρ_{az}	8.83 m	2.65 m	1.08 m / 1.71 m
ρ_{ra}	6 m	1.87 m	5 m
r_0	923'760 m	567'136 m	3310 / 5230 m
λ	0.0566 m	0.0312 m	0.2306 m

COMPUTATION   Computed with the following formulas:

$$\rho_{az} = r_0 \frac{\lambda}{2L_{sa}}$$

$$r_0 = \frac{altitude}{cos\alpha} \tag{1.1}$$

$$\lambda = \frac{c_{light}}{f}$$

1.1 COST CALCULATION AND COMPARISON

LAKE ZÜRICH   Lake of Zürich has about the following dimensions (see Wikipedia.ch)

$$Length = 42km$$
$$Width = 4km \tag{1.2}$$

SYSTEM NR. 3   With System Nr. 3 it would take 10 pictures (5 à 2 rows) à 1200 CHF.

$$= 12'000\ CHF$$

SYSTEM NR. 2   System Nr. 2 would cost 4500 CHF in this operation, about one third of System Nr. 3.

$$= 4500\ CHF$$

FINAL DECISION   System Nr. 3 may be precise as well and also more flexible in task operation planning; thrice the price of system Nr. 2, however, seems to be too much of an expense.
System Nr. 2 would be chosen in this configuration as the data provider for this task, as it is cheaper than the others and still very precise as well.