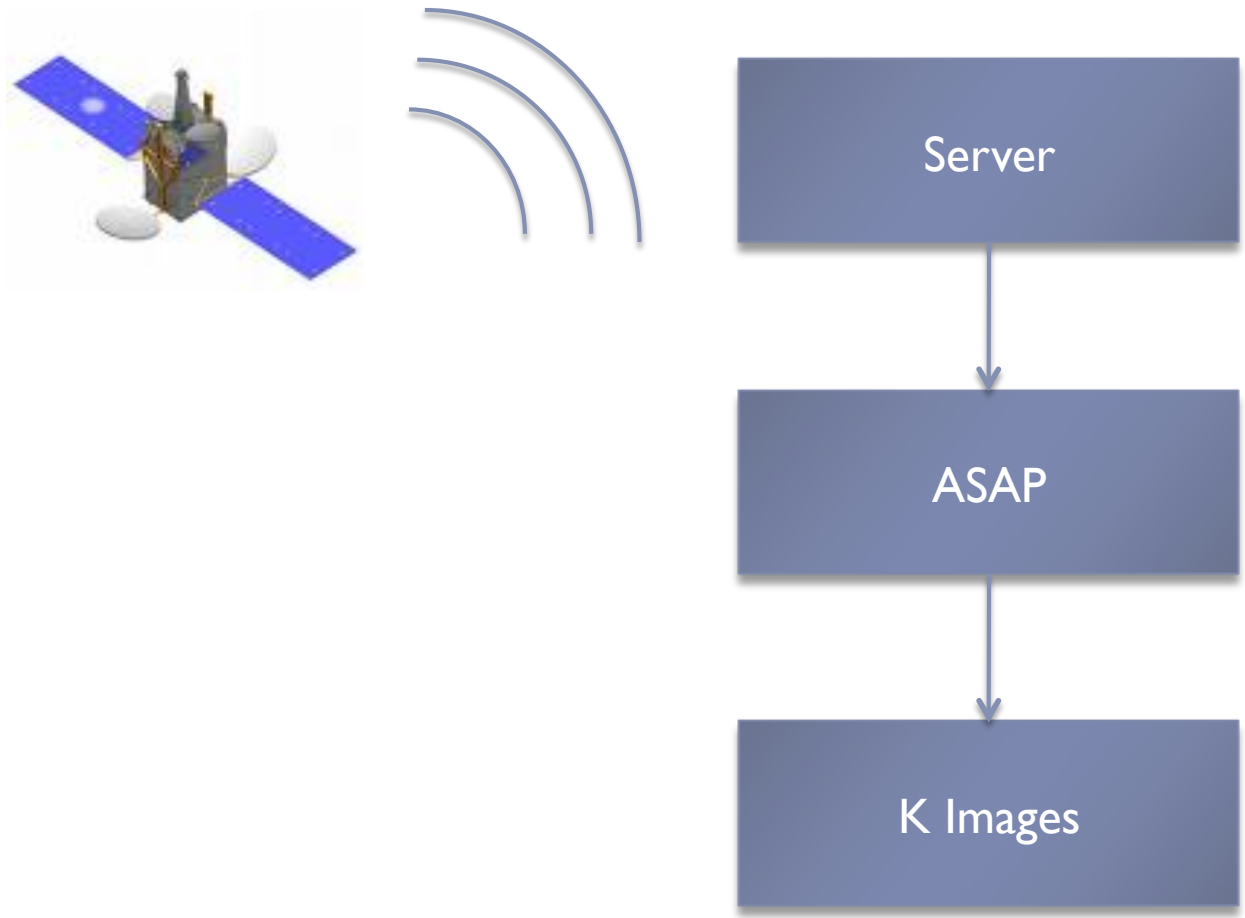
Automated Selection and Processing

Harald Hecking, Martin Kurowski

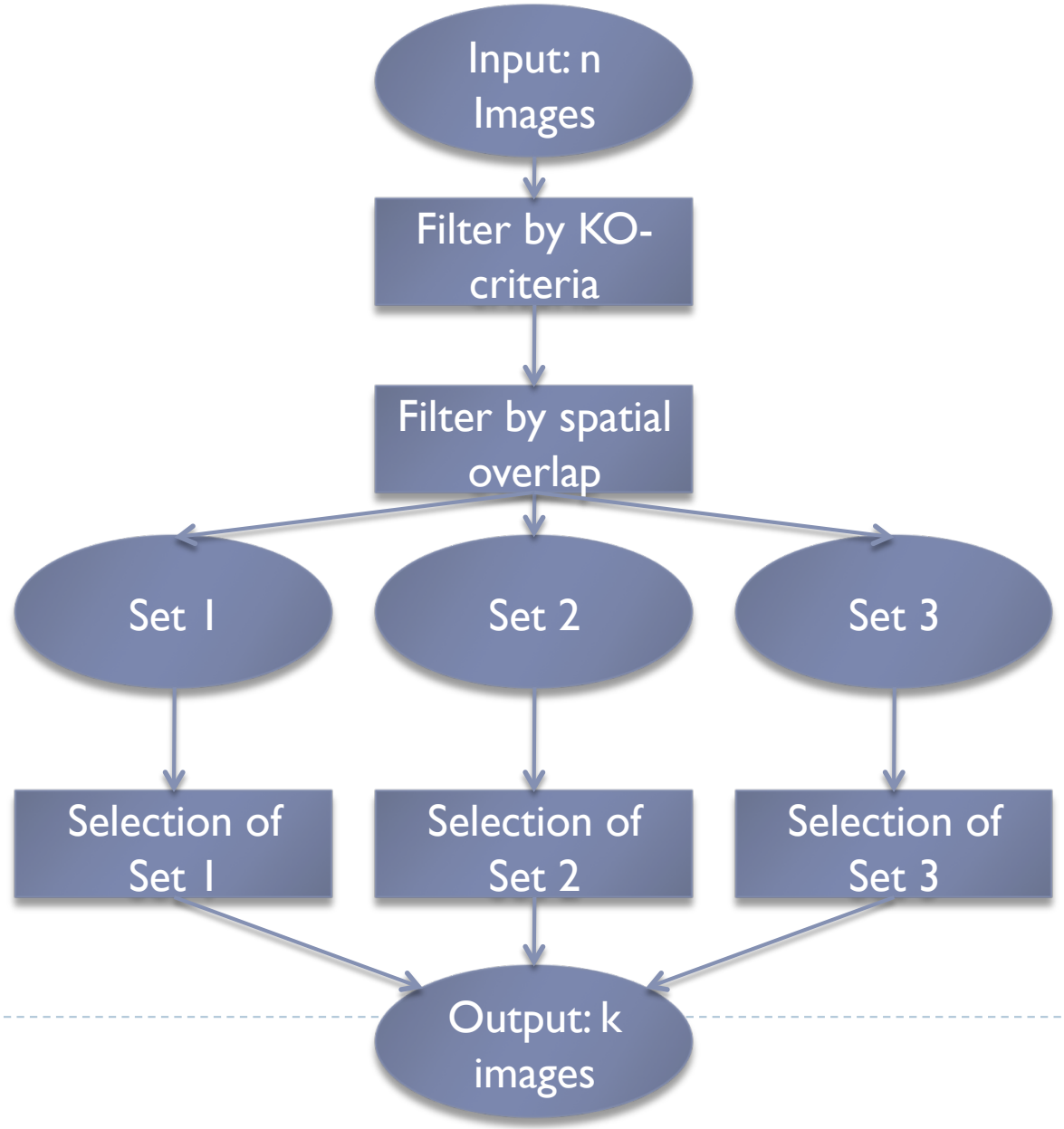
Introduction

- Problem:
  - Large amount of images, but many are useless
  - When getting a set of images, which image can be seen as representative for this set?
- Solution:
  - Automated Selection and Processing
  - Before working with images only the best images for the certain puropse will be provided
  - showing typical images for a certain set enables more efficient work

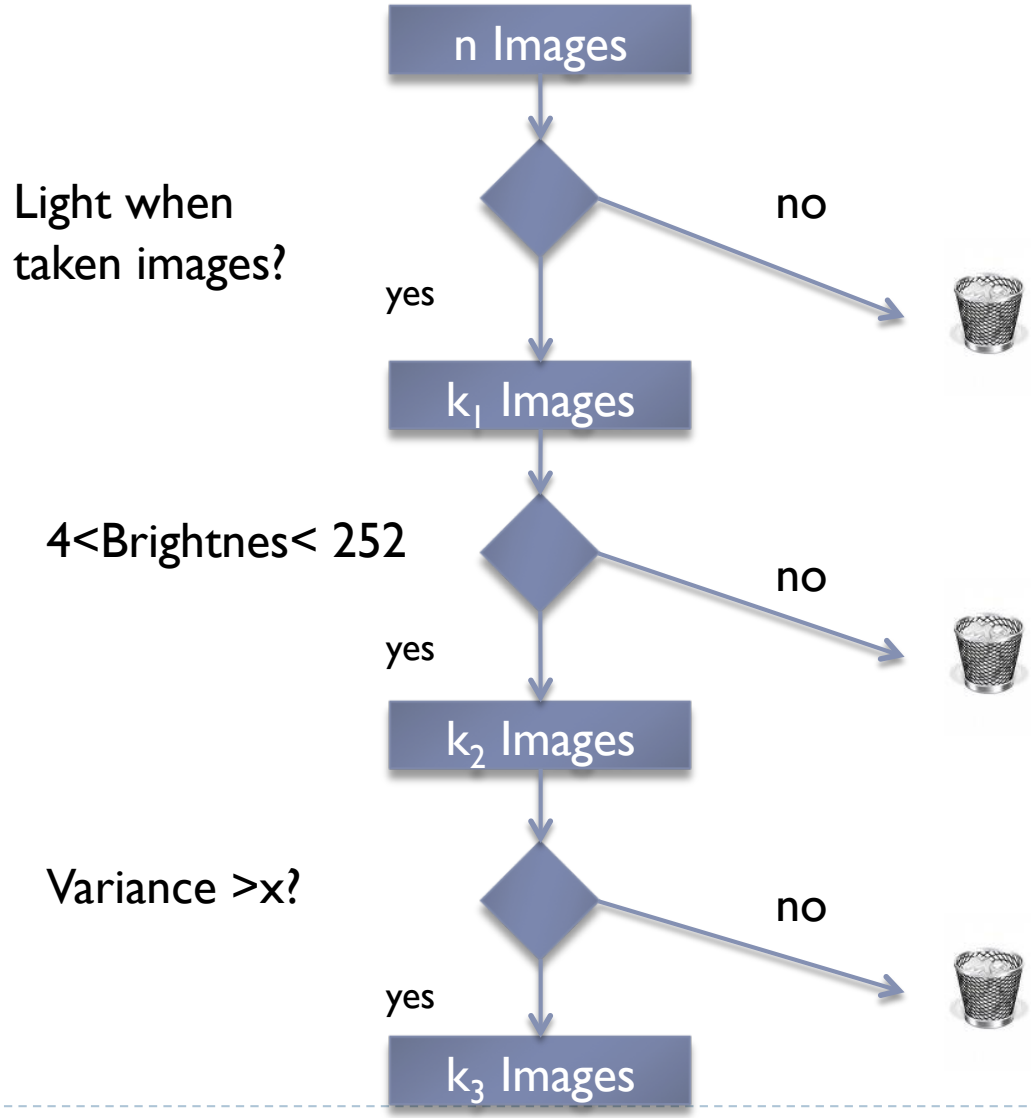
Function in general



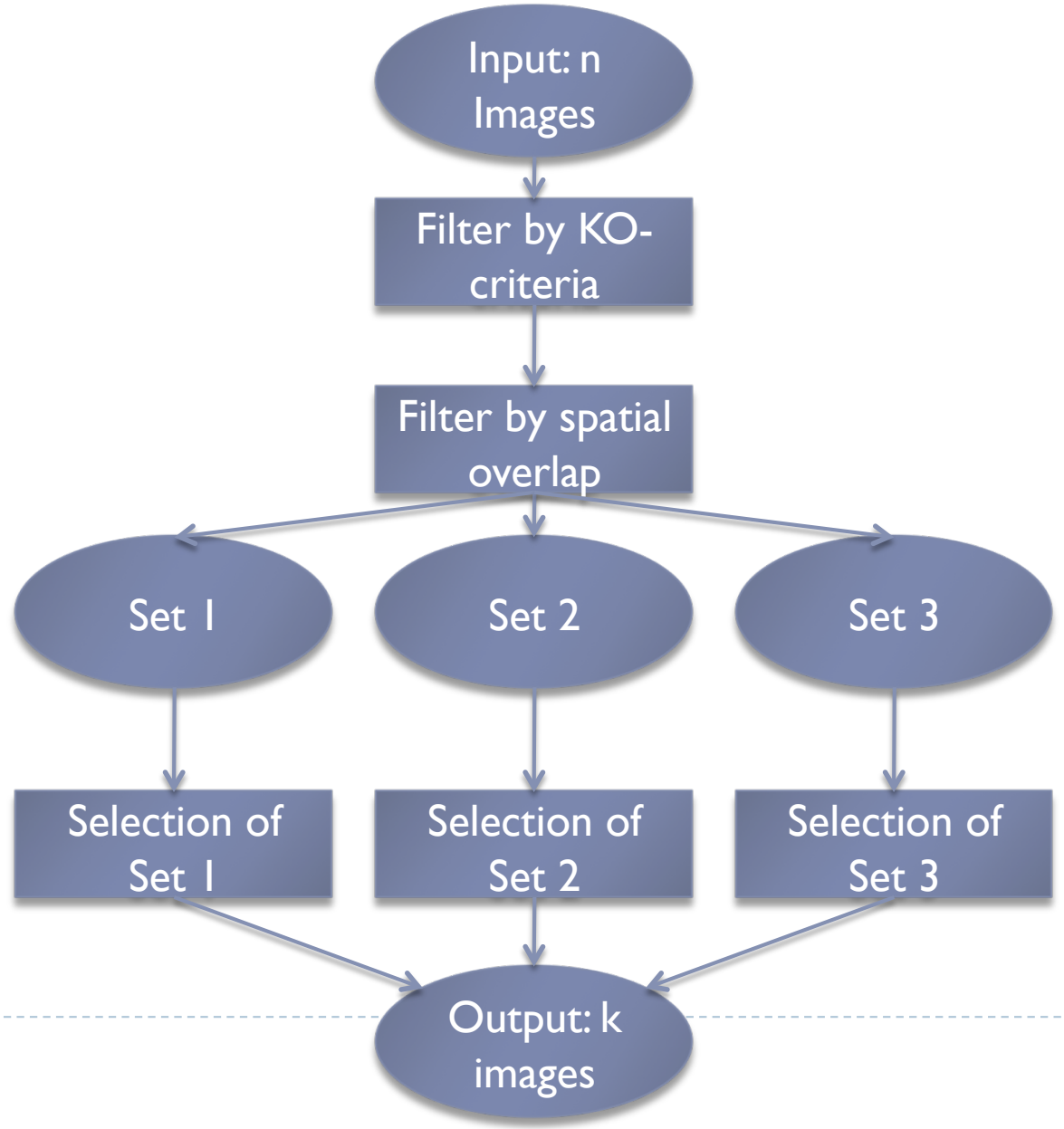
Architecture



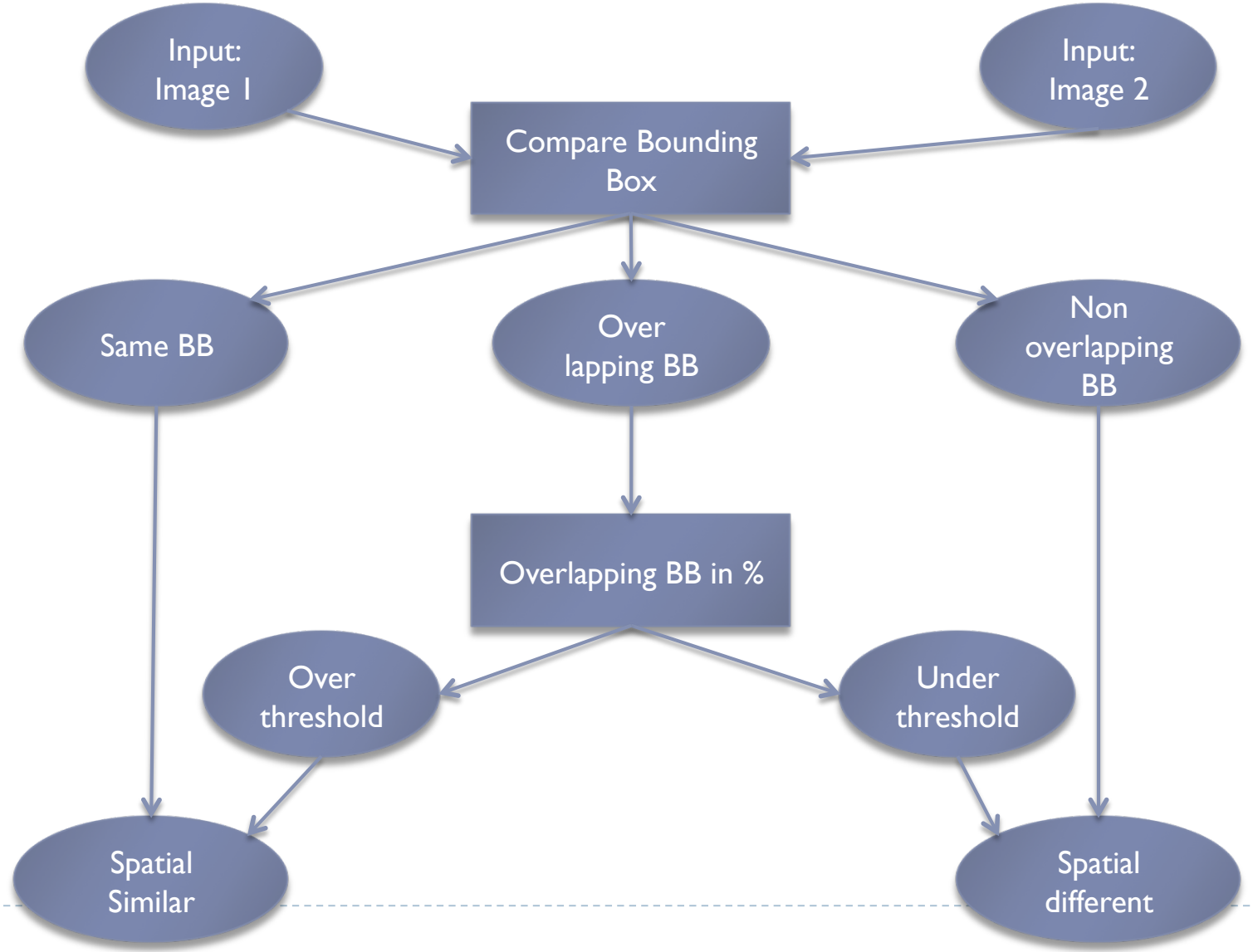
KO-Criteria


n Images
Light when taken images?
no
yes
k_1 Images
4<Brightnes< 252
no
yes
k_2 Images
Variance >x?
no
yes
k_3 Images

Architecture



Filter by spatial overlap



Mahalanobis Distance

$$d(x, y) = \sqrt{(x - y)' S^{-1} (x - y)}$$

$$S = \begin{pmatrix} \mathrm{cov}(X1, X1) & \mathrm{cov}(X1, X2) & \dots & \mathrm{cov}(X1, X9) \\ \mathrm{cov}(X2, X1) & \dots & \dots & \mathrm{cov}(X2, X9) \\ \dots & \dots & \dots & \dots \\ \mathrm{cov}(X9, X1) & \dots & \dots & \mathrm{cov}(X9, X9) \end{pmatrix}$$

X1	X2	X3
X4	X5	X6
X7	X8	X9

Image 1

X1	X2	X3
X4	X5	X6
X7	X8	X9

Image 2

X1	X2	X3
X4	X5	X6
X7	X8	X9

Image n

Example

$$S = \begin{pmatrix} 0.1 & 0.0 & \dots & 0.0 \\ 0.0 & \dots & \dots & \dots \\ \dots & \dots & \dots & \dots \\ 0.0 & \dots & \dots & 2 \end{pmatrix} \qquad S^{-1} = \begin{pmatrix} 10 & 0.0 & \dots & 0.0 \\ 0.0 & \dots & \dots & \dots \\ \dots & \dots & \dots & \dots \\ 0.0 & \dots & \dots & 0.5 \end{pmatrix}$$

- low covariance => high weight
- deviation in pixel X1 is rare
- therefore a strong indication of dissimilarity if it differs

Pro‘s and Con‘s

- takes regard of the image‘s spatial structure
- frequently used in multivariate statistics
- invertability of S has to be guaranteed

Timeline

	Activity	Estimated Time
25.11. – 27.11.	Introduction to GEONET Cast	10
30.11. – 13.12.	Implementation I	40
14.12. – 23.12.	1st Thst Phase & plausibility validation	10
24.12. – 03.01.	Christmas Break	
04.01. – 10.01.	Implementation II	25
11.01. – 17.01.	Final Test Phase II & Report	20
18.01.	Report representation creation	8
19.01.	Final Report Meeting	2
20.01. – 24.01.	Debugging	10
25.01. – 29.01.	Project Closure	

Time effort

Research & Preparation	30
Implementation	65
Testing	20
Debug & Project Closure	20
Project Management	45