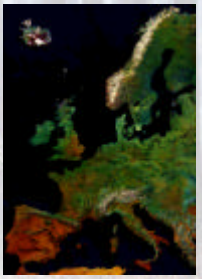
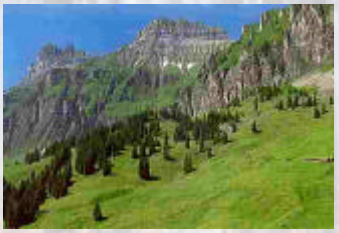
Statistical Approaches to the Integration of Partial and Full Coverage Monitoring Information : Experiences in Forestry

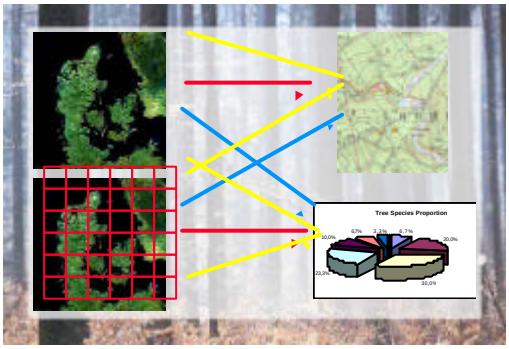
Forest Cover in Europe as Reported to UN-ECE & EUROSTAT

Spain	25'622'000 ha
Sweden	28'015'000 ha
Austria	3'877'000 ha
Portugal	3'102'000 ha

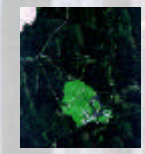


Forest Area Definition



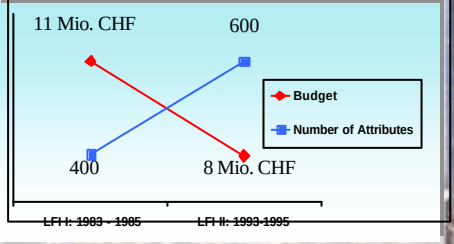


Data Sources


Satellite imagery


Aerial photograpy


Field assessments



Characteristics of Attributes

Assessment

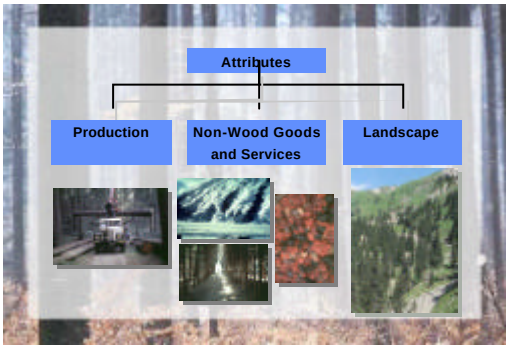


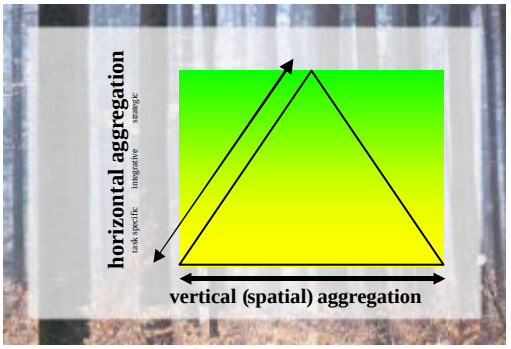


Characteristics of Attributes

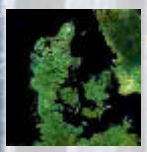
Scale	
Absolute Scale	Tree height
Interval Scale	Altitude a.s.l.
Ordinal Scale	Stand layer
Nominal Scale	Tree species



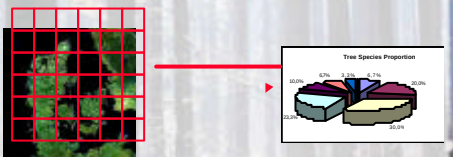


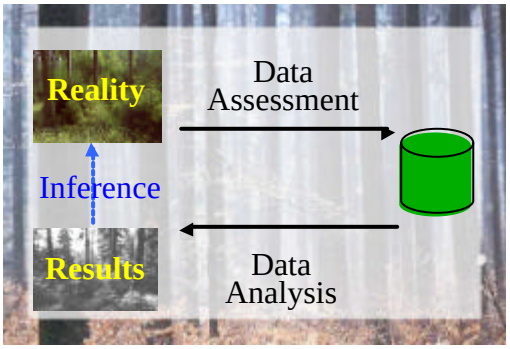


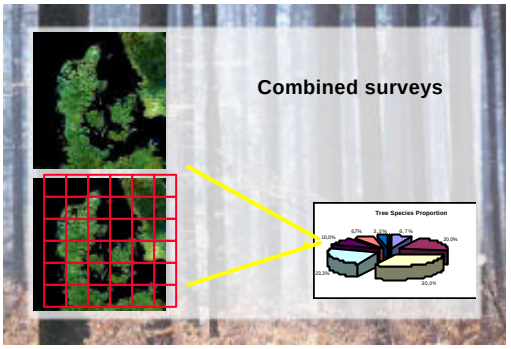
Derivation of maps from satellite imagery

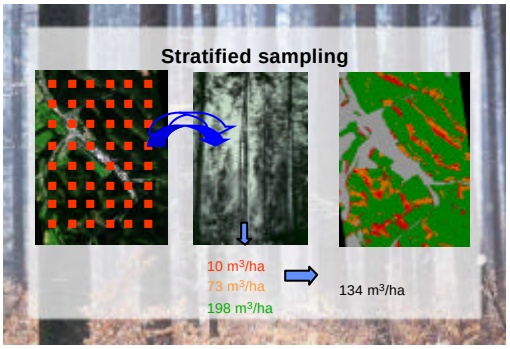


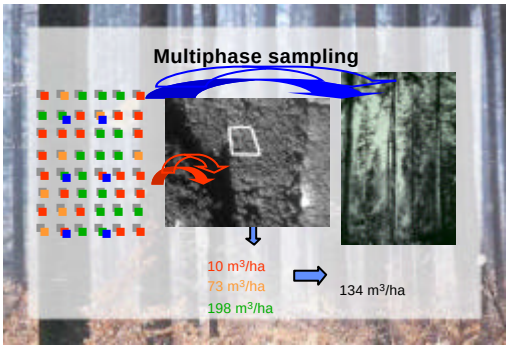

Derivation of statistics from sample surveys

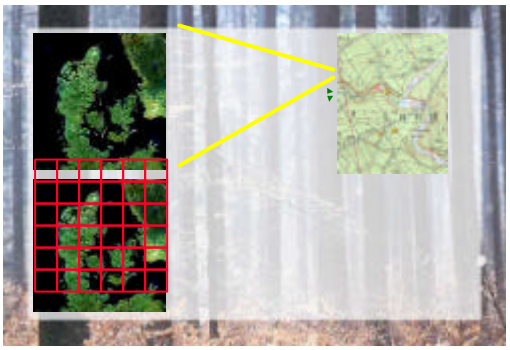


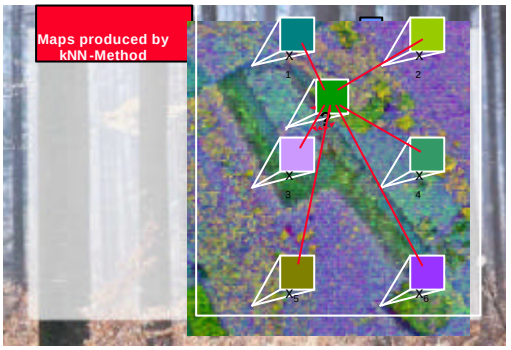

Reality
Data Assessment
Inference
Results
Data Analysis


Combined surveys
Tree Species Proportion

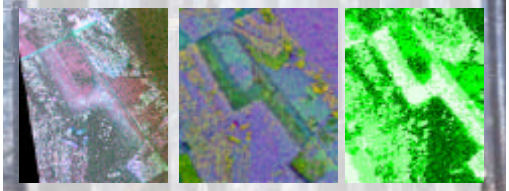

Stratified sampling
10 m³/ha
73 m³/ha
198 m³/ha
134 m³/ha


Multiphase sampling
10 m³/ha
73 m³/ha
198 m³/ha
134 m³/ha



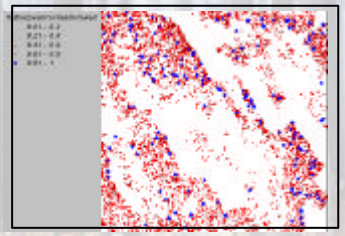

Maps produced by kNN-Method

Data Sources and kNN-Estimates



HRSC-A | HyMap™ | kNN

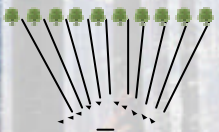
kNN-Method: Probability of Dead Standing Trees





Traditional Statistics

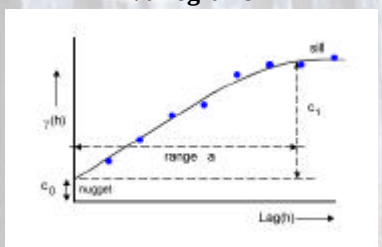
Geostatistics



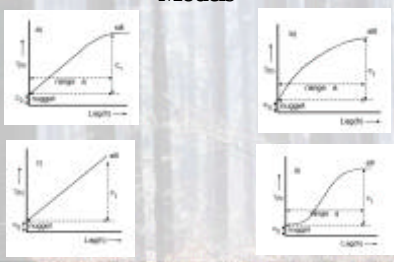
$\overline{X}$

$$g(h) = \frac{1}{2n}\sum\left(z(x_i) - z(z_i + h)\right)^2$$

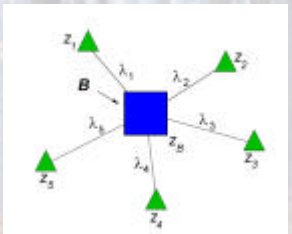
Variograms



Models

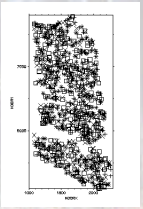


Using the variogram for interpolation: Kriging

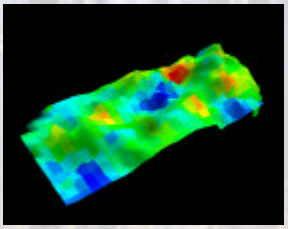


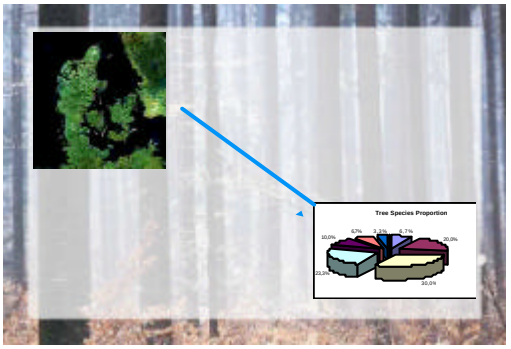
Raw data: fir-tree locations and dbh-growth between 1976 and 1987

Quartile -.300 ≤ + ≤ 1.000
Quartile 1.300< x ≤ 2.500
Quartile 2.500< ø ≤ 5.600
Quartile 5.600< * ≤ 17.900

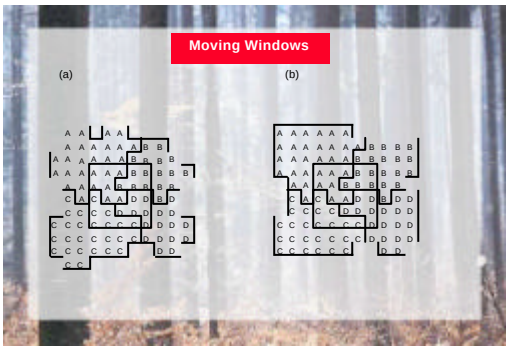


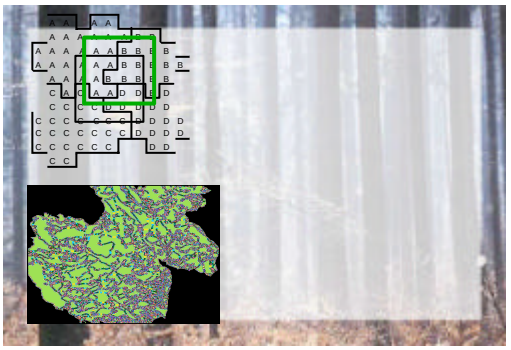
Krieged estimates for tree growth

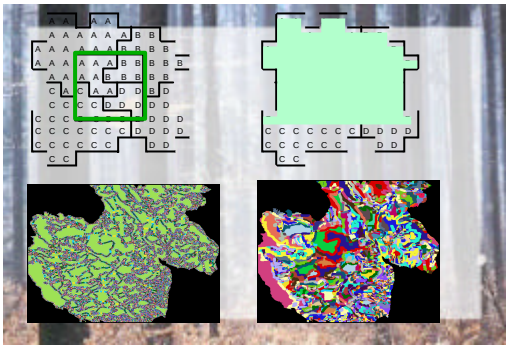


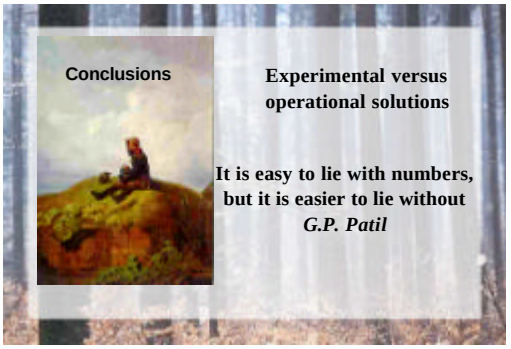


Moving Windows








Conclusions
Experimental versus operational solutions
It is easy to lie with numbers, but it is easier to lie without
G.P. Patil