



metsäkeskus

Cross-country route optimization for forest inventory in Finland

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The Finnish Forest Centre

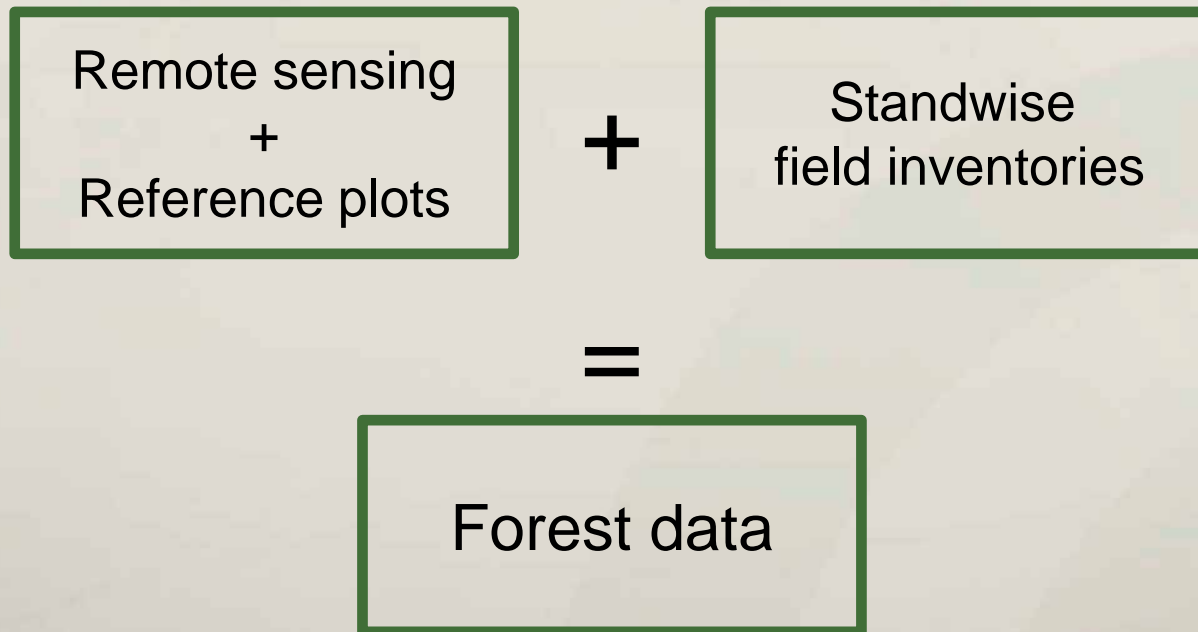
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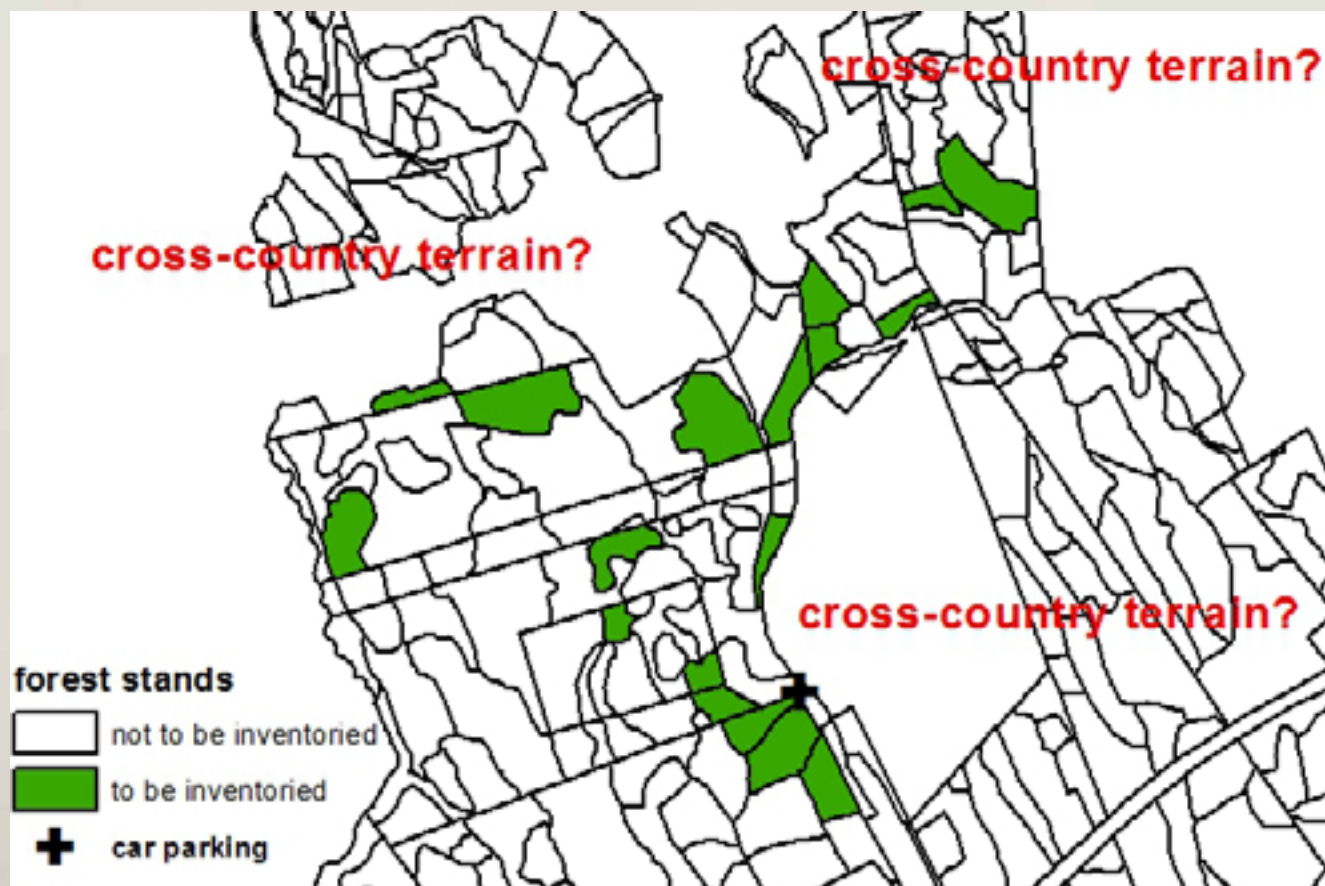
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Forest inventory in Finland

- The Finnish Forestry Centre collects forest data on privately owned forest resources



Problem to be solved



- How to choose the best route from the car through all forest stands to be inventoried and return to the car?

How the problem was solved?

- Checking which relevant GIS data is available
- Defining terrain classes for the cost surface
- Finding cost values for the cost surface
- Deciding if the slope data is needed
- Deciding how the areal objects need to be inventoried
- Implementing the GIS tools
- Testing the route optimization application in a field work
- Evaluating the test results

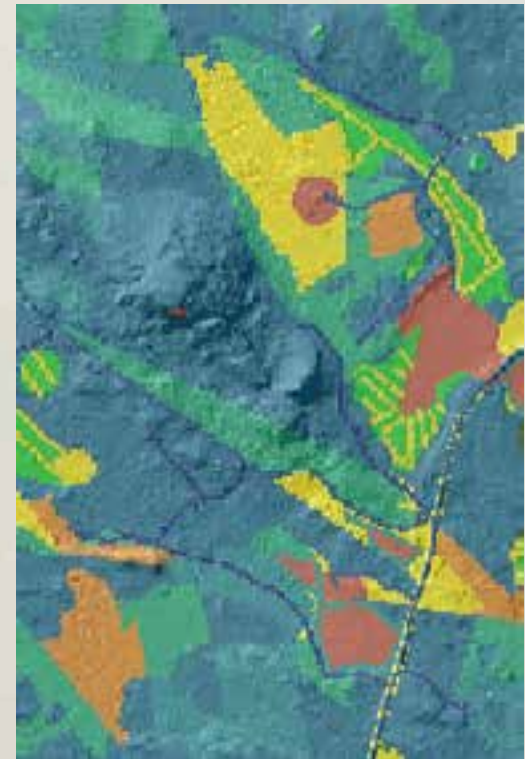
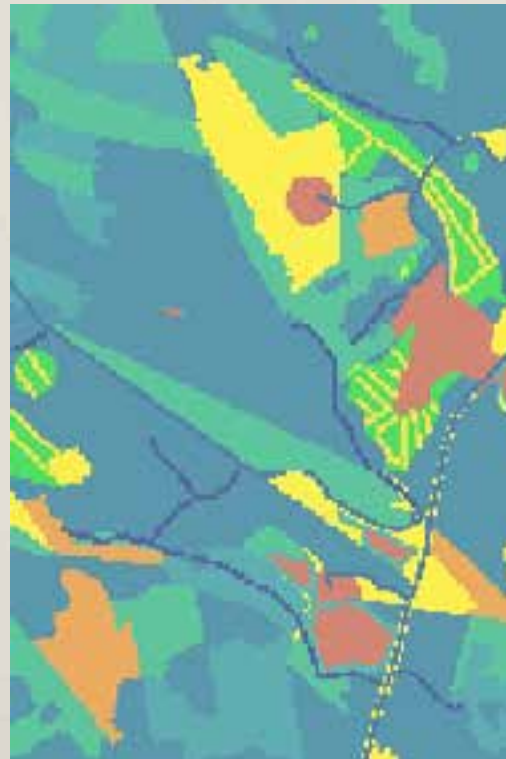
Data

- Forestry stand database (The Finnish Forestry Centre)
- Topographic database (The National Land Survey of Finland)
- Digital elevation data (The Finnish Forestry Centre)

The cost surface and DEM

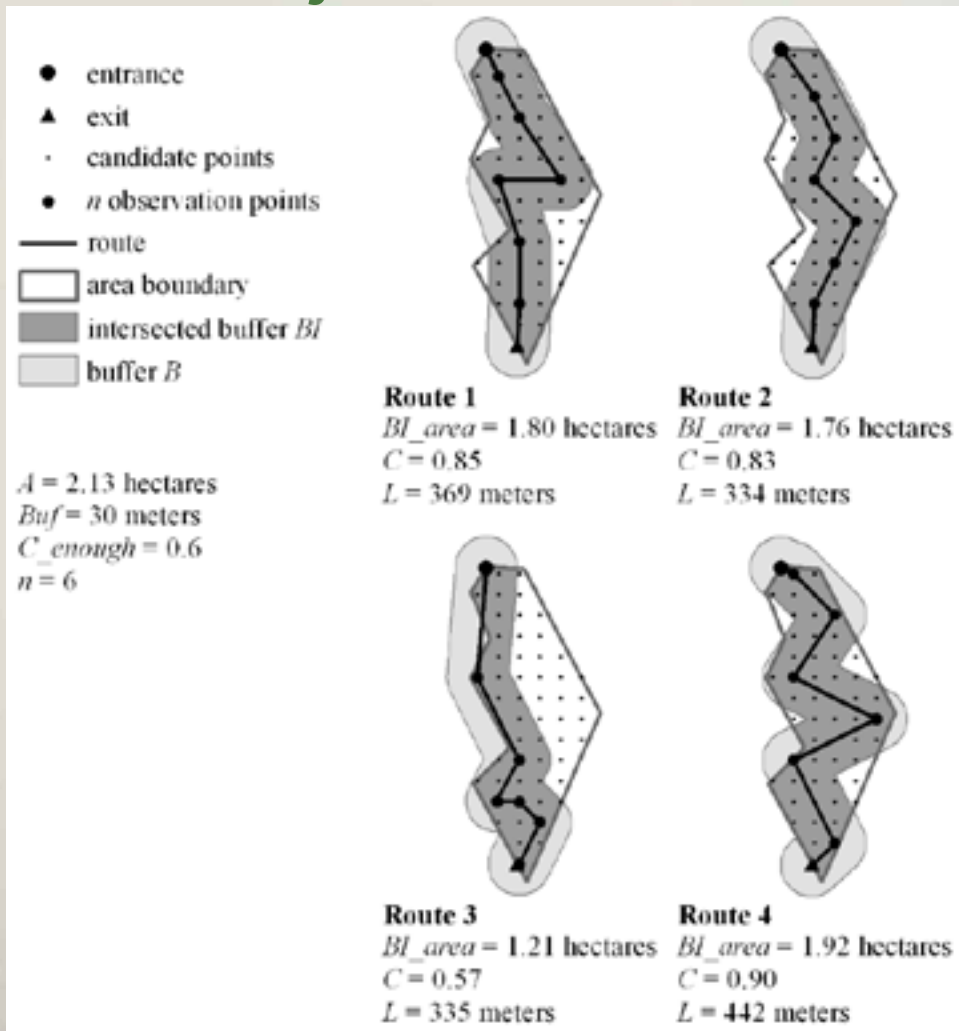
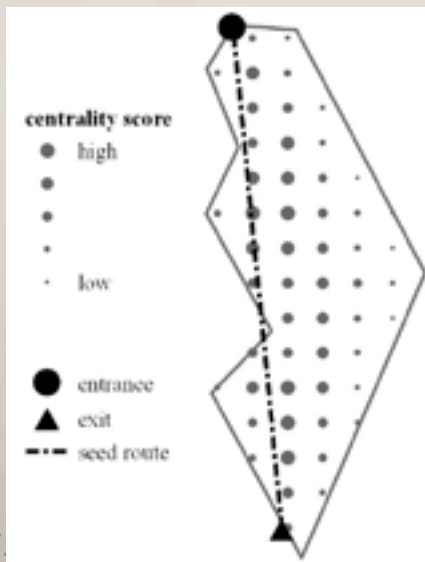
Cost

9 999 barrier
19,1 swamp, ditches, young dense forest
14,1 swamp, no ditches, young dense forest
12,0 mineral soil, young dense forest
10,4 swamp, ditches, young sparse forest
9,3 swamp, ditches, regeneration stand
9,3 swamp, ditches, mature forest
7 no data available
5,6 power line
5,4 swamp, no ditches, young sparse forest
4,7 peat or sand production area
4,3 swamp, no ditches, regeneration stand
4,3 swamp, no ditches, mature forest
3,3 bedrock
3,3 mineral soil, young sparse forest
2,4 the edge of farmland
2,2 mineral soil, regeneration stand
2,2 mineral soil, mature stand
1,1 road
1 trail

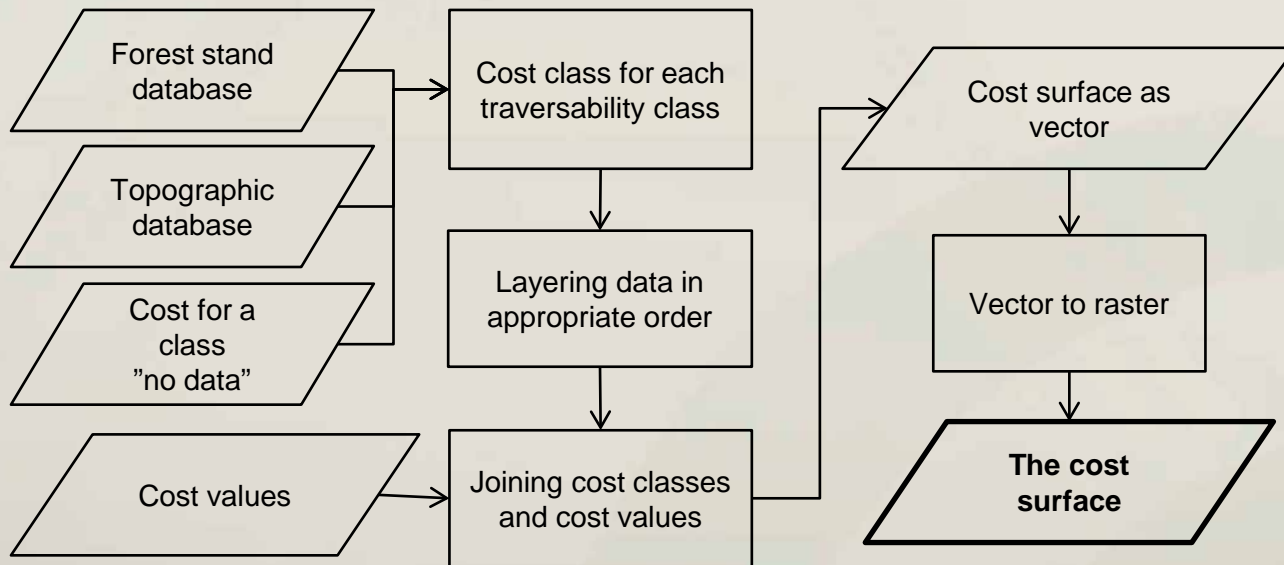


An optimum inventory route for an areal object

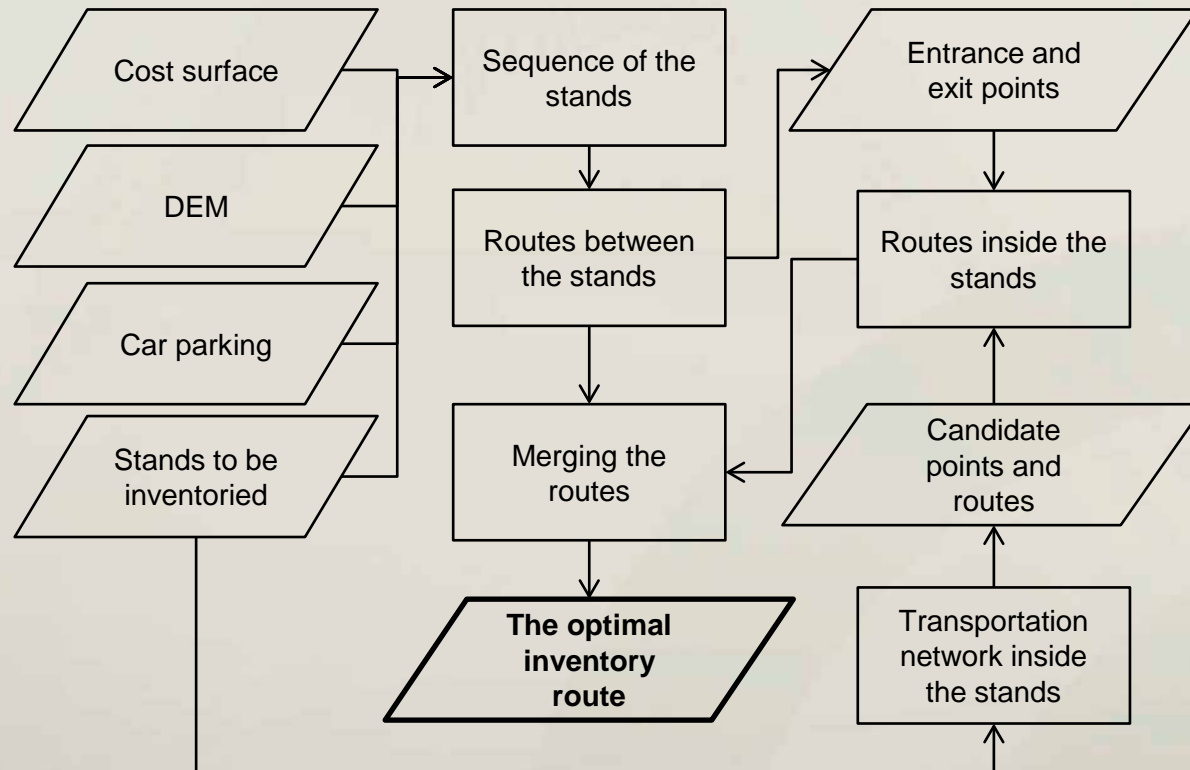
- Create a route
 - › that is as short as possible,
 - › the object will be inventoried adequately well and
 - › the solution is heuristic.



The cost surface tool



The route optimization tool



An example route



Test results

- The cost values describe Finnish terrain realistically.
- Route optimization method is suitable when
 - › the proportion of stands to be inventoried is low
 - › stands are far away from each other
 - › the employee has a little experience of field work
 - › the inventory area is not familiar to the employee.
- The route optimization tool needs development
 - › the sequence of the stands is not always logical
 - › the route processing takes too much time.

Future vision: terrain navigator



Thank you for your attention!

Questions?