

Multi-objective optimization in road design

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SYSTEMA

Autodesk® VAR

www.systemsrl.it



Road Optimization

Road Optimization

Pipeline

Why Autodesk Civil 3D?

Problem presentation

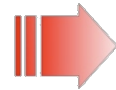
modeFRONTIER Scatter

modeFRONTIER Pareto
frontier

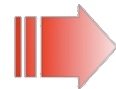
modeFRONTIER design

modeFRONTIER History
chart

modeFRONTIER RSM chart



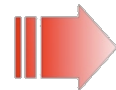
Road design is a complicated problem relating economical and environmental considerations. Designers should evaluate sufficient number of alternative routes to locate a final route, with the lowest cost, while conforming to design specifications, and environmental requirements



objectives

minimizing total cost of
construction

minimizing total cost of
manteinance



constraints

design requirements

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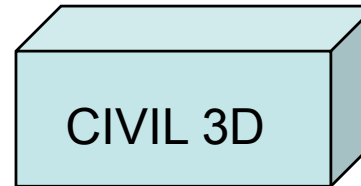
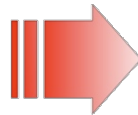
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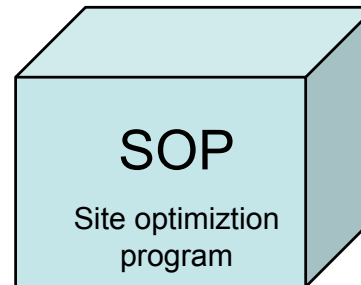
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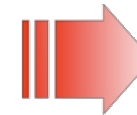
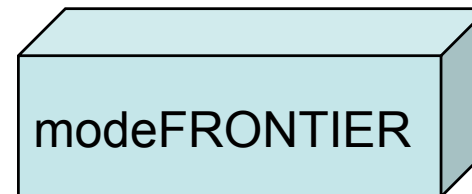
input



+



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optimal
solution

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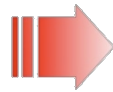
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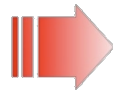
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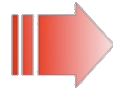
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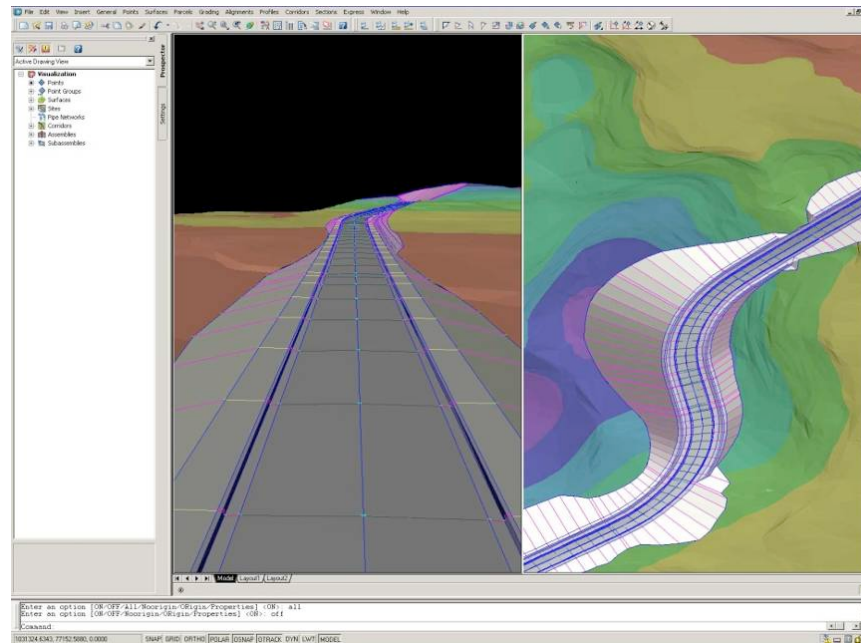
parametric 3d model



analysis tools



integrated GIS platform Map 3D



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Connect two points above while minimizing total cost of construction and maintenance

modeFRONTIER workflow

40 input variables

2 design goals

Design parameters

Input variables

Horizontal and vertical alignment parameters

Design Objectives

Minimize construction cost
Minimize maintenance cost

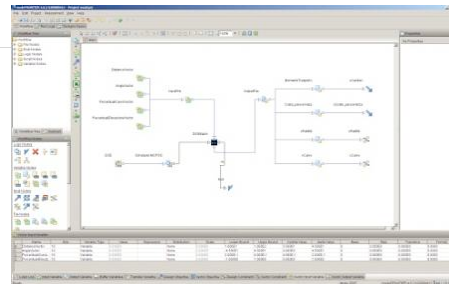
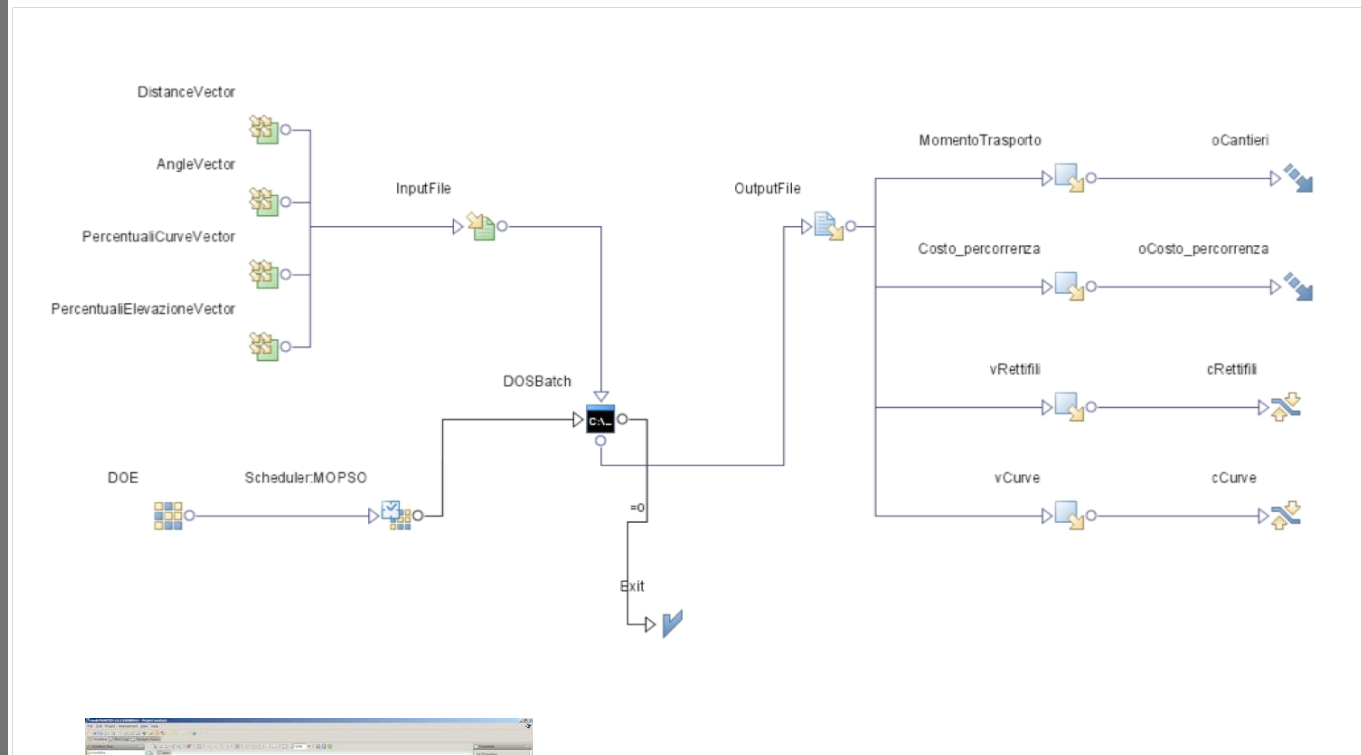
Optimization's set-up data

Sampling phase

SOBOL DOE sequence – nr initial individuals: 300

Scheduler

MOPSO



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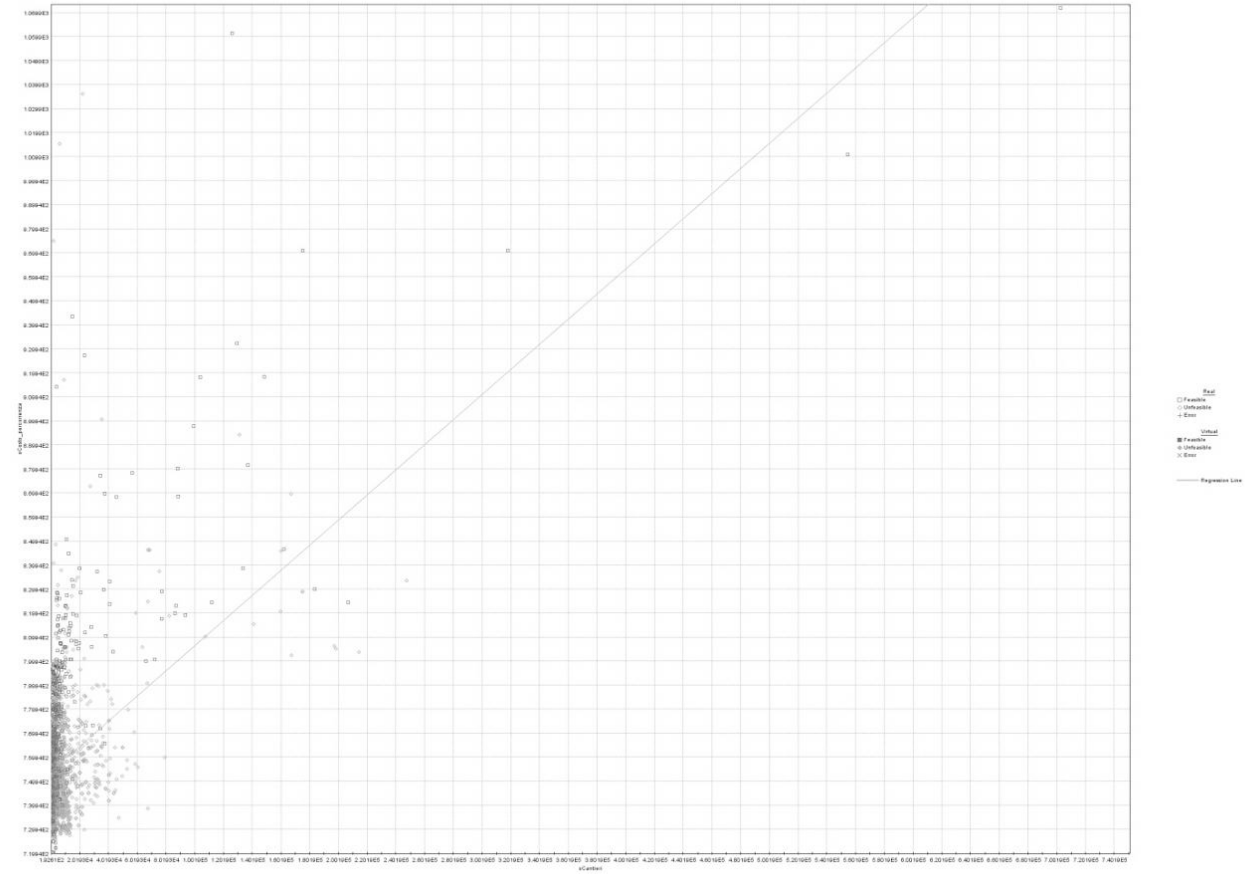
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total cost of maintenance



total cost of construction

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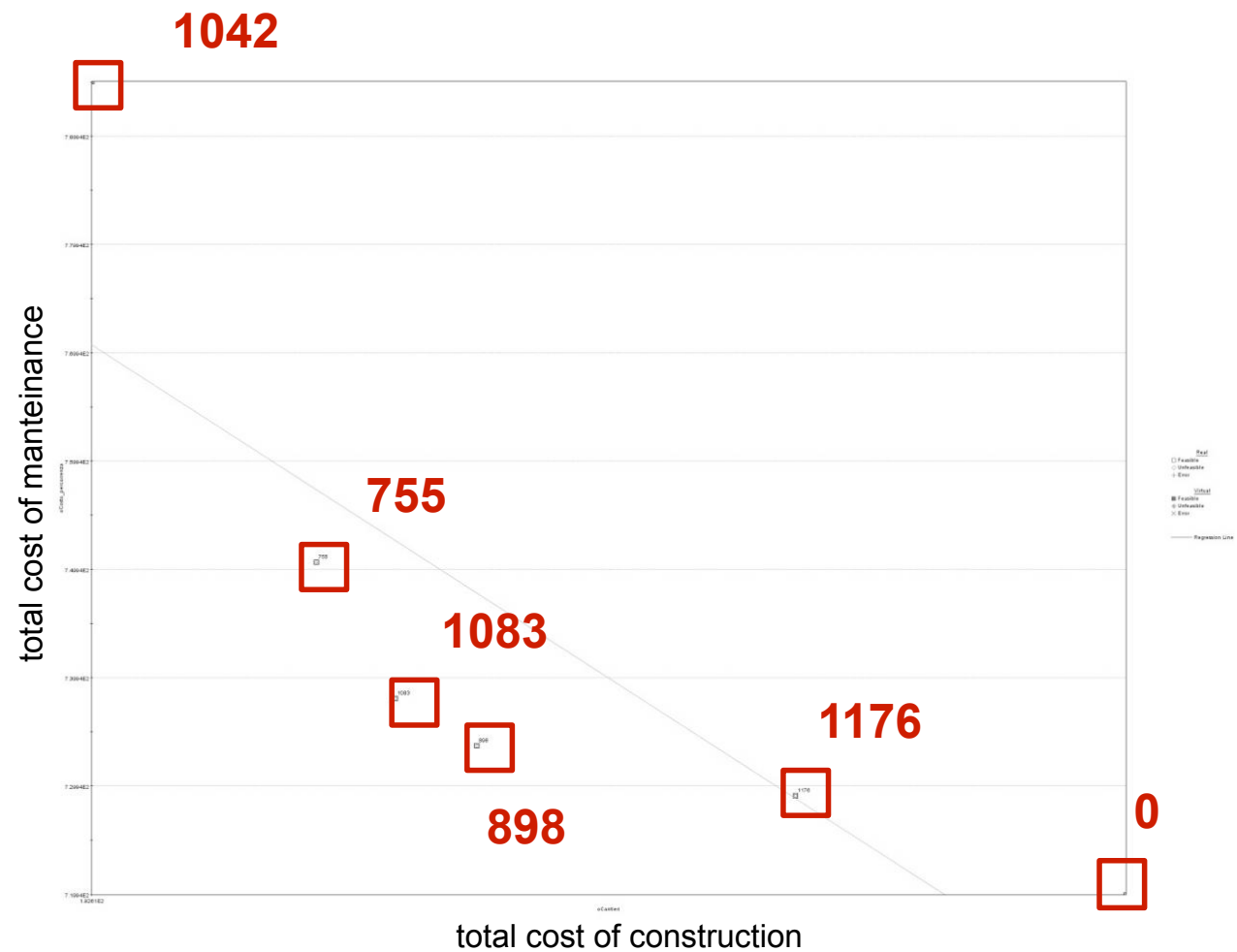
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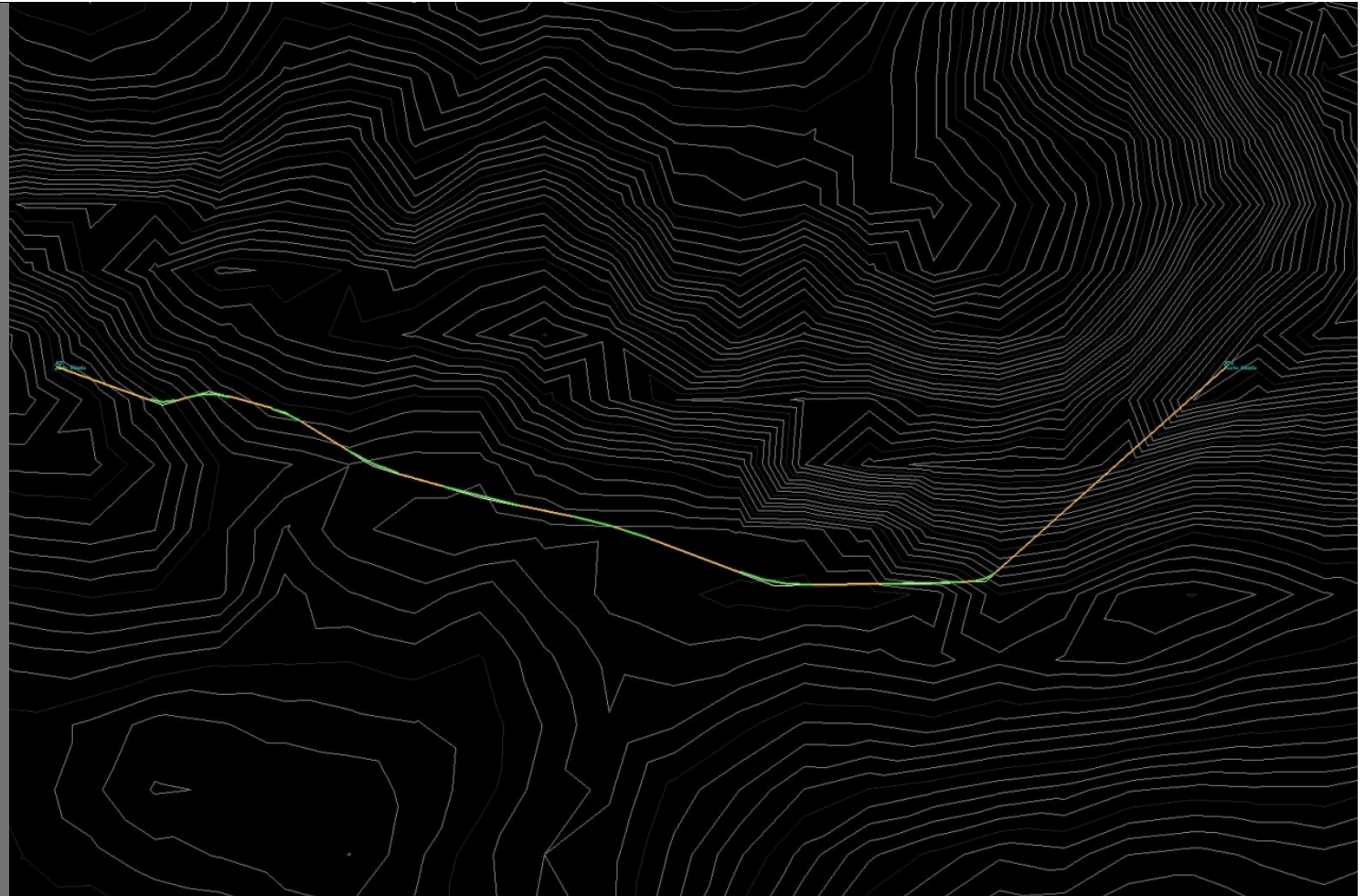
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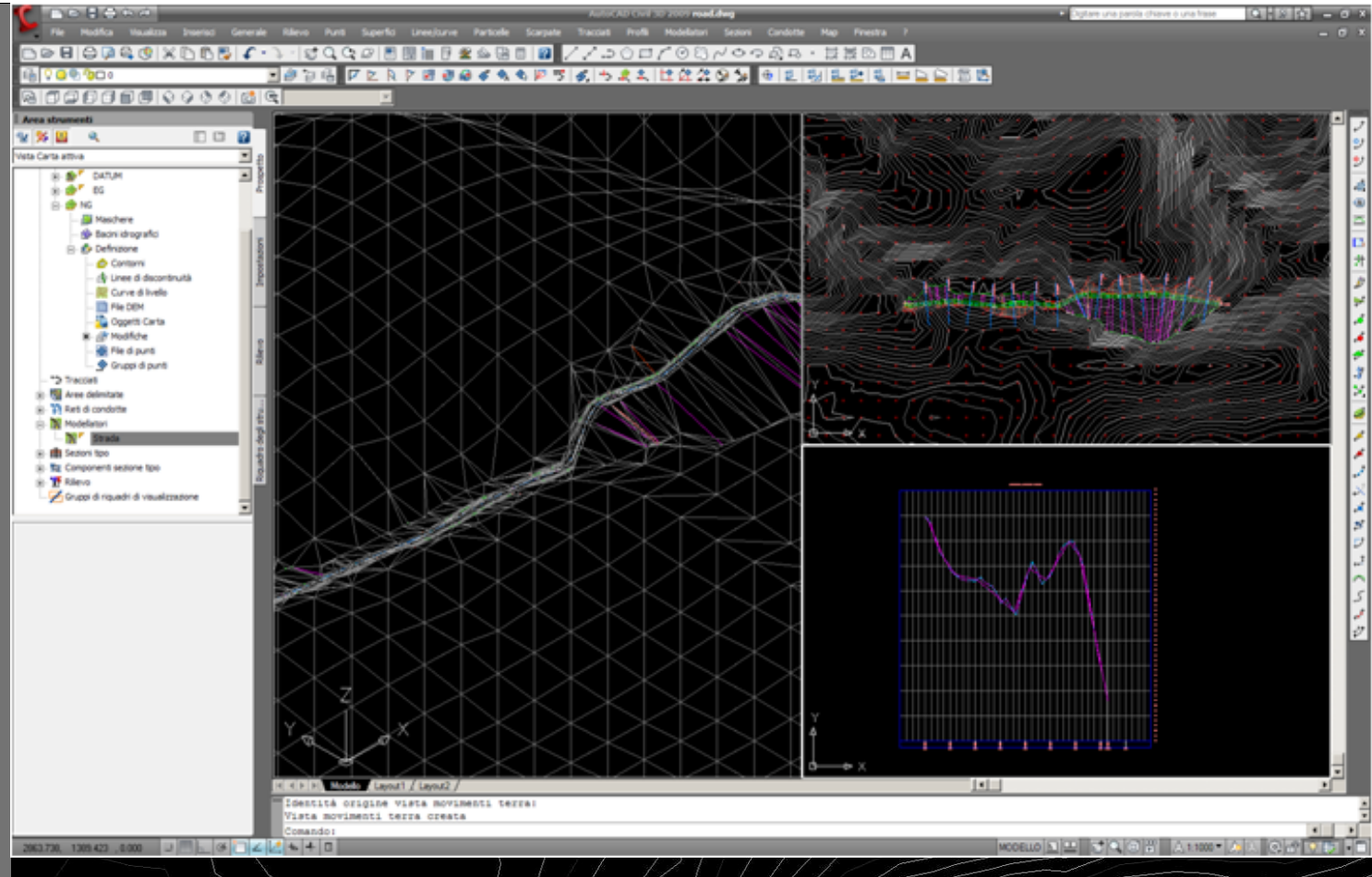
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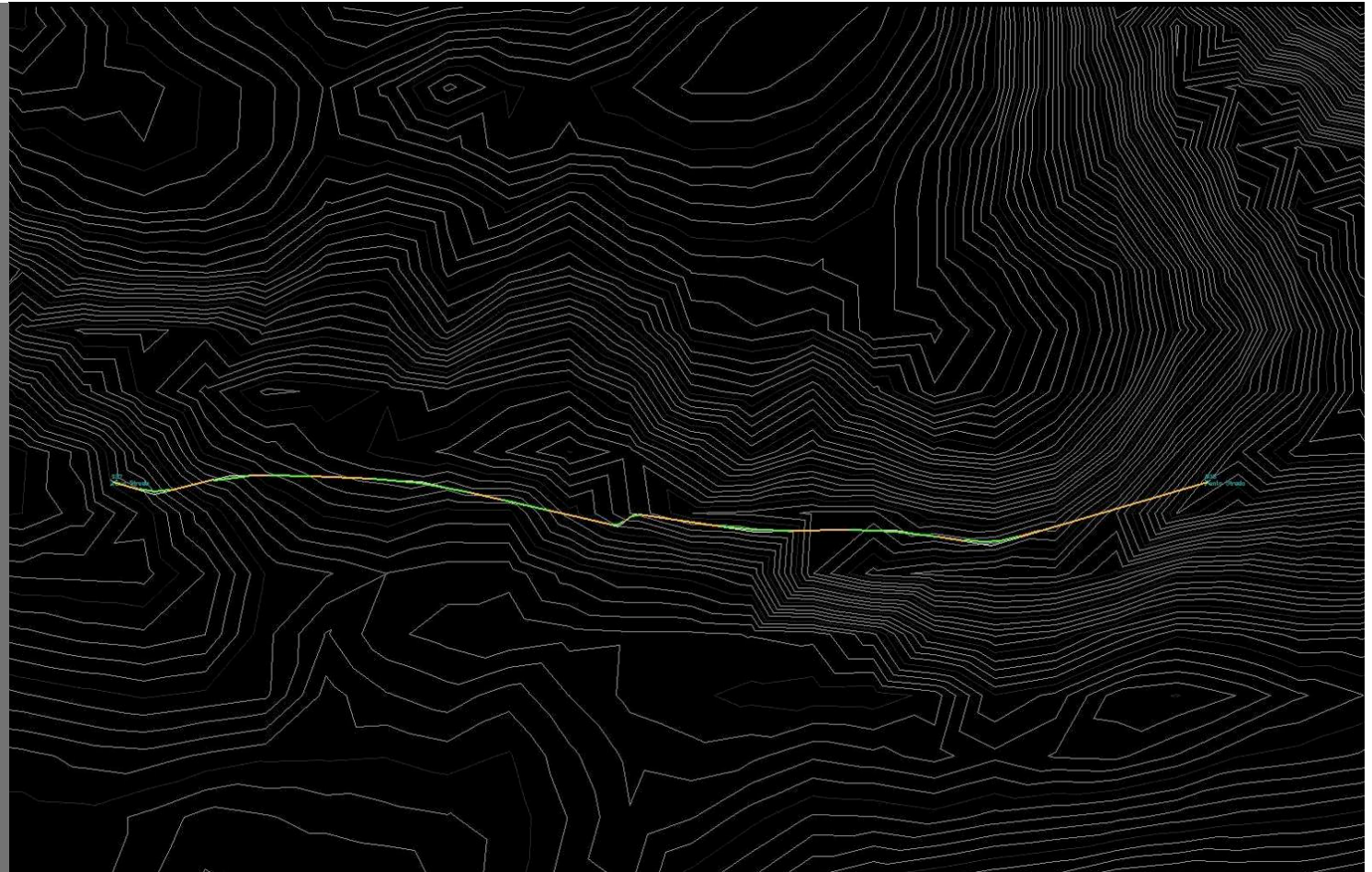
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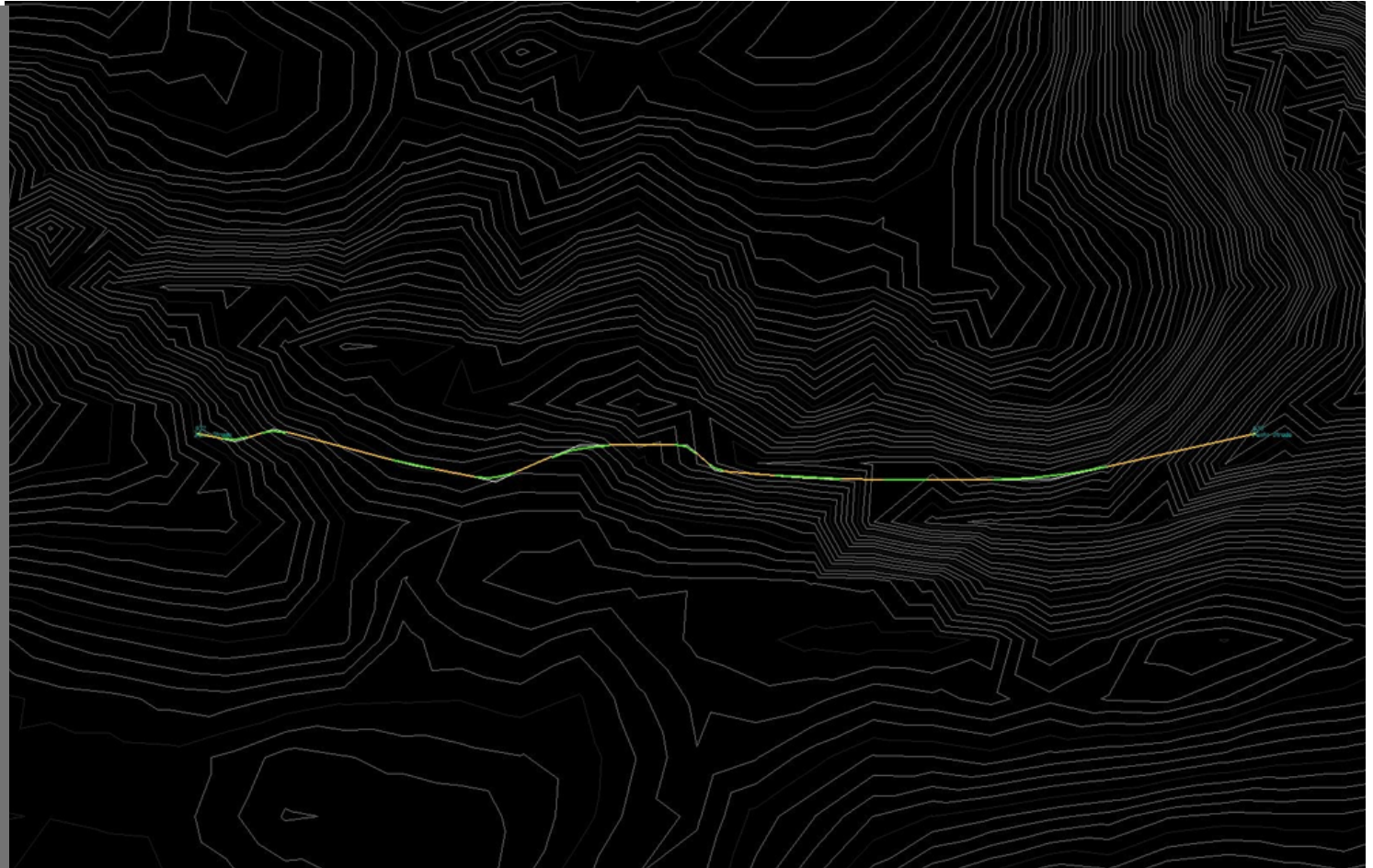
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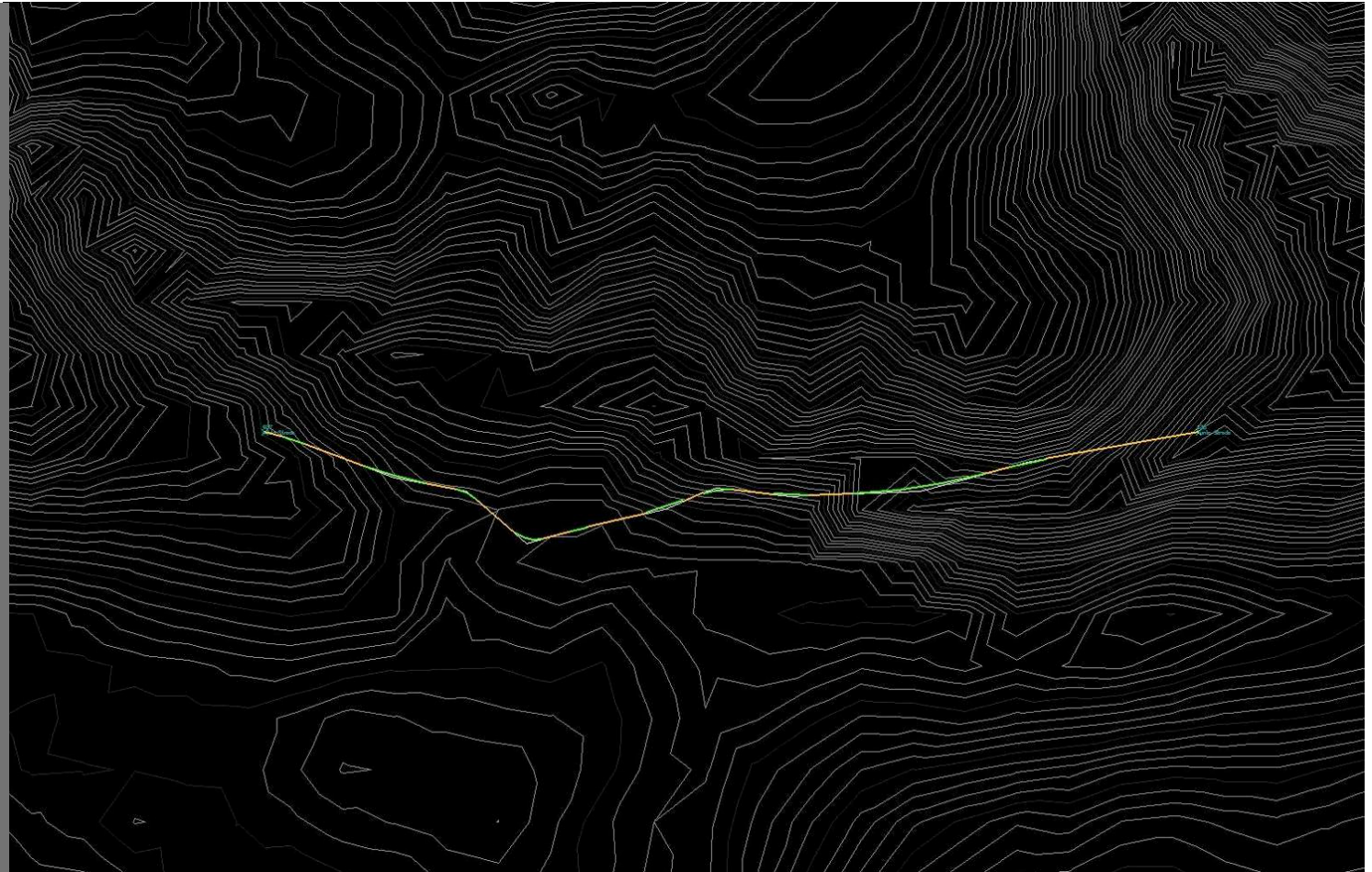
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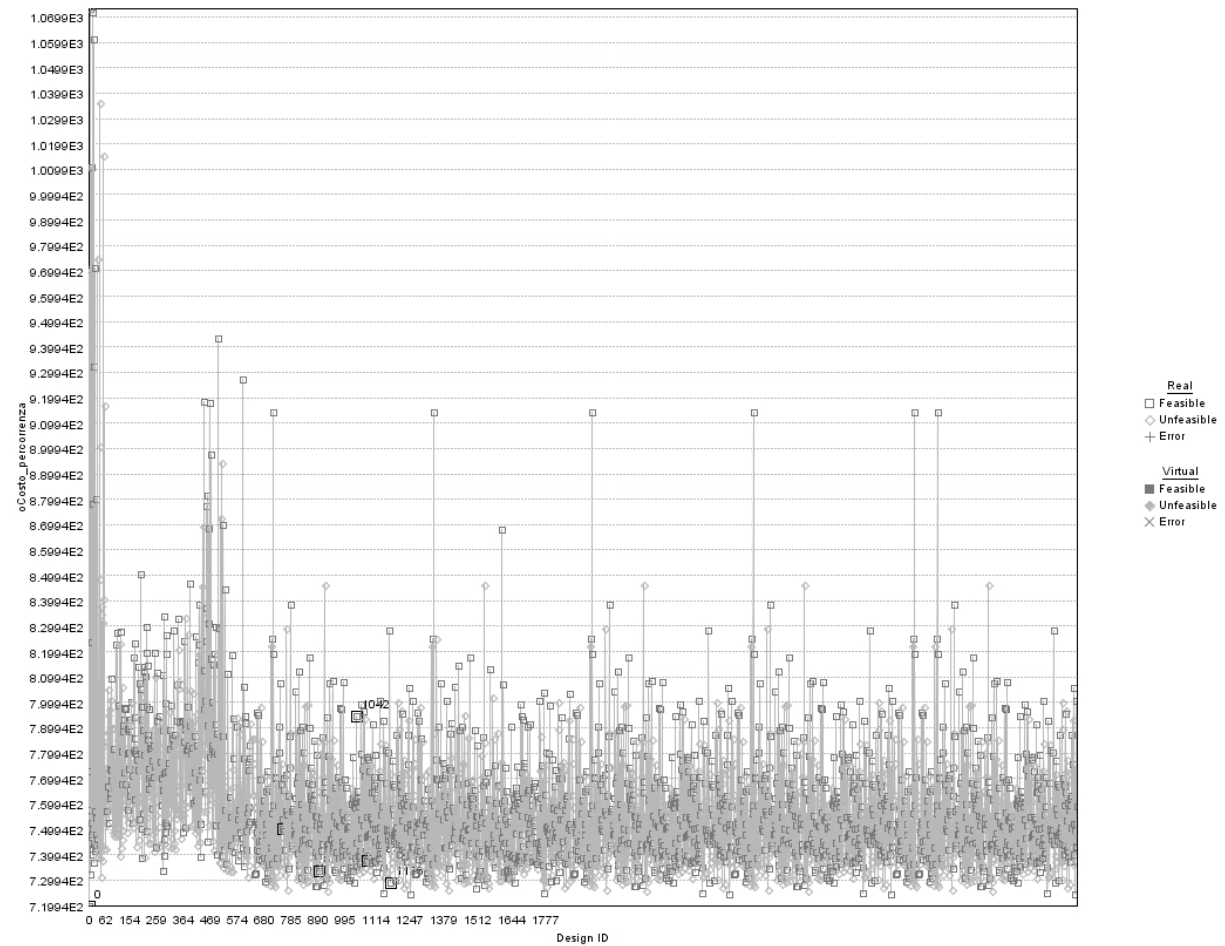
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