Planning transmission lines upside down: How earth cables are combined with overhead lines

Author(s):
Schito, Joram; Raubal, Martin

Publication date:
2018-10-22

Permanent link:
https://doi.org/10.3929/ethz-b-000297911

SCCER – FURIES
Shaping the FUtuRe SwIss Electrical InfraStructure

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Innosuisse – Swiss Innovation Agency

2018 Annual Conference

October 22nd, 2018

Planning transmission lines upside down: How earth cables are combined with overhead lines

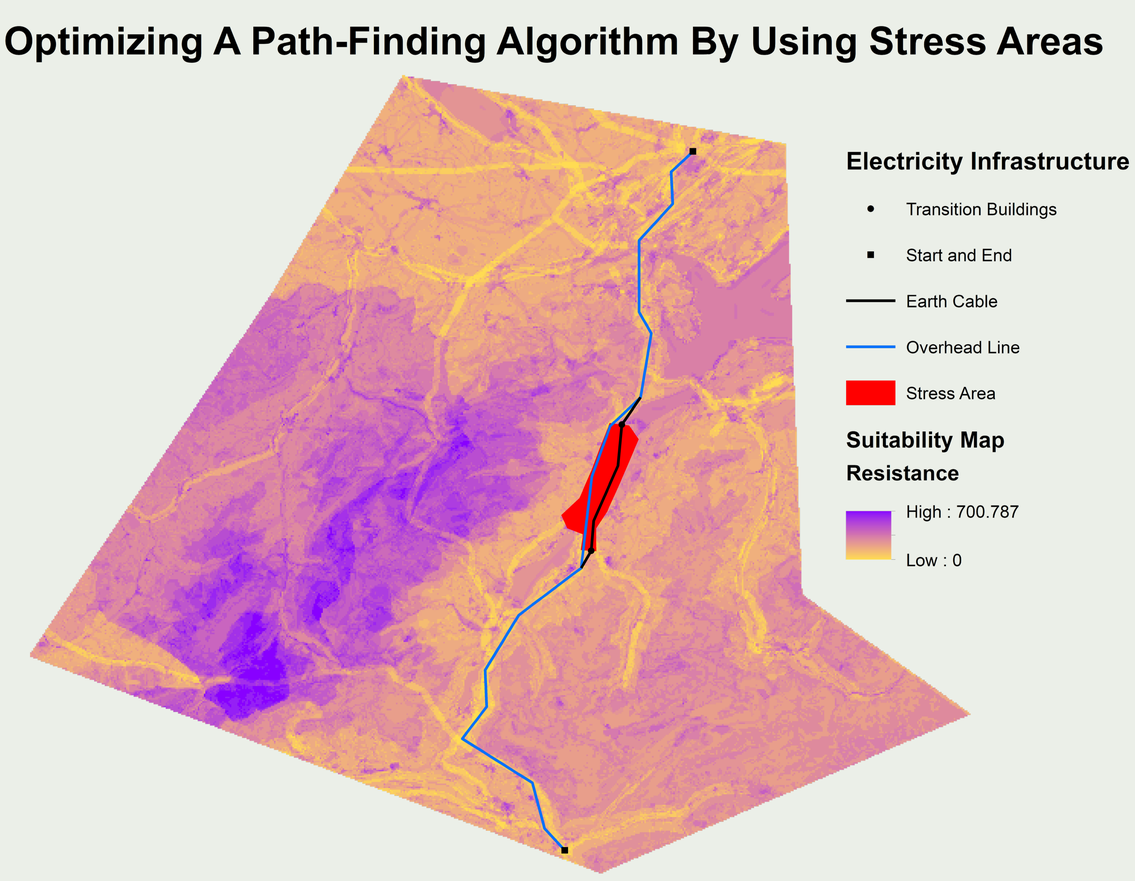
Joram Schito and Martin Raubal

The grid extension in Europe is in full swing and thereby, citizens' demand on earth cables instead of overhead lines is steadily increasing. The keyword often used in this context is **partial underground cabling**, as the Swiss jurisprudence compels grid planners to suggest not only an overhead line but also a partial underground cabling when a new transmission line is planned. However, where can the areas suitable for partial underground cabling be located?

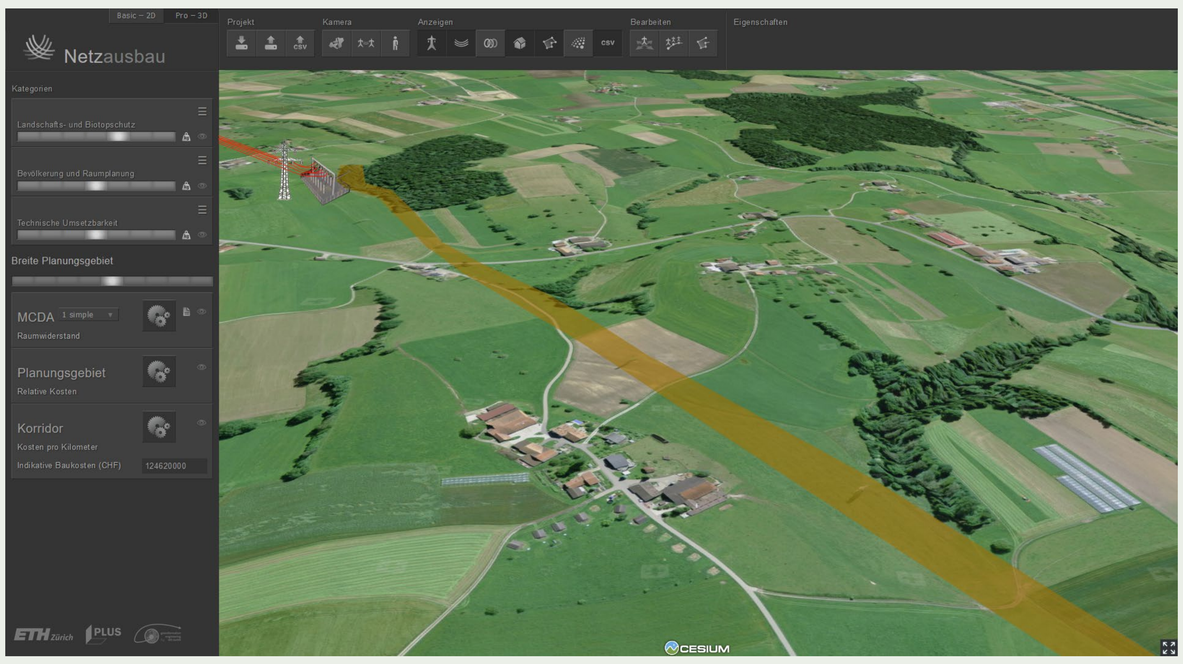
Geographic Information Systems in combination with Multi-Criterial Decision Analysis offer established tools for determining an optimal transmission line path. However, the approaches used so far do not offer satisfactory solutions when planning a combined – overhead or underground – transmission line. Therefore, we propose a **procedural method** that turns the planning process upside down by determining **for each section** the optimal path.

Procedure

1. Determine areas of a high stress level in which it is advantageous to build an earth cable.
2. Around the borders of these areas, determine places appropriate for building a transition building.
3. Between two optimally placed transition buildings, compute the optimal path for an earth cable.
4. Between the transition buildings and the start and end points, compute the optimal path for an overhead line.
5. Calculate the difference regarding costs and impact between both approaches.
6. Use this information when negotiating about possible transmission line paths in areas with a high stress level.



How this novel approach will be used in the future



We will make use of this novel approach to enhance **our 3D Decision Support System (3D DSS)** by adding an option that computes not only overhead lines, but also earth cables. Grid planners and affected citizens may profit from a more transparent planning procedure and more alternatives by making potential earth cable corridors visible.

Acknowledgements
This research is supported by the Swiss Federal Office of Energy SFOE and is part of the activities of the Swiss Competence Center for Energy Research on the Future Swiss Electrical Infrastructure (SCCER-FURIES), which is financially supported by the Swiss Innovation Agency (Innosuisse - SCCER program).

ETH zürich
IKG
Institute of Cartography and Geoinformation
geoinformation engineering
ikg eth zurich

3DDSS 3d decision support system

3ddss.ethz.ch