

## Software Lab:

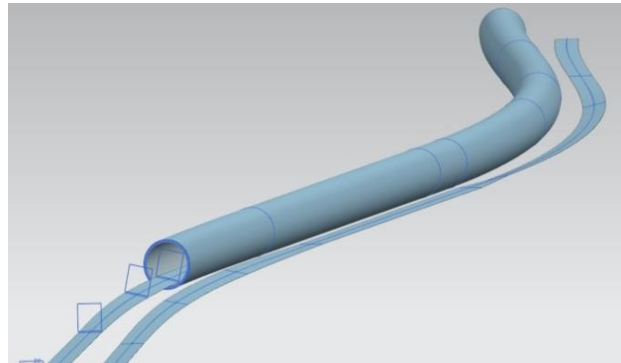
Modeling: ★★★★★  
Mathematics: ★★★★★  
Programming: ★★★★★

# Track Alignment and Energy Consumption of a Train

## Setting

The main goal of the DFG research project “3DTracks” is to research concepts to improve the collaboration in the highly complex task of planning inner-city subway tunnels.

The basis for planning a subway tunnel is the so-called alignment, which defines the principle track course. Modifications of the alignment obviously result in a change of the length of the route between two given points and also to a change of the permissible speed of the train due to changes of the curvature of the resulting track course.



The track alignment defines superelevation and train speed.

The objective of this Software Lab project is the simulation respectively calculation of the changes of a train’s energy consumption due to modifications of the alignment.

To this end, firstly the basics of alignment modeling have to be understood, and an algorithm for the calculation of a train’s energy consumption has to be developed. This algorithm should consider several input parameters such as the length of the route, the influence of the gradient, and the (permissible) train speed. Secondly, a software module has to be implemented, that calculates the energy consumption using this algorithm. Finally, this software module should be integrated into the collaboration platform developed in the scope of the “3DTracks” project in order to give the different modeling experts real time feedback concerning the energy consumption resulting from their modifications of the alignment model.

## Task

The Software Lab will include the following tasks:

- Gain basic understanding of alignment modeling.
- Develop an algorithm for the calculation of the energy consumption of a train.
- Build a (recommended C# based) software module, which implements this algorithm.
- Integrate this software module into a given collaboration platform.

## Supervisors

Matthias Flurl, Chair of Computation in Engineering, [matthias.flurl@bv.tum.de](mailto:matthias.flurl@bv.tum.de)

Javier Jubierre, Chair of Computational Modeling and Simulation, [jubierre@bv.tum.de](mailto:jubierre@bv.tum.de)