Diplomarbeitspräsentation

FAKULTÄT FÜR !NFORMATIK
Faculty of Informatics

Large-Scale Noise Simulation and Visualization of Moving Point Sources

Masterstudium:
Medieninformatik

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Problem Statement

Noise pollution is an ever increasing problem not just in urban environments but also in more rural areas such as small villages, along country roads or even in very sparsely populated regions. The purpose of this master's thesis was to propose ways to simulate and visualize noise pollution in large-scale, non-urban environments in order to help communicate the impact of new sound emitters on affected neighbors. Knowledge of noise propagation, the influence of theterrain and other obstacles as well as how different emitters add upcan provide valuable insights and help in the decision-making process. This knowledge may be particularly helpful when trying to decide on suitable locations for noise screens and/or when trying to find good places to offset some of the local noise emitters.

Noise Simulation

- We use a simplified Noise model (ISO 9613)

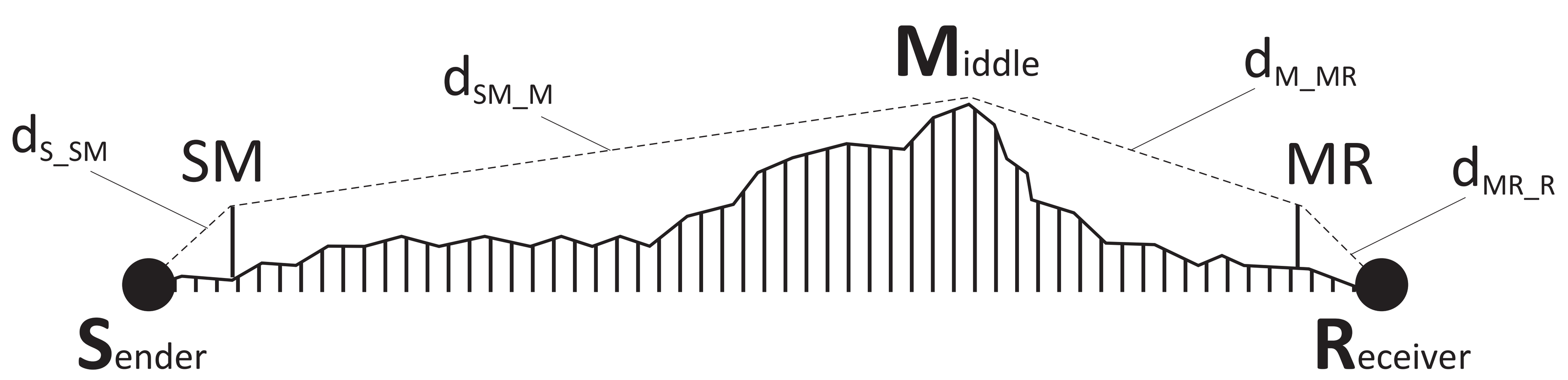
Noise Attenuation = $A_{div} + A_{atm} + A_{gr} + A_{bar}$

- A_{div} distance (logarithmic relationship)
- A_{atm} atmosphere (humidity and temperature)
- A_{gr} ground (type of ground and mean sound height)
- A_{bar} **barriers (depends on number and height)**

Noise Barriers, How to Calculate?

- Sample the points between **S**ender and **R**eceiver
- find the **convex hull** of the points between **S** and **R**

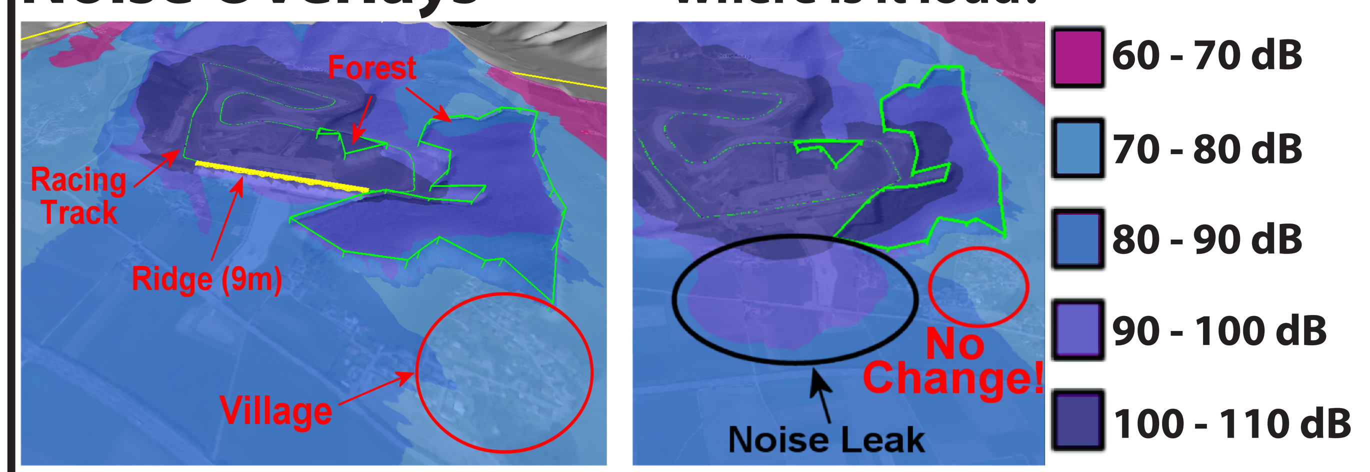
Illustration of the Convex Sound Distance using the Rubber-band Method



Noise Visualization: The Red Bull Ring in Styria

Noise Propagation Terrain Slices — Where is noise diffracted?
Immission Graphs — Where does the noise originate from?

Noise Overlays — **Where is it loud?**



DTM training simulation — **Scenario: No Ridge**

The ridge does not protect the village!

How to verify? Measure Real Cars and Compare!

Brüel & Kjaer
2270 Sound Level Meter

Results

DTM Training (June 4th, 2012), Evaluation Results ($L_{A,eq}$)

Immission Point	Measurement [dB]	Simulation [dB]	Difference [dB]
IP 1	78.8	80.57	1.77
IP 2	71.4	72.87	1.47
IP 3	72.1	73.29	1.19

- Fast (> 25 fps) and accurate (differences are < 3 dB)!
- Evaluation of (almost) arbitrary scenarios!
- Plan streets, noise screens, industrial facilities...

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