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Title: Interpolation in between road measurements in RF-EMF exposure assessment

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Text:

Background and aims: In the Netherlands, a large database of dense radiofrequency (RF) monitoring data is available, covering a majority of connecting roads and streets of the four largest cities. Our aim is to find out whether this existing database can be used effectively for RF electromagnetic fields (EMF) exposure assessment within the enclosed areas, and how much inner data is needed to complement the road data to increase the assessment accuracy.

Methods: Measurements were performed in the GSM 900 MHz and 1800 MHz bands around and inside a residential area in Amersfoort, with an RF measurement system installed on the roof of a car. The average power density per tile of 35 m by 35 m was calculated from all collected samples within that tile. Then, using ordinary kriging, we interpolated the power density in the area using random combinations of 10 to 100% of the edge and 0 to 100% of the inner data samples. Each combination was modeled 100 times and validated with 50 inner data points.

Results: Using only edge data, large errors but reasonable correlation statistics are obtained. However, analysis of the validation results further shows that by covering at least 10% of the inner area, the edge data effectively lose their influence on the model. Correlation coefficients of 0.8 and relative errors of 50% are obtained, which is comparable to the literature.

Conclusions: From the results of our pilot study in Amersfoort, we cautiously conclude that our approach is sound, and that a relatively accurate interpolation model of the RF-EMF exposure within an area can be built using measurements on the edge complemented with measurements in 5 to 10% of the inner area, corresponding to 40 to 80 tiles of 35 m by 35 m per km².