



1 Section of the road network in downtown Mannheim with its famous square pattern

2 Histogram of the crossing angles in Mannheim. The amount of 90° and 270° angles here are quite exceptional.

3 Comparison of averages between Aachen and Mannheim, referencing a pool of 190 cities in Germany. The larger the bar for a characteristic, the closer it is to the average. The angular distribution in Mannheim is particularly far from the average.

Global geo-referenced data can play a major role in statistical validation of the assessment base and the estimation of fuel consumption as used for vehicle development: In view of the great variability of use in the automotive sector, statistical analysis of these data can be a valuable supplement to the current methods.

The software package Virtual Measurement Campaign VMC[®] enables the simulation of vehicle loads. To this end, VMC[®] combines information from the global road network with algorithms developed in the MF division. A key function of VMC[®] is the regional analysis. It gives users the option to select an individual region, like a city or a municipal district. After selecting the region, users can analyze different consumption and load variables that are relevant to that area.

Virtual urban district and real cities

Last year, two of our research projects were tasked to expand the regional analysis. The core question to them was: What cities are particularly representative or above average for a specific area of application? Each project provided a different motivation for solving this problem: One involved the preparation of a representative virtual urban area for a vehicle simulator, while the other made a selection of suitable cities for an actual measurement campaign.

To compare two cities, we used various categories of characteristics. Which category a characteristic is assigned to is defined by how closely the characteristic relates to the expected load factor. For example, hilliness and curviness correlate quite directly with vehicle load and are assigned to the category of pseudo-load factors. Conversely, the appearance of the crossing angles in a city road network or the city's population density only indirectly affect the load, and so are placed in one of the other categories.

Appropriate criteria for each application

We developed pseudo-load factors using combinations of the various base measures established in VMC[®]. They can be simple measures, such as the stop event density, or more complex objects, such as the statistical hilliness distribution. To characterize the appearance of a road network, we used factors like the distribution of the crossing angles in the city. This process enables a statistically based selection of cities with a suitable formulation of criteria for the respective application.

