Analysis of Topo-Morphological Impact in Indoor Wireless Sensor Network Deployment in Urban Transport Buses

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One of the main challenges large populations are facing is the need to increase interaction of infrastructure as well as people in order to optimize resource usage, leading to the global concept of Smart Cities. Vehicular communications, including transportation of goods as well as passengers is a key element in such optimization strategy, with a variety of communication systems already in use, such as mobile PLMN or WLAN networks in order to optimize transportation routes as well as to enhance passenger interconnectivity. An additional step is not only to communicate vehicles with the surrounding infrastructure but also enable information exchange within the passenger as well as with the vehicle to further optimize energy consumption as well as to enhance user experience.
In this work, the influence of the topology as well as morphology of a public transport vehicle (a passenger bus) in the deployment of an indoor wireless sensor network will be presented. The analysis has been performed with the aid of an in-house developed 3D Ray Launching algorithm, in order to take into account realistic material parameters as well as the dimensions and location of elements such as seats or handbars, as depicted in Figure 1. The results show a clear dependence of the wireless sensor network deployment with the layout of the bus and therefore, the use of this deterministic approach can aid in the optimal network layout in terms of energy consumption as well as of expected quality of service.

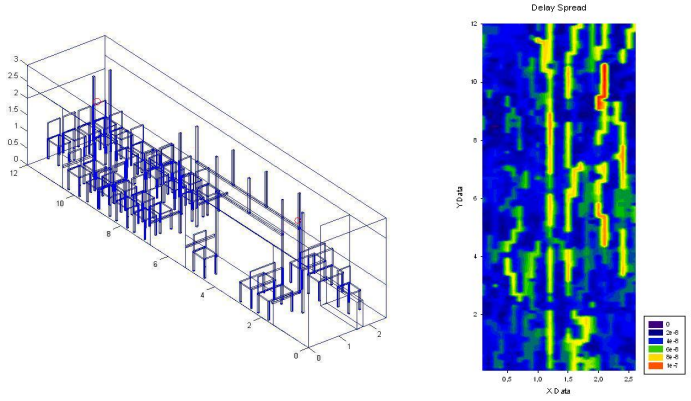

Figure 1: Schematic of the indoor configuration of an urban bus transport implemented for 3D Ray Launching Simulation b) simulation result for a bi-dimensional delay spread at a height plane of 1.3m inside the bus.