Dense Wireless Systems Deployment Challenges as Enablers of Indoor Context Aware Environments

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Interactive environments within Smart Cities and Smart Regions will require the use of multiple wireless systems. In the case of user-device interaction, which finds multiple applications such as Ambient Assisted Living, Intelligent Transportation Systems or Smart Grids, among others, large amount of transceivers are employed in order to achieve anytime, anyplace and any device connectivity. The resulting combination of heterogeneous wireless network exhibits fundamental limitations derived from Coverage/Capacity relations, as a function of QoS parameters, required bit rate, energy restrictions and adaptive modulation and coding schemes. In this context, inherent transceiver density poses challenges in overall system operation, given by multiple node operation which increases overall interference levels. In this work, a deterministic based analysis applied to variable density WSN operation within complex indoor scenarios is presented. The extensive analysis derives in interference characterization, both for conventional transceivers as well as wearable devices. Both 2.4GHz and 5.8GHz frequency bands have been considered. The proposed methodology, based on wireless node density analysis by means of deterministic 3D ray launching enables to provide accurate estimations of interference effects and hence determine optimal network configuration layouts for high node density scenarios inherent to IoT and Context Aware environments.

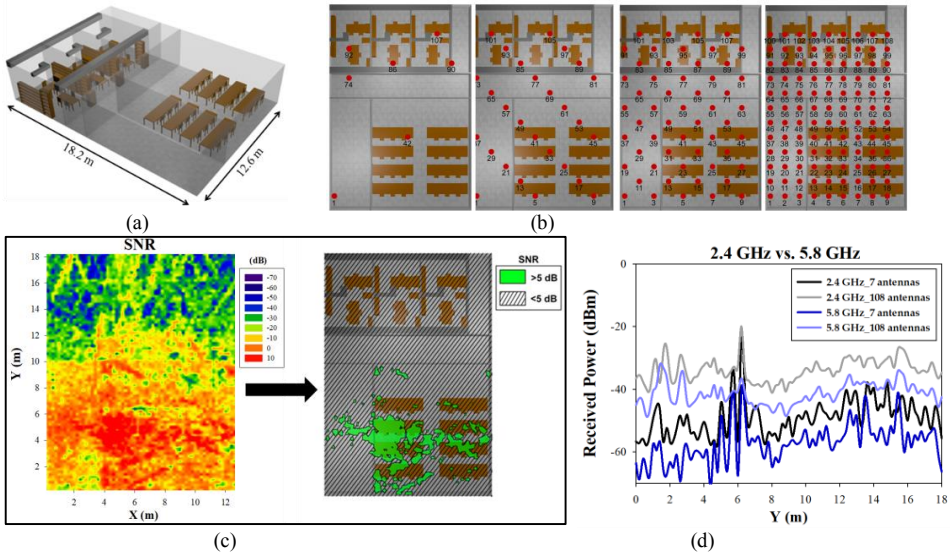

Figure 1. (a) Schematic representation of the simulation scenario, (b) Transceiver density: 7, 27, 54 and 108, (c) Estimation of SNR values for the scenario with 7 interfering transceivers and SNR fulfillment for ZigBee (5dB), (d) Received power level vs. distance distributions for 2.4GHz and 5.8GHz.