Ray-Tracing Interpolation for Continuous Modeling of Double Directional Radio Channel

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Abstract:

The paper investigates size of an area where certain propagation phenomenon is visible in an urban setting, using post-processing of ray-tracing data. The propagation phenomenon is distinctive from its counterparts by unique series of interactions that the radio signal encounters while traveling from transmitter to the receiver. Interactions are uniquely defined by their nature, i.e. diffraction or reflection, and by the object where they occur, i.e. specific building edge, or building side, respectively. The analysis of phenomenon visibility was performed on a set of data along an urban route, obtained from the rigorous 3D ray tracing simulations. The rays along the route were divided into “ray entities” (RE), based on the affiliation to unique propagation phenomena. Detection of RE presence along the route enables interpolation of the ray-tracing results between ray-tracing receiver points, thus enabling continuous radio channel model with significantly reduced computational burden. Additionally, based on each RE visibility along the route, the results give an insight into the dynamics of change of propagation modes in a multipath environment. This information provides the conditions under which it is reasonable to decrease the sample rate in ray tracing tools and use interpolation instead.