RADIO TRANSMISSION MODEL FOR WIRELESS NETWORKS

Liao Jiabing, Dong Ke, Okhrymenko M.
National Technical University «Kharkiv Polytechnic Institute», Kharkiv

Wireless communication systems rely heavily on accurate modeling of radio wave propagation to ensure reliable data transmission and optimal network performance. This paper presents a radio transmission model tailored for wireless networks that incorporates both deterministic and stochastic channel characteristics to enhance prediction accuracy in real-world environments.

The model combines the large-scale path loss model with stochastic fading components [1] to reflect environmental variability. It includes Rayleigh and Rician fading to represent different propagation conditions, such as urban clutter and line-of-sight scenarios, respectively. Additionally, the model integrates shadowing effects using a log-normal distribution, thereby allowing more precise simulation of signal attenuation due to obstacles.

The proposed approach supports dynamic adjustment of parameters based on topology and user density. Simulation results in NS-3 and MATLAB demonstrate [2] the model's capability to reproduce realistic signal strength distributions and to assess network metrics such as throughput and packet delivery ratio under varying deployment scenarios.

One of the key advantages of this model is its flexibility in adapting to different frequency bands and antenna configurations, making it applicable to a wide range of wireless technologies including Wi-Fi, LTE, and 5G [3]. Future work will focus on integrating this model with mobility patterns and cross-layer optimization strategies to further improve the accuracy of performance evaluations.

The development of a radio transmission model for wireless networks provides a vital tool for accurately simulating signal behavior in diverse environments. By incorporating both deterministic and stochastic propagation effects, the model enhances the realism of performance evaluation for various wireless technologies. Its adaptability to different frequencies, topologies, and mobility scenarios makes it highly applicable for modern network design and optimization tasks, supporting more reliable and efficient communication systems.

References

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