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STATE OF THE ART ON PATH LOSS MODEL DEVELOPMENT

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This is a study of path loss prediction modelling. Path loss modelling is widely applied in determining mobile wireless signal propagation in a given environment. This helps radio network planners to have an accurate view of requirements to obtain good quality of service when deploying radio networks. The empirical models are exhaustively analysed and compared with the emerging machine learning models. Also, mention is made of RIS models which are beginning to gather some attention due to their focus on the programmable electromagnetic properties. The study was able to establish empirical models as the most simple and efficient method of path loss prediction models. Attention is paid to the application of these models in both 900MHz and 1800MHz in urban, suburban and rural areas. This is due to the wide application of these frequencies in mobile wireless communication. The machine learning models present better results and give a high level of accuracy for diverse environments. However, they require large volume of data and environmental features extraction at both 2D and 3D to get reliable model. This makes it imperative to carry out field measurement tasks that are basically synonymous with methodologies employed in empirical approach to modelling. The variation in vegetation determines the best fit model for each particular case as well as the derivation of path loss exponent. The RIS modelling approach gives positive views especially at higher frequencies. The tuneable properties of the surfaces give a wide berth in application across different frequency spectrum. Complex and large volume of computation required in use of RIS implies that machine learning models, especially deep learning models will be better off incorporated into the process. It is thus beneficial to the researcher to ensure that a good grasp of the different approaches highlighted is obtained such that the benefits available are merged to produce finer results.

Keywords: Wireless communication, Pathloss models, traditional model, machine learning model, RIS

INTRODUCTION

Path loss models have become veritable tools for designing reliable wireless communication links over both long and short distances. It has been long established that several factors affect the propagation of radio waves which leads to non-uniform signal strength at different points. Some of the identified factors are buildings, trees,