Abstract

Moustafa Hussein Aly

Statistical Studies Using Goodness-of-Fit Techniques with Dynamic Underwater Visible Light Communication Channel Modeling

In this paper, we studied the probability distribution function (PDF) of the channel gain of dynamic underwater visible light communication (UVLC) model for different types of water using goodness-of-fit (GoF). We used different water channels at different system parameters with dynamic scenarios. First, the Zemax Optics Studio simulator is used to simulate dynamic UVLC channels. UVLC links are examined using Monte Carlo Ray-Tracing (MCRT) simulation for three different water channels namely, pure sea water channel, clear ocean water channel and coastal ocean water channel at different configuration types. With the presence of blocking divers, we added a dynamic movement in a single input multiple users (SIMU) scenario. Our simulation is based on Zemax Programming Language (ZPL) in sequence with the Zemax Optics Studio. The GoF tests are used to get the degree of fitness between the simulation data and the set of well-known candidate distributions to determine the best fit. We used the R statistical programming language and applied predefined algorithms to determine the optimum degree of fitting for each statistical result. The Kolmogorov-Smirnov (KS), Chi-Square (CS), Cramer-Von-Mises (CVM) and Anderson-Darling (AD) tests are used to represent the four GoF statistical computation techniques for each channel scenario. The received power is enhanced by 35% when the detector movement area increases from 25 m² to 100 m² in clear ocean water channel. The obtained results reveal that the UVLC is best represented by Weibull, Gamma Lognormal distributions.