On Differential Growth Equation to Stochastic Growth Model Using Hyperbolic Sine Function in Height/Diameter Modeling of Pines

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Abstract : Richard's growth equation being a generalized logistic growth equation was improved upon by introducing an allometric parameter using the hyperbolic sine function. The integral solution to this was called hyperbolic Richard's growth model having transformed the solution from deterministic to a stochastic growth model. Its ability in model prediction was compared with the classical Richard's growth model an approach which mimicked the natural variability of heights/diameter increment with respect to age and therefore provides a more realistic height/diameter predictions using the coefficient of determination (R2), Mean Absolute Error (MAE) and Mean Square Error (MSE) results. The Kolmogorov-Smirnov test and Shapiro-Wilk test was also used to test the behavior of the error term for possible violations. The mean function of top height/Dbh over age using the two models under study predicted closely the observed values of top height/Dbh in the hyperbolic Richard's nonlinear growth models better than the classical Richard's growth model.