名古屋工業大学大学院社会工学専攻　　趙　研究室

Lambda Distribution and Its Application in Data Fitting

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Background and Objective

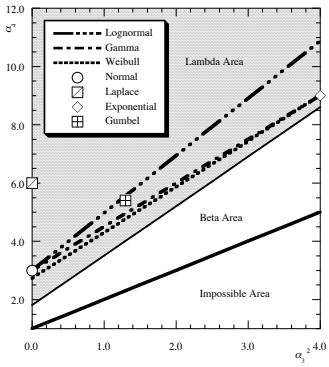
Usually, the method for determining the probability distribution of a variable is to fit the histogram of the statistical data with a candidate distribution. Generally, such candidate distribution would have parameters that may be evaluated from the mean value and standard deviation of the statistical data. However, the two-parameter distributions may not be appropriate when the skewness and kurtosis of the statistical data are important and must be reflected in the distribution.

In the present research, a four-parameter Lambda distributions is introduced and the simplicity, flexibility and advantages of this distribution in fitting statistical data are identified and discussed.

Definition of the Lambda distribution

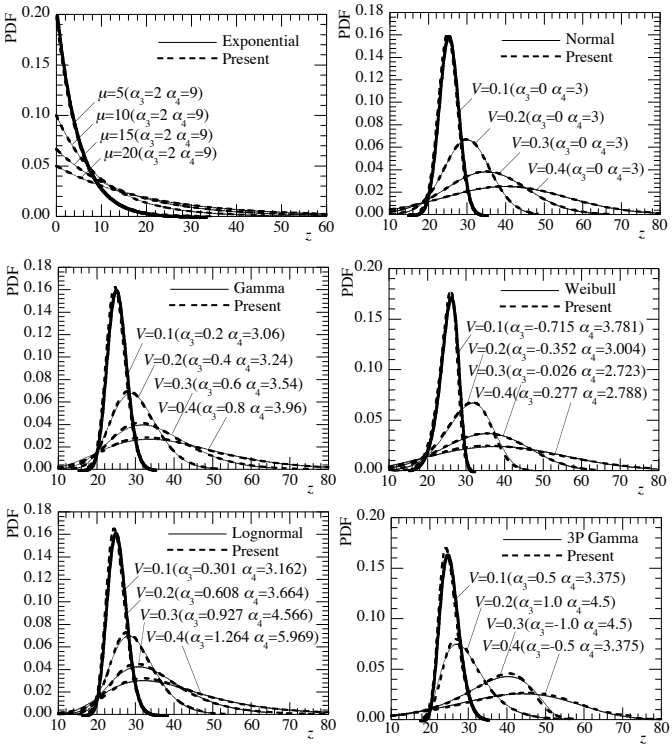
$$z = R(p) = \lambda_1 + \left[p^{\lambda_3} - (1-p)^{\lambda_4}\right]/\lambda_2 \quad (0 \le p \le 1)$$

Operable area in the α_3^2 -α_4 Plane

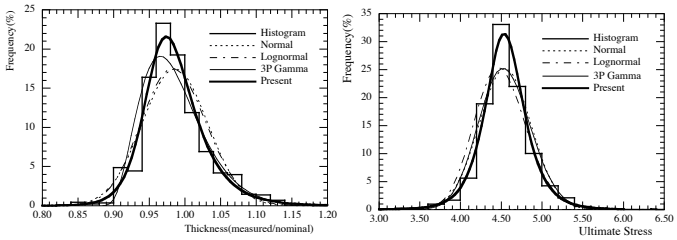


Main contents

Approximation for one-, Two- and Three-Parameter Distributions



Data Fitting of thickness and ultimate stress of H-shape steel



Outcomes

- The distribution has a single expression, and it is generally operable for common engineering use.
- The distribution has more flexibility for fitting statistical data of variables, and can more effectively fit the histograms of available data than two- or three-parameter distributions.
- The 4P Lambda distribution can be used to approximate some popular distributions, such as one-parameter exponential distribution, two-parameter distributions including normal, lognormal, Gamma, Weibull distributions and three-parameter Gamma distribution and so on.