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Abstract
In the grey relational generation, there are four data processing methods nowadays. They are traditional data processing, linear data processing, generalized data processing, and piecewise linear data processing methods. For the traditional data processing method, there is no linear relationship between the raw data series and the after-processing series for the larger the better or nominal the best cases. The generated series will also become undefined while the minimum raw value is zero for the smaller the better case. The linear data processing method will generate a new series which may magnify or shrink the relationship among the raw data series. The generalized data processing method will lead to the new series undefined while the minimum raw value is zero for the smaller the better case. The piecewise linear data processing method consists of multiple linear relationships. Its calculation is complicated. The four data processing methods didn't take the specification limits into consideration which is very popular in the manufacturing industry. In order to solve the problem, the research developed a data processing method which considers about the specification limits of quality characteristics. In addition, the research also proposed a data processing method which will not magnifies or shrinks the relationship among the raw data series while the raw data series are very close to each other.

In the real application, the relationship between the raw data series and after-processing data series is not necessary linear. It can be nonlinear. Based on this, the research proposed a method which first transformed the raw data series by loss function or signal–to-noise ratio method. Then apply the transformed data to any available data processing methods. This will make it become more suitable to the real cases.
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