

Exploration of Some Problems in Fourier Series and Fourier Transform

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Abstract

This paper discusses some easily fuzzy concepts and problems in Fourier series and Fourier transform by proposing and analyzing three kinds of problems, gives corresponding clear description, and gives corresponding conclusions: triangular form of Fourier series, correct representation of initial phase Angle. In the representation of periodic signals by Fourier series triangular forms, the expansion of the first type of triangular forms accurately describes the periodic signals that meet the Diiheri condition, while the expression of the second type of triangular forms is not accurate enough for the initial phase Angle. By analyzing and demonstrating the expression of the initial phase Angle, an accurate expression is proposed: When $a_n > 0$, the negative θ_n is in the first and fourth quadrants, and the arctangent function can correctly represent the Angle of these two quadrants. When $a_n < 0$ and $a_n < 0$, negative θ_n is in the third quadrant; When $a_n < 0$, and $a_n < 0$, negative θ_n is in the second quadrant; Two forms of power spectrum representation of periodic signals. The frequency spectrum of periodic signal can be expressed by Fourier series or Fourier transform. According to the characteristics of the frequency spectrum of periodic signal, two ways of expressing the power spectrum of periodic signal are given; For the common signal-sign function, the DC spectrum is zero. The theoretical proof is given: the algebraic sum of t less than zero inclusion area and t greater than zero inclusion area is zero, that is, the DC component is zero.

Keywords

Fourier Series, Triangular Form, Initial Phase Angle, Periodic Signal Spectrum, Periodic Signal Power Spectrum