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Apêndice A

Teoria da convolução

Um dos mais importantes conceitos na teoria de Fourier é a teoria da convolução [21,22]. Matematicamente, uma convolução é definida como a integral sobre todo o espaço de uma função $f(x)$ vezes uma outra função $g(u\text{-}x)$. A integral é tomada sobre a variável x, tipicamente no intervalo $[-\infty,+\infty]$ sobre toda dimensão. A convolução será uma função da nova variável u, como é mostrado na equação seguinte. A círculo com a cruz representa o operador convolução.

$$Con(u) = f(x) \otimes g(x) = \int_{espaço} f(x)g(u-x)dx \qquad (A.1)$$

Para melhor entendimento é apresentado um exemplo de fácil compreensão. É considerado a convolução de dois pulsos quadrados idênticos, em função da variável u. Na figura A.1 (a) um dos pulsos fica fixo, enquanto o outro varia ao longo do eixo x. Para cada posição u é tomada a área da interseção entre os dois pulsos, e conseqüentemente, um novo gráfico é construído, figura A.1 (b), que mostra a convolução em função da nova variável u.
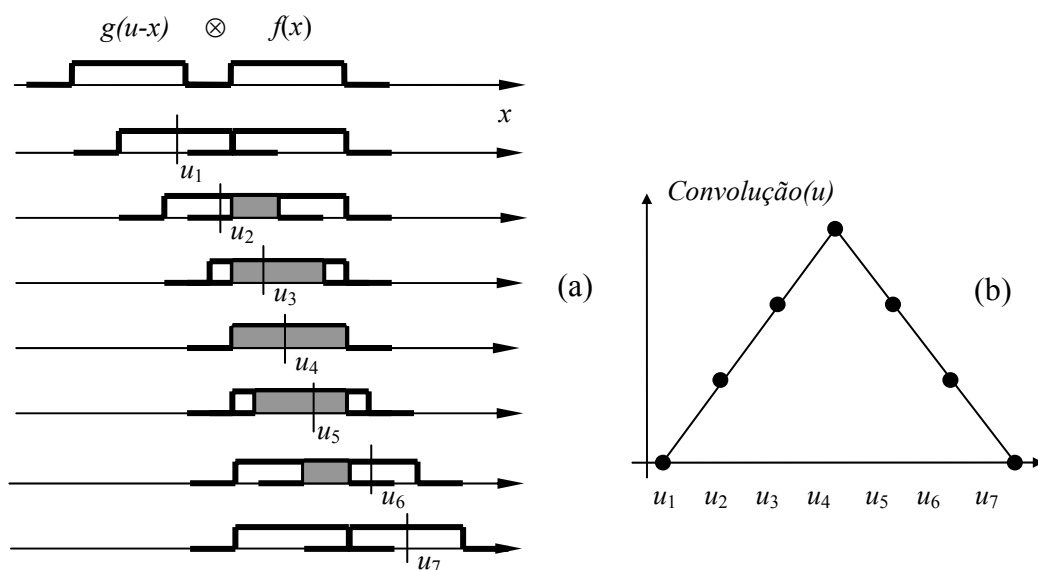

Figura A.1 - (a) Interseção dos pulsos para diferentes valores de u; (b) Convolução dos dois pulsos