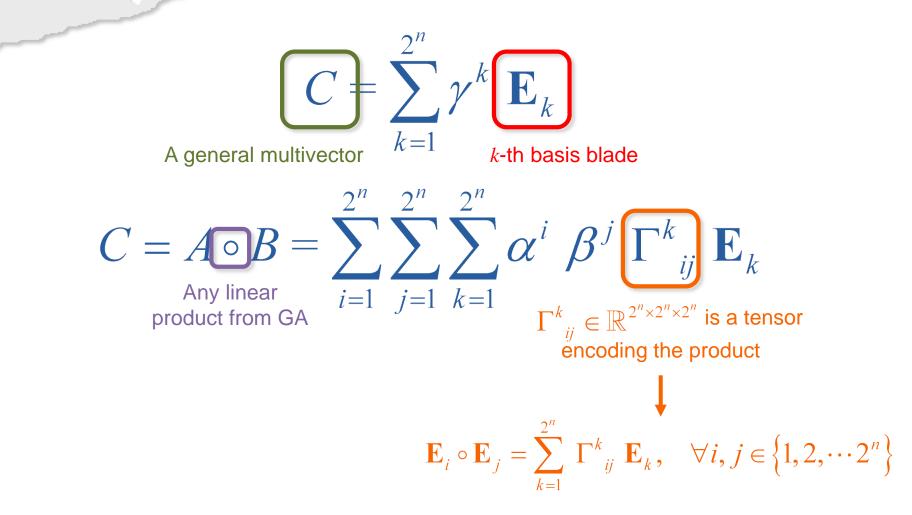
Introduction to Geometric Algebra Extra I

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Tensor representation of products





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Tensor representation of products

$$C = \sum_{k=1}^{2^n} \gamma^k \mathbf{E}_k$$

$$C = A \circ B = \sum_{i=1}^{2^n} \sum_{j=1}^{2^n} \sum_{k=1}^{2^n} \alpha^i \beta^j \Gamma^k_{ij} \mathbf{E}_k$$

The relation among the coefficients and a given product is

$$\gamma^{k} = \sum_{i=1}^{2^{n}} \sum_{j=1}^{2^{n}} \alpha^{i} \beta^{j} \Gamma^{k}_{ij}$$

One may use such relation to perform <u>multivector differentiation</u>.



Matrix notation of products

The two Jacobi matrices of the product of multivector.

The relation among the coefficients and a given product is $\gamma^{k} = \sum_{i=1}^{2^{n}} \sum_{j=1}^{2^{n}} \alpha^{i} \beta^{j} \Gamma^{k}_{ij}$



 $\frac{\partial \gamma^{k}}{\partial \beta^{j}} = \sum_{i=1}^{2^{n}} \alpha^{i} \Gamma^{k}_{ij} = \Gamma_{R}(\mathbf{a})$

The product can now be written as

 $\mathbf{c} = \Gamma_{R}(\mathbf{a})\mathbf{b} = \Gamma_{L}(\mathbf{b})\mathbf{a}$

where **a**, **b**, and **c** are column vectors,

e.g.,
$$\mathbf{C} = \begin{bmatrix} \gamma^1 & \gamma^2 & \cdots & \gamma^{2^n} \end{bmatrix}^T$$



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