Subject: Re: Meaning of outer product
Posted by Paul Sorenson on Fri, 19 Jul 2002 01:29:05 GMT
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Thanks, James and M. Katz. Your responses really helped clear up this issue for me. To summarize: the IDL documentation is correct in referring to C_ij = A_iB_j as the outer product. Other resources that refer to the cross product as the "outer product" are using the term more loosely.

James...

> OP = [[a.x*b*x, a.x*b.y, a.x*b.x],
> [a.y*b*x, a.y*b.y, a.y*b.x],
> [a.z*b*x, a.z*b.y, a.z*b.x]]

... I think you meant

OP = [[a.x*b.x, a.x*b.y, a.x*b.z],
[a.y*b.x, a.y*b.y, a.y*b.z],
[a.z*b.x, a.z*b.y, a.z*b.z]]

-Paul Sorenson

"M. Katz" <MKatz843@onebox.com> wrote in message news:4a097d6a.0207131330.1a6c1835@posting.google.com...
>> IDL documentation says: "Note - If A and B arguments are vectors, then C =
>> MATRIX_MULTIPLY(A, B) is a matrix with C_ij = A_iB_j. Mathematically, this
>> is equivalent to the outer product. . . ." But I'm having difficulty
>> reconciling this with my understanding of outer product. . .
>>
>> c.x = a.y*b.z - a.z*b.y
>> c.y = a.z*b.x - a.x*b.z
>> c.z = a.x*b.y - a.y*b.x
>>
>
> That's the "cross-product" c = a x b you've written (above).
> As you know, the "inner product" of two 3-element vectors is a scalar,
> also known as the "dot-product"
>
> c = a . b = a.x*b.x + a.y*b.y + a.z+b.z
> The inner product is written as a row vector times a column vector.
>
> The "outer product" of two three-element vectors is a 3x3 matrix
> C =
> (a.x*b.x a.x*b.y a.x*b.z)

> (a.y*b.x a.y*b.y a.y*b.z)
> (a.z*b.x a.z*b.y a.z*b.z) (I hope this isn't the transpose!)
>
> it's usually written as a column vector times a row vector.
>
> Remember that vector and matrix multiplications aren't necessarily
> commutitive: a times b != b times a, necessarily.
>
> M. Katz