Re: Simple trig question

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- *From*: Eric C <eric.forum@xxxxxxxxx>
- *Date*: Mon, 09 Jul 2007 20:07:11 −0000

On Jul 9, 3:32 pm, "jmorr...@xxxxxxxxxxx" <jmorr...@xxxxxxxxxxx>
wrote:

> On Jul 9, 3:13 pm, Eric C <eric.fo...@xxxxxxxxx> wrote:
>
>> I am currently learning more about SAR radar processing and I'm reading a Spotlight Mode SAR book by Jakowatz. I enjoy the book, but I've hit a very minor stumbling block I can't seem to figure out. It's on page 361, for those who have the book, but I'll simplify it here.
>>
>> It involves a triangle with sides a, r0, and r, where a << r0. He first sites the law of cosines:
>>
>> r^2 = r0^2 − a*a*r0*cos(phi)
>>
>> where phi is the angle across from r0. Then he states at a << r0 (also r0 > r), therefore the following is approximately true:
>>
>> r − r0 = −a cos(phi) + (a^2 / (2*r0)) * sin(phi)^2
>>
>> For the life of me I cannot figure out where that second term is coming from. I know it's basic, I just can't find it. I've tried looking at the problem from multiple angles, so to speak, but I just can't see that term. I've come up with approximations of my own. Can anyone explain that to me?

> > By the way, he also says (also approximately equals)
> >
> > (r − r0)^2 = a^2 * cos(phi)^2
> >
> > Which makes sense to me.
>
> Well, for starters, the version of the Law of Cosines as printed in your post is incorrect (IMHO).
>
> If the sides are r, ro, and a, and the angle given is phi, opposite the angle opposite ro, then the LofC says:
>
> ro^2 = a^2 +r^2 − 2 * a * r*cos(phi)
>
> Rearranging to give the LHS of the form you quote:
>
> r^2 = ro^2 − a^2 + 2 * a * r*cos(phi)
>
> which is not what you quote for the RHS...

I'm sorry, the equation I entered is incorrect. It should have been:

r^2 = r0^2 + a^2 − 2*a*r0*cos(phi)

where phi is across from r. He actually uses the angle that is pi/2 − phi so all the cosines and sines are switched and I was so focused on getting that right that I missed the errors you mentioned. Thanks. I still can't find where the last term comes from though. I did find that it was very accurate in a test case. Much more so than the approximations I came up with using the first few terms of sqrt(1+x) and the L2−norm with vectors.

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