Results 1 to 5 of 5

THREAD:
ESTIMATING A SALT TANK WITH VECTOR ADDTION

07-25-2010, 10:55 PM #1

trurl_
Registered User

Join Date: Dec 2004
Posts: 133

ESTIMATING A SALT TANK WITH VECTOR ADDTION

You know those salt water tank problems in calculus? I think you can estimate the salt left in the tank with vector addition. It worked on two examples I tried. Like a lot of my ideas it probably doesn't work. It is just something I have been trying to show mathematically since college. Let me know what you think. The write up is still evolving; trying to get in a simple form, but you should be able to get the basic idea.

There is a PDF to download and pictures on www.constructorscorner.net . The pictures are there because the computer errored every time I tried to put it into the PDF.

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07-26-2010, 08:55 AM #2

ComicSansMS
Most Horrible Font Ever

Join Date: Jun 2003
Location: Trier, Germany
Posts: 1,328

congratulations, you just managed to solve a simple problem in a horribly complicated way

the introduction by itself seems reasonably good, it introduces the problem well enough to get the reader on course. you don't give a motivation for the 'multiplication loop' approach, but well, you may give that later on.

unfortunately, you don't and things start to get quite messy. sentences like "The multiplication of a loop can be found by vector addtion. Or at least estimated." seem random at best, and give rise to a sense of confusion. the salt water tank-example comes utterly unexpected. since this seems to be the general idea of the approach, why wasn't it mentioned in the introduction?

and then you just stop without any conclusion. why is this approach useful? what did we gain over the original approach? your biggest problem is again a complete lack of structure.

also: when discussing problems at such a general level as you do, please use properly named variables in your equations (note: x is *not* a proper name). all you do is juggling some numbers around which makes the whole thing a) hard to follow and b) impossible to verify, since it is completely unclear whether you do something meaningful or the fact that your results match is simply a coincidence.

A Pageant of the Bizarre

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07-28-2010, 10:04 PM #3

trurl_
Registered User

Join Date: Dec 2004
Posts: 133

Thanks for the reply Sans. I do need to make things more clear. The salt water tank and statics problems are possible applications. But you are right the problem is overly complicated.

The important feature to me about this is not the salt water problem. Instead it is the loops and series you get using calculus in the salt water

problem and statics. If it holds true we are solving series and loops with vector addition and subtraction.

For example

salt in tank = 20
5000 gallon tank
salt enters at .03
water enters and leaves at 25 L/min

so the loop looks something like this

(20 + .03) - (20+ (.03* 25) / 5000)*25 iteration 1

let L = (20 + .03) - (20+ (.03* 25) / 5000)*25

(L + .03) - ((L + .03)/5000 *25) iteration 2

Try doing this 30 times without a computer. Not fun. This is not quite the division series. You're right I forgot to put it in the write up. I will have to find it in my notes. But you may be able to discover it on your own.

such as

L+0.3-[L +.03 - [L - (L\5000 *25]/5000*25]/5000*25

I found writing math is something you are always refining. I write something and after that I have to wait a few days to check it because if one thing needs fixed it can cause confusion and second guessing throughout the entire problem.

Thanks for the critic. I can right something that to me has made sense, but has just confused the readers. Now I need to give more reasons why I did something and clarify the endless series the vector addition is solving.

I hope the series I am trying to explain make sense. The idea is really abstract, especially when my problems are solved to demonstrate them instead of the more concrete problem.

I think simple statics problems are the best way to see the series. Like pulleys or angled frames. You need to find the weight each holds and the weight one holds is subtracted from the other. But how much do you subtract the weight on member holds from the other. Somehow we just take for granite that summing or subtracting the vectors solves are problems. Maybe this demonstrates what is going on behind our plugging and chugging.

I hope this problems encourages the readers to follow along with the problem, understand the point, and solve something with it.

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07-29-2010, 07:11 AM #4

ComicSansMS
Most Horrible Font Ever

Join Date: Jun 2003
Location: Trier, Germany
Posts: 1,328

> Originally Posted by **trurl_**
> *I think simple statics problems are the best way to see the series. Like pulleys or angled frames. You need to find the weight each holds and the weight one holds is subtracted from the other. But how much do you subtract the weight on member holds from the other. Somehow we just take for granite that summing or subtracting the vectors solves are problems. Maybe this demonstrates what is going on behind our plugging and chugging.*

This is all well and good, but you still owe us a motivation why an endless series of vector additions is a better solution than a simple force diagram that solves this problem in 3 simple steps without the use of any higher maths besides basic trigonometry.

A Pageant of the Bizarre

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07-30-2010, 08:55 PM #5

Join Date: Dec 2004

trurl_
Registered User

Posts: 133

Yes, it is simpler to use trig and a force diagram. I do that in the write-up. I did not draw the FBD but the vector addition does come from the free body diagram. I use vector addition instead of angles, because in more complex statics problems the most organized solution can only be found by vector addtion.

So in short, it is common to solve for statics problem with vector addition. I use the statics problem only to call attention to the “loop or series”. This way the salt water tank can be “estimated” using vector addtion and subtraction combined with basic trigonometry.

But again, I am trying to demonstrate this infinite loop or series that vector addition solves. This type of loop is not uncommon. Can you think of any other applications?

Please let me know if you have anymore questions. I will answer as best I can.

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