Re: Fourier Series Tutorial

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- *From*: Joseph2k <quiettechblue@xxxxxxxxx>
- *Date*: Thu, 3 Jan 2008 20:07:56 −0800 (PST)

On Jan 2, 3:53 am, buleg...@xxxxxxxxxxxxxxx wrote:

> On Jan 1, 8:38 pm, John Popelish <jpopel...@xxxxxxxx> wrote:
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> > buleg...@xxxxxxxxxxxxxxx wrote:
> >
> > > On Dec 31 2007, 11:03 pm, John Popelish
> > > <jpopel...@xxxxxxxx> wrote:
> > >
> > > > buleg...@xxxxxxxxxxxxxxx wrote:
> > > >
> > > > > Hi,
> > > > > I have created a tutorial for
> > > > > thefourierseries.
> > > > > It is located
> > > > > atwww.fourier−series.com
> >
> > (snip)
> >
> > > > Nice. Are you interested in suggestions, or is
> > > > this done?
> > >
> > > I would welcome suggestions, especially blatant errors.
> >
> > Thanks,
> >
> > Brent
>
> No blatant errors, just some little things that jarred my
> mental model of a beginner student taking your course. As

it is, the course is a nice review for people who have already had an earlier course, and covers many weaknesses in other versions.

My concerns are all about starting out with clear, but not overly detailed and complete definitions.

I am bothered about your use of words like basis vectors, orthogonal and use them without first giving a simple definition of what those words mean in this application. I am sure they are so familiar to you that they seem obvious, but that is not necessarily the case for the student.

I think you might mention thatFourieranalysis decomposes a repeating waveform into a sum of component parts, those parts being sine and cosine waves of all frequencies that are integer multiples (including zero) of the period of the repeating waveform. You work your way around this definition, but it is strung out through a lot of words.

I like the part of the discussion ofFourieranalysis where you mention that it is a tool to go from thinking of a wave as a repeating sequence of variations as time passes to thinking of that same wave as a combination of frequencies that are present throughout the wave... switching the viewpoint from the time domain to the frequency domain.

I think a nice addition would be a bit about how the X and Y axes are orthogonal because they are oriented at 90 degrees with respect to each other, so a point can be moved vertically without changing its X component, or moved horizontally without changing its Y component. This independence of movement vertically and horizontally is what makes the X−Y coordinate system a set of basis vectors that uniquely identify any point location as a unique combination of an X and Y displacement from the origin.

And that the points distance from the origin is the square root of the sum of the squares of its X and Y components.

Then show how similar to this two dimensional location of a point is to a two dimensional description of an arbitrary amplitude and phase shifted sinusoidal wave with sine and cosine components. Note how the sine and cosine are also phase shifted 90 degrees with respect to each other, similar to the way the X and Y axes are rotated with respect to each other. This 90 degree shift or rotation in a cyclic sense is what makes these two components orthogonal to each other and thus, usable as basis vectors that can locate the amplitude and phase of the arbitrary sinusoid.

And like the points distance from the origin being the square root of the sum of the squares of its two orthogonal components, the magnitude of the arbitrary sinusoidal wave is the square root of the sum of the squares of the magnitudes of two wave orthogonal wave component magnitudes, (sine and cosine).

In other words, I think you might spend a bit more time extending what might be most obvious to the beginner about the Cartesian plane to the new concept of sine and cosine as orthogonal another kind of two dimensional way to capture a different kind of information. You do some of this, but it didn't seem like you were trying to build on an existing mental concept (the X−Y plane) as much as mention some similarities it has with the sine cosine basis vectors.

I love your Java applets that allow waves to be built up from components, but if you could add a live numerical match score, it would help the user make sure a given change took him closer to the ideal solution, rather than further away, teaching him to visually recognize a real improvement, rather than guess what that looks like.

Given what you already have, I am guessing that coming up with a live match score wouldn't add much. But ignorance is always bliss.

I think you might also eliminate the frequency adjustment in the cases where it changes all frequencies together, and has no effect on the result. Just pick, say, two cycles of the wave.

I haven't gotten past 4.5, so I have no comments past the first part.

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Regards,

John Popelish

Martin ,
Thank you for your insightful comments. I did put a back button in on some of the later lectures , an I need to learn how to control the audio better, as you have suggested.

Brent

John,

Thanks for your detailed thoughts regarding this. I agree that I should consider updating the introduction, and I like your suggestion about even/odd symmetry.

I think you are probably correct that the tutorial seems to target the person that has already had some exposure to theFourierSeries. I am not sure if I want to change that or not, however.

I appreciate your taking th time to make these detailed comments.

Brent

I got here a bit later. Tame down the colors. Avoid "outlined" fonts.
Introduce phase shift versus sine/cosine coefficients earlier; the idea
is that you may get all sine or all cosine results more often. Clean up the navigation. Add many more examples, i know it is hard, but please. Even though this is a relatively introductory explanation, please
consider adding windowing issues. I also hope you will add many

student exercises but require "site registration (tell us a little
about
you)" to access the answers.
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