Aug 2013 update edit log PhL 7.22.13

1. Issue confusing X'(ω) and Y'(ω) **1**

1. Issue confusing X'(ω) and Y'(ω)

Question: Why do I use y_n instead of x_n a my sequence values for a pulse train?

Answer: In (20.3) I write

$$x(t) = y(t)\, d(t) = \sum_{n=-\infty}^{\infty} y(t)T_1\delta(t - nT_1) = \sum_{n=-\infty}^{\infty} y(t_n)\, T_1\delta(t - nT_1) = \sum_{n=-\infty}^{\infty} y_n\, T_1\delta(t - nT_1) \qquad (20.3)$$

Here $x(t_n) = x_n = y(t_n)T_1\delta(0) = y_n\, T_1\delta(0)$, so x_n already had a meaning different from y_n. This was for pulse = δ function. Later I have

$$x(t) = \sum_{n=-\infty}^{\infty} y_n\ x_{\mathbf{pulse}}(t - t_n)$$

which then says

$$x_n = x(t_n) = \sum_{n=-\infty}^{\infty} y_n\ x_{\mathbf{pulse}}(0) = x_{\mathbf{pulse}}(0) \sum_{n=-\infty}^{\infty} y_n$$

and again x_n and y_n have different meanings. Had I called y_m by the name x_m it would be a disaster.

OK, I like the answer above. Now I think I have some wrong stuff concerning X"(ω) and Y"(ω) being written as the same thing. Let's do a full FT scan and see what I can do about this.

$$X(\omega) = Y'(\omega) = \sum_{m=-\infty}^{\infty} Y(\omega - m\omega_1) = Y(\omega) + \sum_{m \neq 0} Y(\omega - m\omega_1) \quad . \qquad (20.7)$$

The above is with a pulse train of delta functions. It is OK.

In Section 23 on X'(ω) I do deal with x(t), $x_n = x(t_n)$, X(ω), X'(ω). This is an isolated little world, there are no pulse trains here. In the summary box I have for example

$$X'(\omega) \equiv T_1 \sum_{n=-\infty}^{\infty} x_n e^{-i\omega n T_1} \qquad \text{projection = transform}$$

which is just fine. And then in the Z transform section

$$X''(z) = \sum_{n=-\infty}^{\infty} x_n z^{-n} \qquad \text{projection = transform} \qquad (24.3)$$

So no harm in having x_n appearing in these generic sections devoid of x(t) as the pulse train. Continue:

Section 25 talks about amplitude modulated pulse trains so look carefully.

$$\sum_{n=-\infty}^{\infty} y_n e^{+i\omega t_n} = \frac{1}{T_1} Y'(\omega) \quad = Y''(z) \qquad (25.2)$$

The above is just fine.

$$X(\omega) = X_{pulse}(\omega) \frac{1}{T_1} Y'(\omega) \quad = c(\omega)\, Y'(\omega) \quad = X_{pulse}(\omega)\, Y''(z) \ . \qquad (25.3)$$

The above is just fine. Box 25.4 is fine too. No errors yet. Everything is squeaky clean.

$$X(\omega) \ = \ (1/T_1)\, X_{pulse}(\omega)\, Y'(\omega) \ . \qquad (26.1)$$

Above just fine. The DFT section is its own world, no pulse trains.
Chap 4 practical topics all OK
Chap 5 Kramers OK.

So all is well up to the start of Chapter 6. Pay attention now please!
Section 32 all OK.
Section 33. Starts on "simple" pulse trains.

First problem appears in (33.2). This is a mess, and I now turn to temp1.doc as a repair sandbox for as much as I need to repair. DONE. I think I have now repaired this problem in full everything in FT! I saved after doing, and will retain temp1.doc for a while.

2. The Z transform W-K

I want to work in my W-K in terms of R"(z). I think a good place to do that is as a new section called 32 (f). I want it near the other W-K stuff. I have not yet defined SPD stuff. I have it all ready to go in a file new FT 32 (f), so I will install it right now. **DONE**.

3. The rule $\mathcal{P}(\omega) = \mathcal{P}_{pulse}(\omega)$ R"(z)

I defined r_s and R"(z) in item 2 above so can refer to them later. But I have to wait until $\mathcal{P}(\omega)$ has been defined somewhere! Section 34 seems logical. I need to do it after (34.12) somewhere. Consider rewriting

$$\mathcal{E}(\omega) \equiv |X(\omega)|^2/2\pi = (1/2\pi)\,|\,X_{pulse}(\omega)\,|^2 \sum_{n=-\infty}^{\infty} \sum_{m=-\infty}^{\infty} y_m^*\, y_n\, e^{i\omega(m-n)T_1} \tag{34.11}$$

$$\mathcal{P}(\omega) \equiv \frac{\mathcal{E}(\omega)}{T} = (1/2\pi T)\,|\,X_{pulse}(\omega)\,|^2 \sum_{n=-\infty}^{\infty} \sum_{m=-\infty}^{\infty} y_m^*\, y_n\, e^{i\omega(m-n)T_1} \tag{34.12}$$

so that we always see things both ways:

$$\mathcal{E}(\omega) \equiv |X(\omega)|^2/2\pi = (1/2\pi)\,|\,X_{pulse}(\omega)\,|^2\,|\,Y''(z)\,|^2$$
$$= (1/2\pi)\,|\,X_{pulse}(\omega)\,|^2 \sum_{n=-\infty}^{\infty} \sum_{m=-\infty}^{\infty} y_m^*\, y_n\, e^{i\omega(m-n)T_1} \tag{34.11}$$

$$\mathcal{P}(\omega) \equiv \frac{\mathcal{E}(\omega)}{T} = (1/2\pi T)\,|\,X_{pulse}(\omega)\,|^2 |\,Y''(z)\,|^2$$
$$= (1/2\pi T)\,|\,X_{pulse}(\omega)\,|^2 \sum_{n=-\infty}^{\infty} \sum_{m=-\infty}^{\infty} y_m^*\, y_n\, e^{i\omega(m-n)T_1} \tag{34.12}$$

Similarly for the next two

$$\mathcal{E}(\omega) = T_1\, \mathcal{P}_{pulse}(\omega)\,|\,Y''(z)\,|^2 = T_1\, \mathcal{P}_{pulse}(\omega) \sum_{n=-\infty}^{\infty} \sum_{m=-\infty}^{\infty} y_m^*\, y_n\, e^{i\omega(m-n)T_1} \tag{34.13}$$

$$\mathcal{P}(\omega) = \mathcal{P}_{pulse}(\omega)\,\frac{T_1}{T}\,|\,Y''(z)\,|^2 = \mathcal{P}_{pulse}(\omega)\,\frac{T_1}{T} \sum_{n=-\infty}^{\infty} \sum_{m=-\infty}^{\infty} y_m^*\, y_n\, e^{i\omega(m-n)T_1} \tag{34.14}$$

This is then where we want to "do it" !

OK I have done it with equation numbers (34.13a) etc. This is done exactly where it would be done.

4. No References for (34.5,6,7)

I will add references in italics:

$$x(t) = \sum_{n=-\infty}^{\infty} y_n\, x_{pulse}(t - t_n) \qquad \textit{(25.1)} \tag{34.5}$$

$$X(\omega) = (1/T_1)X_{pulse}(\omega)\,Y'(\omega) = X_{pulse}(\omega)\,Y''(z) \qquad \textit{(25.3)} \tag{34.6}$$

$$Y''(z) = Y'(\omega)/T_1 = \sum_{n=-\infty}^{\infty} y_n\, e^{-i\omega n T_1} \quad . \qquad \textit{(24.2)} \tag{34.7}$$

All done.

5. What to do with Appendix F?

I decided to use it and enhance it in several ways.

First, I have it compute X(ω) in addition to $\mathcal{P}(\omega)$.

I have finished a nice cut of a new Appendix F with this TOC

Appendix F: The Power Density of an Infinite Pulse Train having a Repeated Sequence.....1
(a) Calculation of X(ω) for a Pulse Train with a Repeated Sequence.....1
(b) Calculation of $\mathcal{P}(\omega)$ for a Pulse Train with a Repeated Sequence.....3
(c) Calculation for an Ensemble of such Pulse Trains subject to Certain Conditions 5
(d) Limit as $P \to \infty$ of the Ensemble Result.....10
(e) Alternate derivation of $\mathcal{P}(\omega)$ using the Autocorrelation Sequence.....11

Point of Confusion: In section (c) I compute <P(ω)> but in section (e) I compute P(ω) for a single sequence. How can they be the same?

Steam has run out and I have a mystery:

" If this is valid for any ensemble,

$$\langle \mathcal{P}(\omega) \rangle = \mathcal{P}_{\mathtt{pulse}}(\omega)\ \omega_1 \sum_{m=-\infty}^{\infty} \delta(\omega - \omega_1 m/P)\ \frac{1}{P^2} \sum_{n=0}^{P-1} \sum_{m=0}^{P-1} \langle y_m^* y_n \rangle\ e^{i\omega(m-n)T_1} \qquad \text{(F.24)}$$

$$= \mathcal{P}_{\mathtt{pulse}}(\omega)\ \omega_1 \sum_{m=-\infty}^{\infty} [\ (\beta-\alpha)\ \frac{1}{P}\ \delta(\omega - \omega_1 m/P)\ +\ \alpha\ \delta(\omega - \omega_1 m)\ ] \qquad \text{(F.33c)}$$

subject to the condition

$$\langle y_m^* y_n \rangle = \alpha \qquad \text{for } m \neq n$$

$$\langle y_m^* y_n \rangle = \beta \qquad \text{for } m = n \qquad \text{(F.25)}$$

then why can't you apply it to an ensemble consisting of a single sequence? In this case, what exactly is the meaning of $\langle y_m^* y_n \rangle$? How does this relate to $\langle y_m^* y_n \rangle_1$ which is a sort of "horizontal" average, whereas $\langle y_m^* y_n \rangle$ seems to be a vertical average? "

Something is fishy here!

Continued Tues July 23.

I went off and wrote averages.doc and studied many things, learned more about <.> versus <.>$_1$. Found resulting errors in App F. Fixed them, then did more work on Appendix F. My investment in this appendix continues to increase, I think it is completely correct now as of 3 PM.

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7. Soften comments about autocorrelation.

In the main body I definitely pooh-pooh autocorrelation as useless, but in Appendix F it is the only way I know to get the MLS spectrum result! **DONE** My added comment there also ties various newly entered things together.

6. What to do about the main-body "repeated subsequence" section?

First I am adding a section to Appendix F to do the AB and ABC cases.

In doing this, I found that Re(AB) should be Re(A*B) in the main body! 5 places, all fixed, DONE.

OK, I have added section (g) which replicates main text results. I have decided NOT to shorten the main text because it provides very excellent calculation experience for my trusty reader, showing lots of pitfalls and so on. Also it demonstrates various other methods.

But I should now cross link to the Appendix from the repeated section area. **DONE**.

Be sure to repaginate all!

I will now do a final check on Appendix F and then install it.

* Just did a full reread, caught a few errors.
* Paginate. Good through p 10. All done, it went OK
* spelling scan. I already formatted and checked all equation numbers. DONE.

Time to install!

STOP! Something is wrong with existing Appendix E. It is missing! But it just came back.
Installation is complete.

Next, update the two overviews! Done, no problem. We are sitting now at 287 pages!

I will now go down my separate spectral doc errata list and fix each item.

References: I need to add my Scrambler doc reference and I think I refer to it twice. Copy the form used in Scrambler for References. So FT now references Scrambler and no other Lucht docs.

Let's make a PDF just to see if there is any major problem. First attempt did not fly. Close word and try again.

Friday July 26.

I have been working for a few days now on Spectral Appendix G which now contains all my Probability Theory and discussion of random variables. Right now I am up to the "ensemble experiments" section. My goal here is to have some clear statements to make about sequences of pulse train amplitudes from the perspective of random variables. I want to get clear meanings for my friends like $\langle a_m a_n \rangle$ for $m \neq n$. I have never really pondered this in the full random variable framework. Hopefully I will finish this appendix tomorrow.

Sat July 27.

I worked more on Appendix G, adding equation numbers and figure numbers and adding applications of the "basic probability theory" and now at 10:15AM I am ready to attack section (f): experiments with sequences. This is supposed to be the big payoff and connection, we shall see!

Mon July 29.

JB mort 5:20 PM. Today I once again finished Appendix G. I think I followed a reasonable path and ended up obtaining the simple results I was looking for. I now have to ponder how this jibes with App C on probability theory, there is lots of duplication. I need to review all the temp docs and see if something big got left out. This just took forever to thread. My "useful ensemble" was the key thing I think.

Tues July 30.

Reviewed all docs lying around, gave them a red header paragraph, marked REVD in file name. In App G I open with (a) and (b) answering the question "what is a random variable". Then the Basic Prob section comes next as (c). But we have the heavy math lemmas here right in the middle, Jacobian and all that. After that comes the sequence: mean, function of a random variable theorems, covariance, variance, correlation, summary of stat independence Fact. This ends and we have ensemble experiments. I relate dice to people, current versus historical. Then two dice at once. Then new (f) is about how you compute the p functions. Then finally (g) on sequences.

I don't want to make someone read this whole thing just to get the μ, σ,α,β connection!

But as I read Appendix D, it says things that are not supported ouch! And it has a fact I omitted from Appendix G (just added it). I think D needs a rewrite.

Rewrite of App D. I like the opening section (a), but it is too long, so I am editing it now. I knocked this down from 15 equation numbers to 9 with some being paired in an obvious way. I got rid of the delta function thing which appears in App G.

Now section (b) will need more work. Why not just do direct translation and just prime all the equation numbers.

OK, I now have a renovated version of appendix D. It is 6 pages long, the old was 5 pages. // I have gone through it a few times, it seems OK. Number sequence OK, no figures, reference to Appendix G, spelling. I will save the old one and install this soon.

First, I will fix up all main body references to Appendix D. DONE. There were about 5 references.

Now save the old App D and install the new one: DONE, new TOC all OK.

Get ready now to install App G. Opening paragraphs OK. it is a huge 28 pages long.
equation number sequence and position: Stop at (G.39) there are two of these! I just deleted one of them. No, changed to an a,b. All EN are adjusted not.
figures, 12 of them, sequence OK, adjust OK
spelling: DONE

Let's browse a few sections before installation.
(a) fine
(b) fine
(c) this baby is very long but I think very good. I have it now in my record, finally.
(d) historical data tie in, this is good
(e) rolling two dice, OK
(f) computing pmfs in practice. Perhaps a bit mundane, but want to get practicality in with theory.
(g) OK

All done. Before install, I want to examine *references* which involve things "statistical" from the main body of FT. There will be nothing before Section 35. I want to make sure the right things are said and I can refer the reader to App G or perhaps App D as needed.

Read starting Section 35
(a) done. I do refer to Appendix D here (but not G).

I realized that I have never defined a statistical pulse train, though that phrase appears in various places. After about an hour of fiddling, during which I thought I might have to ditch ensembles altogether, I cam up with what I think is a pretty good definition. This now sits at the front end of Section 35. I think it helps a lot.

Restart reading Section 35"
new intro: OK
(a) done, comment re App G added.
(b) done
(c) done, it is all good.
(d) done and good
(e) done, my simulation
(f) done.

This Section 35 I feel is very very good, and is made much better by my opening introduction. It will need repagination of course.

Let's now just start into Section 36 and make sure nothing wrong is said.

Question: How do we understand variance in (36.5) ? OK

Status: I think my statistical remarks are now OK! And the swirling pieces are linked together OK.

It is 9PM so I stop. Tomorrow I will first write the various missing overview pieces, then I will installed Appendix G. I hope I got the major stuff done today. Kent is not coming to Hellfire so a little extra time there.

Weds July 31.

I just installed Appendix G, now at some 317p.

The App F detailed summary is already in place.
App G summary written and installed.
App D summary updated.
I have done some browsing with small edits. I think we are ready to fly for repagination and PDF.

BUT, I will put things on hold here and go back to Scrambler, redo section 2.5 there to link it do the new FT sections. I want to make sure this linkage is clean before taking FT to PDF.

Thurs Aug 1.

(1) I found a major error in using terms independent and uncorrelated and did a global repair of FT on this subject. See separate doc for working doc on this subject, name stat indep repairs doc.

(2) I reviewed Bennett and Davey and Xiong, and the general subject of <...> and $<...>_1$ and am now very uncomfortable about my whole foundation. This pondering is **now in progress** at 3 PM.

Sat Aug 3.

What I did was stop working in the aug update folder, created a no ensemble folder and started working there. But then my Scenario #1 failed cause the Y_n are not random variables, so I then stopped working there and am now resuming here. I am keeping that folder alive however. I copied back a backup in which I made some improvements, such as in the reflections Section 7. So things now resume here.

My first edit was to improve the definition of a random variable to stress that it must be connected with a specific experiment and a specific outcome of that experiment. You cannot just make up a set of random variables devoid of an experimental context. **DONE**.

I will now start doing edits one Section at a time.

Section 32: No changes until section (f) where I now restore the $<..>_1$ subscript. I leave in place my extra note on computing R"(z) for a finite pulse train, I think this is still correct. So not much here, but I did bring back $<...>_1$.

Section 33. In (a) I get PSD for the infinite simple pulse train case. It is a completely direct calculation. But I stop at the point of $\frac{|X(\omega)|^2}{[2\pi\delta(0)]}$ and I never talk about PSD. So I have given these two sections new titles now to make clear what work is being done.

In (c) I think everything is OK. Did some extra infinite/finite labels on things.

OK, I think Section 33 is OK in light of my current mindset. Added "instantaneous power" again here in section (d) which is all about power P.

Section 34. (a) Am easing in. This section is just a summary of previous stuff.

(b) States $\mathcal{P}(\omega)$ as the famous double sum $\sum_{n=-\infty}^{\infty} \sum_{m=-\infty}^{\infty} y_m^* \, y_n \, e^{i\omega(m-n)T_1}$. There are no averages yet, nothing statistical. I say that endpoints -N and N would apply for finite. I do relate to R"(z) and at least mention r_s. So this section just sits there. I guess it can still sit just as it is.

(c) is the repeated sequences stuff. I am making titles of the very long sections more explicit so people can remember what work is supposedly being done. Then we have the long special cases section which I still thing is just fine.

So Section 34 has survived. No ensembles mentioned, no nothin.

Section 35. This opens with my very recent explanation of "statistical pulse train". Having tried out "no ensemble land", I now like this section again, very much. I now note what the experiment is and what the outcome of interest is.

(a) Right off the bat now we have our <...> averages ending with (35.4). I now want to think hard about what this section should really do next! I think things are out of order. Let's try a rewrite of Section 35 in a separate file, just to see where it might lead.

I am working on Sec 35 sep file, and right now am at a "rubber meets the road" point with the two expressions side by side

$$\mathcal{P}(\omega) = \mathcal{P}_{pulse}(\omega) \sum_{s=-\infty}^{\infty} \langle y_n^* \, y_{n+s} \rangle_1 \, z^{-s} \qquad z = e^{i\omega T_1} \qquad \text{one pulse train} \qquad (35.5)$$

$$\langle \mathcal{P}(\omega) \rangle = T_1 \, \mathcal{P}_{pulse}(\omega) \, (1/T) \sum_{n=-\infty}^{\infty} \sum_{m=-\infty}^{\infty} \langle y_m^* \, y_n \rangle \, e^{i\omega(m-n)T_1} \qquad \text{ensemble} \qquad (35.2)$$

OK, now 5:45PM I am way past the above in Section 35. I have completely rewritten this entire Section and am still going.

At 8:20PM I have done a *complete rewrite* of Section 35! I did this in its own file and nothing is installed, and I will be sure to save the old Section 35 in an archive file "just in case" in need something in it. This rewrite pushes the autocorrelation stuff front and center and demonstrates the method, but the older ensemble method also works and more directly relates to random variables Y_n.

I got rid of α and β altogether and there is now no need for Appendix D which I will remove at some point. Then of course E,F,G have to be relabeled with lots of cross reference repairs.

I still have an outstanding question. If I use the autocorrelation method for the finite pulse train, how on earth is that δ_6 all positive function going to appear? If it does not, how do I interpret the different result?

Much more work still remains. Signing off at 8:45PM.

Sun Aug 4.

I wrote up the paradox that δ_5 goes negative but R"(z) must be positive and added its resolution as a Comment 2 at the end of the finite N section of Section 35, **DONE**. Adjusted figure and equation numbers, but not all internal cross references yet.

So let's now have a review of this new Section 35 before we move on.

Section 35

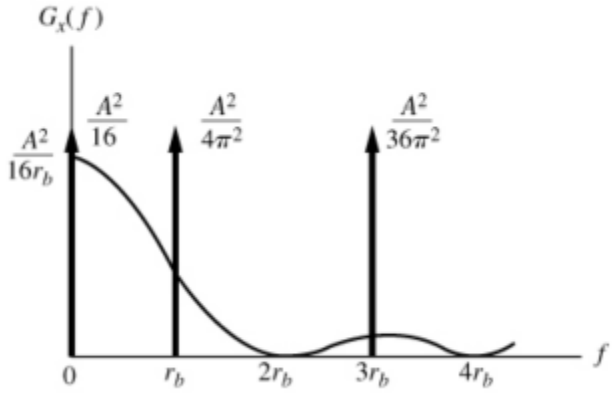
equation numbering sequence: 1 to 40, various a and b stuff, but OK
Fig numbering: Fig 35.1 through 35.7, OK
position adjusts on these items:
(a) OK, did small edits. Read again, more edits, it is fine. Good to define stat pulse train.
(b) Tale of Two is OK
Assumptions also OK, always making smalledits
(c) thru verification, all OK
case A,B OK
(d) OK
(e) OK
(f) done, I still like this simulation for N = 20 and I = 10.
(g) done

OK, I am now done with this new Section 35. Its external references are good, and it is ready to install.

But first, I create a new Section 36 which makes no mention of α and β.

Section 36 -- this is taking a VERY long time, I had to make things more uniform.
(a) redone several times now to have a solid template
(b) done several times, now seems stable
(c) done

Stop. I screwed up the Unipolar RZ lines, and fixed it with this confirmation from some PDF



But my plot is still OK if I do it my way, don't have show these quantities above, but at least I now mention them.

(d) instead of a problem for the reader, I just inserted the bipolar RZ code here OK
(e) Manchester. Finally OK
(f) eye patterns OK

This took ALL DAY to get cleaned up. Yikes. It is of course very much better than it was before.

Equation number check: DONE and OK
Figure number check: DONE, did repairs.
spelling check: OK

Section 36 is now ready to install!

Section 37: I started digging into this. Got things adapted, then spent a lot of time plotting the autocorrelation function. I then actually blasted into the "autocorrelation method" and almost got the right answer in less than 30 minutes, but it differs. I never thought I would stand a chance with this method, but at least I got a start. It is now 11 PM, having too much fun today.

Mon Aug 5.

This morning I finished off Section 37 and it is hugely improved in very many ways. In some sense it is the main example of this entire doc, so good to have it done right. Both "methods" give the same result for this N = ∞ example. It needs checking of course, and I will do that next.

Section 37
equation number sequence and position: OK and done
figure numbering and alignment: 6 of them all done and OK
spell check visual: done and OK

Before doing a final proofing, I want to look back at earlier tedious sections 33 and 34.

Section 33
opening OK

(a) good
(b) good
(c) good. I am just "working" all the levers here to obtain good results, nothing bad yet
(d) good ..

I have no issues with Section 33, nothing needs changing.

Section 34
(a) OK, the general facts gathered up and connected to autocorr
(b) good, has the famous R"(z) connection
(c) Method 1 and 2 are OK, all uses finite N and then takes N→∞ so on doubts.

I added some Heading 5 levels so things are not so hidden! Maybe other sections could use this, I never had a level 5 before! I scanned before this point and found no need for heading 5's. Fine.

Section 38. I have started now on this Change Hold one. I am trying to make it exactly parallel the AMI section 38. It took some time to get the autocorrelation plots done, but I think they are good.

I finally made it to the start of the NRZ example. it is 6:15 PM, a lot of work indeed. The parallel to the AMI is very close. // Finally I have finished Section 38, the last main body section thank goodness!

Section 38
equation number sequence and position: done
figure numbering and alignment: done
spell check visual: done

Section 38 is ready to install.

Let's first update all overview material for Sections 35,36,37,38.
detailed overviews: done, paste away spell check: found two typos and fixed.
general overviews: it is just one paragraph, no changes needed.
paste spell check shows no typos.

I am now ready for installation. First I will save each of the Chapters being replaced. DONE

Installations
Sec 35: done
Sec 36: done
Sec 37: done
Sec 38: done

Next, I will save off Appendix D and then remove if from FT. But first I will scan for D. references just to make sure nothing is used. : Not a single reference in the entire DOC outside App D. So save it off. Done, and it is deleted from FT. Now delete it from both overviews: done.

Soon I will make the global change E,F,G → D,E,F but want to hold off on that just a bit. I want now to review App F and G next, to adjust for changes made in Sections 35-38. THEN I will do the adjust which will involve some cross reference tuning. And I want to look at the Scrambler tie ins again.

So 8:30 PM is a wrap for this work day which started around 7:15. A good breaking point I think.

Tues Aug 6.

I may have jumped the gun with those installations. I still don't think my "two methods" concept is precise enough. They are always the same for an infinite pulse train, for example. I think I need to rewrite Section 35 again to clear this up. Started a new doc on "tale of two formulas". I think this means I miss my Cod deadline for the FT update because this tale thing itself will take several days. Too bad.

I then made some good progress and good a solid start on a new Section 35.

Weds Aug 7.

Continuing on Section 35.

(a) on stat pulse trains is excellent. Gave the Ensemble thing a Fig number.
(b) region of support has 5 equations, deals with important math details
(c) specific pulse train, just fine
(d) ensemble averages of previous section, just fine. 2 equations per section.
(e) adding stationarity, all seems fine.
(f) adding independence along with stationarity, all fine
(g) decided to include section comparing <..> and $<...>_1$ since Xiong makes related claims

I now pause. In the previous rendition of Section (35) I had Tale of Two Formulas. What were these formulas?

$$\mathcal{P}(\omega) = \mathcal{P}_{\mathbf{pulse}}(\omega) \sum_{s=-2N}^{2N} \langle y_m y_{m+s} \rangle_1 \, z^{-s} \qquad \text{one pulse train} \qquad z \equiv e^{i\omega T_1} \qquad (35.6)'$$

$$\langle \mathcal{P}(\omega) \rangle = \mathcal{P}_{\mathbf{pulse}}(\omega) \frac{1}{2N+1} \sum_{s=-2N}^{2N} \sum_{m=-N}^{N} \langle y_m y_{m+s} \rangle \, z^{-s} \qquad \text{ensemble of pulse trains} \qquad (35.5)'$$

Well, in terms of the new Sec 35, the first is first equation of group (35.7) and is correct, while the second one is the last of group (35.9) and in a certain sense the sums are wrong. In another sense the sum is OK if you use the θθθθ extension of $\langle y_m y_{m+s} \rangle$, and this is how I got into the δ_5 and δ_6 problem. I just added a comment after (35.7) making this point that $y_m y_{m+s}$ is stripped of its θ functions.

My point with the "tale of two formulas" is that for very large N, you can use either one to get a result. AT this point in the new Sec 35 I have not stated this notion yet.

Now at 1:30PM I have battled my way down to the pulse train example now section (f). Above this I all equation numbers are in order, and cross references are updated, and all Figures are labeled in sequence. I can finish this pretty soon now, but time for a break. // Half run, back 2:30 PM.

Got through the simulation thing, made a fix to a code comment, updated eq numbers.

My review of autocorr section is out of order! I now put it at the end. All eq and fig numbers are updated.

Starting section (g) on paradox. Done.

Starting section (h). Done. I did a lot of edits. The two pathways idea is back and they have names, so this part has been resurrected.

Playing now with TOC aspects of Section 35.

Final checks now on this revamped Section 35

equation numbers done

figure numbers done

spellcheck done

Section 36 Update

(1) Go through and search out all 35. references and update them: DONE, went very fast.

All done. This section only makes two repeated refs to Section 35, I got off light.

Section 37 Update

(1) Go through and search out all 35. references and update them: DONE, very few

(2) remove the Ensemble Method section. There is no "ensemble method".

(3) Do a read through" Done, it is all good.

I need to remove all references to "ensemble method". For ∞ pulse trains, the ensemble formula always replicates the autocorr method, so don't waste the readers time showing it both ways.

Section 38 Update

Made the same changes then a little fast browse through

I could now install Sec 35-38, but let's hold off for a while, that would have been a good thing to do LAST time I thought these sections were ready. App D should be a no brainer, so let's get right on now to App F. But first let's just make sure the last section of App G is still OK.

Appendix G. All OK except the last section (g). Here I construct my "useful ensemble". I was at that time trying to somehow justify the notion of stationarity. It seems that using my construction, any Apparatus whether or not stationary will generate an ensemble with the desired stationarity properties! In earlier versions of this doc, I was very dependent on the ensemble to justify things, whereas now I have moved away from that need.

Let's get rid of this whole useful ensemble thing. It serves no purpose. I will make the sectino a much shorter stub.

It is done, I deleted the big useful ensemble from FT and adjusted the front end text a bit. I am now removing pages instead of adding them!!

Eventually I have to redo all my overview things, but let's let that ride.

Next should be Appendix F where I expect trouble. Maybe to fill the next 90 minutes I will instead create App D which requires less effort. it is 6:45 and I am a bit worn down.

Thurs Aug 8.

I finished up the Appendix D on the strange s sum. It is now time to get going on Appendix F.

I copied App F out into a working doc which I will now edit.

(a) Here I compute X(ω) for the periodic pulse train in terms of $Y_P"(z)$ over one period. The calculation is not too long, and this was one of the results I wanted, so I think it is OK.

(b) Now I set out to compute $\mathcal{P}(\omega)$. Would it make sense to do an autocorrelation method here? I could probably come up with some $(r_P)_s$ as the autocorrelation sequence for the P subsequence, and I will later do just this for the MLS sequence. Since I am directly doing the "double sum approach" here, I added a comment at the start that this is what is happening, with reference to Section 35.

So I think this entire section is fine with no further changes and result is in (F.23) as noted in the embedded overview.

(c) Suddenly I am talking ensemble. This section (c) needs work. Well, I think α and β will still fly, so I just did a pass to make the calculation faster, no change in overall equation numbers.
Don with (c) now, all equation numbers check out. My new figure has no number so far.

(d) is the limit P→∞, no changes needed here, all is exactly as it was.

(e) Why am I doing this single-P finite $\mathcal{P}(\omega)$ calculation? This is where I think I need to make a change in direction for this Appendix.

Idea #1: can I claim that since we have infinite pulse trains, P(ω) = <P(ω)> ? How does this relate to all my work in Section 35 regarding <...> = $<....>_1$?

OK OK, I have finally battled my way through (e). I had to add a piece to Section 35 about how many members an ensemble must contain, since I totally ignored that question in my entire doc!

So now we start on App F (f). This HAS to change now because my Fact 1 and Fact 2 are no longer different. // Now OK up to the MLS sequence application section.

(g) done!

OK, I am tentatively done with my pass through Appendix F. I made some simplifications and added understanding of why results come out the same, and it is all summarized in a single Fact F.54. It was pretty much an all-day haul, though I did a triple laundry Samsung shot.

Next I have to update all the Overview Material for my many changes. But maybe take a look first at the linkage over to Scrambler and see if that is cleared up now. Maybe in doing that I will discover some problem that will then cause still more changes in FT. So switching now to the scrambler log.

OK, that took a few hours, and all is well with Scrambler 2.5, so I am now back ready to do more on FT to get ready for an Update!

Detailed Overviews. I have changed Sections 35,36,37,38 and Appendix D, F and G, so lets update the detailed overview stuff:

Section 35 detailed overview: DONE

Updated 36,37,38 all DONE.

New Appendix D overview! DONE.

Appendix F detailed overview: DONE.

Appendix G detailed overview: DONE

Next, review the short overviews. DONE.

Next: do spell check on the new altered detailed overview section. DONE.

I am now ready to start installing into FT. Please be very careful!!!!!

Install 35: done

Install 36: done

Install 37: done

Install 38: done

Install App F: done

Install App D: done

All installations complete, I finally have a single document back again. Close all for a rest of Word.

Fri Aug 9, 2013

(1) Reviewed all doc files, marked REVD after doing each one with red text at the top. Spent some time on the δ_5/δ_6 one, it is fine. This caused a few changes or additions to FT.

(2) changed approach to method for Section 35 deal.

(3) updated the top level Maple index.

(4) repaired all Chapter and Appendix etc headers (print view stuff)

(5) removed some stale references to old Appendix D

Pagination. I am fuzzy right now on whether sections start on new pages, I think that would be a very good idea for having stability, but only large sections!

Overview: 2 pages Reread it and made repairs!

Chapter 1:
- Section 1: OK
- Section 2 starts on a new page which is 13. OK
- Section 3: new page, OK
- Section 4: OK, all these sections are starting on a new page.
- Section 5: OK, but section 6 not starting on new page, short sections here.
- Section 6: OK
- Section 7: again new page start
- 8 OK
- 9 starts new page OK
- 10 new page OK
- 11 not new page
- 12 OK
- 13 OK // made no changes to this Chapter, it was not really updated

Chapter 2
- 14 OK
- 15 starts new page OK
- 16 new page OK
- 17 not new page, OK
- 18 new page OK short
- 19 not new page OK // no changes in pagination needed

Chapter 3
- 20 new page, OK
- 21 new page OK
- 22 new page OK
- 23 new page OK (summary box split into two such boxes)
- 24 new page OK
- 25 new page OK
- 26 new page OK
- 27 new page OK // no pagination changes made

Chapter 4
- 28 OK
- 29 new page OK
- 30 new page OK // no pagination changes made

Chapter 5
- 31 OK, only section in this chapter // no pagination changes

NOW we have to pay more attention, the above was just a fast recheck of stuff already paginated which in general did not get modified.

Chapter 6

Section 32

a,b,c,d OK

e starts on a new page naturally

Section 33. For some reason, this does NOT start on a new page. Change that now. This will help reader see new section starts in ocean of a,b,c subsections.

33 OK

34 new page start OK

Section 35: DONE, I made a lot of changes and it is now much better paginated. There are lots of graphs and lots of pairs of equation groups that want to be on the same page.

Pause to remove the word "view" from certain graphs: DONE

Review page counts in chapters later after repagination done ********** **DONE**

Find and repair bad limit arrows → ********** Here is a typical screw up $\lim_{x \to y}$ and I don't really know what is wrong with it. **DONE**.

Maybe add a Proakis reference for the prob theory. ********** (but that pushes references onto another page which I don't like, so skip this idea **DONE**).

Section 36: DONE and greatly improved.

Section 37: I redid the Maple stuff here, so paginate again: DONE (took a long time

Section 38: DONE

Now I go quickly again on things that did not change

A: done
B: done
C: done
D: done (the new appendix, just a few pages)
E: done

Now we pay more attention again

F: done, lots of shuffling.

G: done, again a lot of shuffling.

Detailed summary pagination: OK, made one change

Pagination is complete, time is 4:25PM, FT is 331 pages long. The TOC needs a next page adder which IO did.

What is on the current errata list? There were some, I just took care of them.

What else? Let's close all Word docs and do a backup right now. // I browse the doc and found some alignments wrong on numbers and fixed a picture or two. I just don't have the energy to proof 331 pages right now. I want to get this out, so:

The Time Has Come: PDF took 4 minutes, went OK.

Check bookmark alignments: 35 (j) has a space. I added that to errata.

What about horizontal alignments when we have tabs versus spaces? Scanned, did not see anything off hand. So fix this one errata and re-export. This is 6:10 PM, it went OK. By the way, pdf's made as I do them do have text indexing, it finds things fast.

I just did the Filezilla release, the updated FT is out in the world. Now back to scrambler.