

Question about Variance propagation of random variables

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Hello All,

I have a question about propagation of the variance of random variables.

This is the problem,

Let X, Y, Z be independent Gaussian random variables with known first and second order statistics. Namely,

$$E[x] = E[y] = E[z] = 0$$

$$S(x) = S_x, S(y) = S_y, S(z) = S_z \text{ (1Sigma standard variation)}$$

So, if we set $V = [x; y; z]$, we have, $\text{Cov}[V] = [S_x S_x \ 0 \ 0; \ 0 \ S_y S_y \ 0; \ 0 \ 0 \ S_z S_z]$

Now, consider the simple function, $V_Hat = \sqrt{X.*X + Y.*Y}$

the question is, what is the variance of V_Hat ?

Is the following equation correct: $S(V_Hat) = \sqrt{S_x S_x + S_y S_y}$?

MATLAB simulations shows that this equation is true for small variances ($S_x S_x, S_y S_y$).

How can I find an Analytical expression for $S(V_Hat)$?

Thanks in advance,
Miki

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