

## Re: Algorithm for approximating a "moving" percentile statistic?

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chessaurus@xxxxxxxxxx wrote:

I've seen clever algorithms for computing "moving" means and variances (without requiring complete recalculation for each window position). Do similar algorithms exist for computing or approximating a "moving percentile"? Any help will be greatly appreciated.

I think that a method adapted from "staircase procedures" used (for example) in some psychophysical experiments may be helpful to you. I'll try to recreate it from memory, but I may have some of the signs wrong.

Suppose you want to estimate the p'th percentile for the distribution of X.

Start with a rough guess, G, and a step size, S (I assume you know enough about the distribution to come up with reasonable values for these in advance. If not, you may based them on the first 100 numbers).

Each time you obtain a new observed value of X, revise your estimate G as follows:

If  $X < \text{Old } G$ ,  $\text{New } G = \text{Old } G - (1-p)*S$   
Else  $\text{New } G = \text{Old } G + p*S$

Note that if Old G sits at the p'th percentile, the expected change from OldG to New G is:  
 $p*[-(1-p)*S] + (1-p)*p*S = 0$

So, for many common distributions of X, G will tend to converge toward the p'th percentile. This method requires no sorting and no storage of previous X values (you must store G and S, of course). Convergence can be quite slow, however.

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If you want a bit more sophistication, you can let  $S$  decrease with the number of  $X$ 's you have already seen (to make  $G$  sit more stably close to the true  $p$ 'th percentile). Another possibility is to take as your percentile estimate a running average of the (recent)  $G$  values. Some simulations may help you determine what works best in your case.

Hope that helps,

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