The source of variability in   neural responses from MT

Ken Mogi 1),2) & Horace B. Barlow 1)
1) University of Cambridge, Downing Street, CB2 3EG U.K.
2) Sony Computer Science Laboratory, Takanawa Muse Bldg. 3-14-13,
Higashigotanda, Shinagawa-ku, Tokyo, 141-0022 Japan

Abstract

We analyzed the variability of response in records obtained from MT (V5) of awake, behaving monkeys and kindly provided to us by Newsome and Bair (see Newsome et al 1990 for Methods).   Some sets of random dot kinematograms had been generated with a constant randomization seed (novar stimuli), while others had been generated with varying randomization seeds (var stimuli).   The neural responses to novar stimuli exhibited a remarkable degree of consistent temporal modulation, while the responses to var stimuli were homogeneous over the presentation time. We suspected that correspondence noise might be a major source of variability and to test this we compared the variability of response to novar and var stimuli, making the assumption that the variability observed in responses to novar stimuli reflected the internal noise only, whereas variability in the case of var stimuli reflected internal noise and external noise.   From this assumption, we could estimate the relative importance of external noise and internal noise in this system. The main conclusions are:- (1) Efficiency values (up to about 35%) calculated from neural responses in MT are of the same order as those of human observers, (Barlow and Tripathy 1997)   (2) External correspondence noise is a significant factor in limiting the detectability of coherent motion in these random dot stimuli.

Referencess
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Newsome, W.T., Britten, K.H., Salzman, C.D. & Movshon, J.A. (1990) Cold Spring Harbor Symposia on Quantitative Biology, 55   697-705.
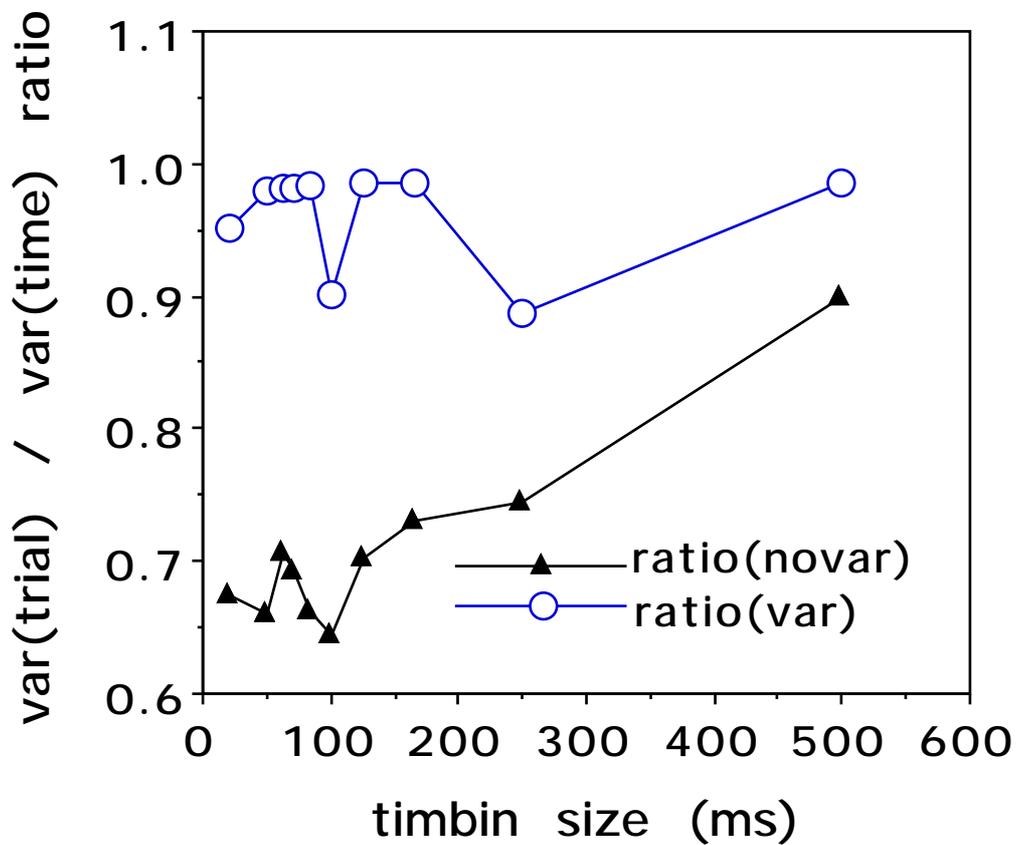
Figure legend

The ratio of response variance over different trials to response variance at different times in the same trial (excluding the first 500 msecs), plotted against duration of the time bin, for the reseeded var trials (open circles) and the novar trials with unchanged seed (closed triangles). With unchanged seed the correspondence noise in each stimulus follows an identical time course, and the response variance across trials is reduced.