Supplementary materials - What computations can be done with traveling waves in visual cortex?

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I. SUPPLEMENTARY FIGURES

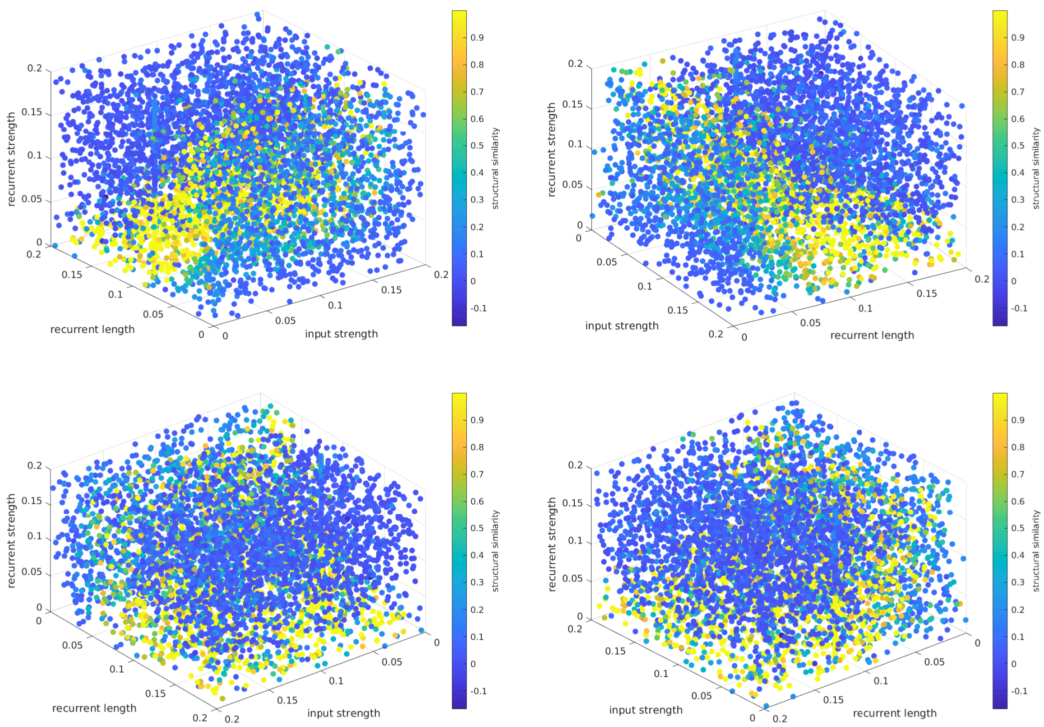

Figure S1: Distribution of the total structural similarity (structural similarity of the entire movie) for the moving bump example (colour scale) throughout the parameter space (axes of recurrent strength, recurrent length, and input strength). Four views of the same parameter space shown.

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SSIM	
phase-unshuffled	phase-shuffled
1.00	0.0126
	0.0143
	0.0086
	0.0125
	0.0095
	0.0109
	0.0211
	0.0018
	0.0069

Table S1: Structural similarity (SSIM) between ground-truth natural video and closed-loop forecast frames for regular case (left column) and case where each frame of the video is phase-shuffled using the discrete Fourier transform (right column). Shuffling was performed 10 times (mean ± standard deviation = 0.0169 ± 0.0050).

II. SUPPLEMENTARY MOVIES

Movie S1: Closed-loop forecast of the moving bump. Left: ground-truth frames. Second from left: closed-loop forecast for the network with optimal recurrence. Second from right: network activity for the network with optimal recurrence. Right: closed-loop forecast for the network with no recurrence.

Movie S2: Closed-loop forecast of the natural movie. Left: ground-truth frames. Second from left: closed-loop forecast for the network with optimal recurrence. Second from right: network activity for the network with optimal recurrence. Right: closed-loop forecast for the network with no recurrence.

Movie S3: Closed-loop forecasts of topographic network model (top row) versus topographically shuffled network model (bottom row) in which the recurrent weights and time delays were shuffled.

Movie S4: Forecasts of the movie-switching example. Left: ground-truth frames. Right: forecasts.

III. TRAINING SPECIFICATIONS

input	reservoir size	video frame size (pixels)	# of training frames	training time (s)	closed-loop forecast performance (SSIM)
moving bump	50x50	30x30	300	26.48	1.00
walking person	50x50	80x50	432	36.07	1.00

Table S2: Training specifications for both forecasting examples for the cases of optimal hyperparameters.

IV. TOPOGRAPHIC SHUFFLE

SSIM	
unshuffled	shuffled
0.9996	0.0186
0.9978	0.3692
0.9998	0.4609
0.9993	0.5982
0.9999	0.0126
0.9989	0.1804
0.9982	0.0091
0.9998	0.4609
0.9992	0.0653
0.9998	0.4553

Table S3: Left column: a random sample of ten well performing (SSIM > 0.99) network implementations (mean $\pm$ standard deviation $= 0.9988 \pm 0.0014$). Right column: topographically randomized versions of the network implementations, in which the recurrent weights and time delays were shuffled (mean $\pm$ standard deviation $= 0.2566 \pm 0.2186$).