Short term synaptic depression improves information transfer in perceptual multistability

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(, 2002 - , 200 200)

$$\dot{u}_R = -u_R(t) + f(I_R - q_L(t)u_L(t)) + \xi_1(t), \quad (\#)$$

$$\dot{u}_L = -u_L(t) + f(I_L - q_R(t)u_R(t)) + \xi_2(t), \quad (\#)$$

$$\tau\dot{q}_R = 1 - q_R(t) - \beta u_R(t)q_R(t), \quad (\#)$$

$$\tau\dot{q}_L = 1 - q_L(t) - \beta u_L(t)q_L(t), \quad (\#)$$

$u_j(t)$ $j = L, R$ $j = L, R$ $\beta u_j q_j$ τ. j ξ_j $\langle x_j(t)\rangle = 0$ $\langle \xi_j(t)\xi_j(s)\rangle = \varepsilon\delta(t-s)$. 10 $u_j(0)$ $[0, 1]$ $q_j(0)$ $[1/(1+\beta), 1]$.

NUMERICAL SIMULATION OF STOCHASTIC DIFFERENTIAL EQUATIONS

(1) dt = 10^{-} 2000 (#) dt = $10^{-\#}$ j $u_j > u_k$ $(j \neq k)$ 20,000 .

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(2). c_1, c_2, c_3

$$f(T) = {}^{c_1}T^{c_2}\,{}^{-c_3T} \quad (\ )$$

(30). ( ),

$$f(T) = c_1 + c_2 \quad T - c_3T. \quad (\ )$$

$p^n(T^n)$ $(T_1^n, p_1^n); (T_2^n, p_2^n); (T_3^n, p_3^n)$ $p_j^n = p^n(T_j^n)$. $T_2^n =$ $_T\, p^n(T)$ $T_1^n = T_2^n/2$ $T_3^n = 3T_2^n/2$.

$$\begin{pmatrix} 1 & T_1^n & -T_1^n \\ 1 & T_2^n & -T_2^n \\ 1 & T_3^n & -T_3^n \end{pmatrix} \begin{pmatrix} c_1 \\ c_2 \\ c_3 \end{pmatrix} = \begin{pmatrix} p_1^n \\ p_2^n \\ p_3^n \end{pmatrix}$$

MATLAB.

RESULTS

(1)

Tln es.7(2]TJ(r)-23v)-3 3(6/bsen.726(unif.5(-8.) (epr48g7((tc513.1 T39

(, 2002 2010).
u
q.
q
( ),

$$u(x,t) \approx \int_{-\pi/2}^{\pi/2} (2(x-y))q(y,t)H(u(y,t)-\kappa)\, y - I_0 \quad (x), \tag{1}$$

q (1).
$(I_a = 0)$.
q , $q_i(t) = q(\pi/\ ; t)$.

$$q_0 = \frac{1}{1+\beta} + \frac{\beta}{1+\beta}\, ^{-T/\tau} - (1-q_0)\, ^{-2T/\tau}, \tag{1}$$

(1)

$$T = \tau \left[\frac{\beta + \sqrt{\beta^2 - (1+\beta)(1-q_0)[(1+\beta)q_0 - 1]}}{2(1+\beta)q_0 - (2+}\right], \tag{1}$$

q_0.
(1), q_0.

$$u(x,t) = q_i(t)\left[\ ^2(x+a(t)) - \ ^2(x-a(t))\right] - I_0 \quad (x). \tag{20}$$

$a(t)$
$u(\pi/\ \pm a(t), t) = \kappa$

$$a(t) = \frac{1}{2}\ ^{-1}\left[\frac{q_i(t) + \sqrt{q_i(t)^2 + (I_0^2 - \kappa^2)}}{2(I_0+\kappa)}\right]. \tag{21}$$

$q_i(t) = q_0$
$q_i(t)$
q_0, (20)
$I_0 - q_0\ (2a_0) = \kappa.$ (21)

$$q_0 = \frac{2I_0\sqrt{(I_0-\kappa)(3I_0+\kappa)}}{3I_0 + q\kappa}. \tag{22}$$

(22), $q_0 \in ([1+\beta]$

$$a_R = \frac{1}{2} \quad ^{-1}\left[\frac{\kappa}{2I_0} + \frac{1}{2}\right]$$

$p[I_R > I_L|T^*(n)]$, $I_R > I_L$ n $T^*(n) = \{T_R^{(1)}, T_L^{(1)}; T_R^{(2)}, T_L^{(2)}; \ldots; T_R^{(n)}, T_L^{(n)}\}$. $n \to \infty$,

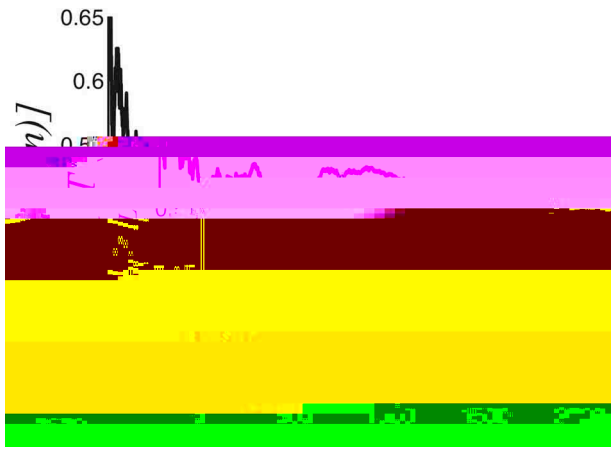


FIGURE 5, Predicted probability right input I_R is higher than the left input I_L, based on the sampling cycles (2 switches between perceptions), for symmetric inputs $I_L = I_R = 0.9$. 2000 , $p[I_R > I_L|T^*(n)] \approx 0$.

FIGURE 10, S i ching ind ced b noise and depression. (A) c uL. **(B)** h c **(C)** m c m · h cmmc
c c h (q c) h · c .
c c · uR (c) c uL ( ) · c c c 0 c 1, c
m · h . c c · qR ( )
c qL ( ) c hc · h · c · uR

(. ., 1 → 3 → 1).

(. ., 1 → 3 → 2).

Figure 11A (., 2010).

(2010)

(., 2002

200 ., 200).

Figure 13B,

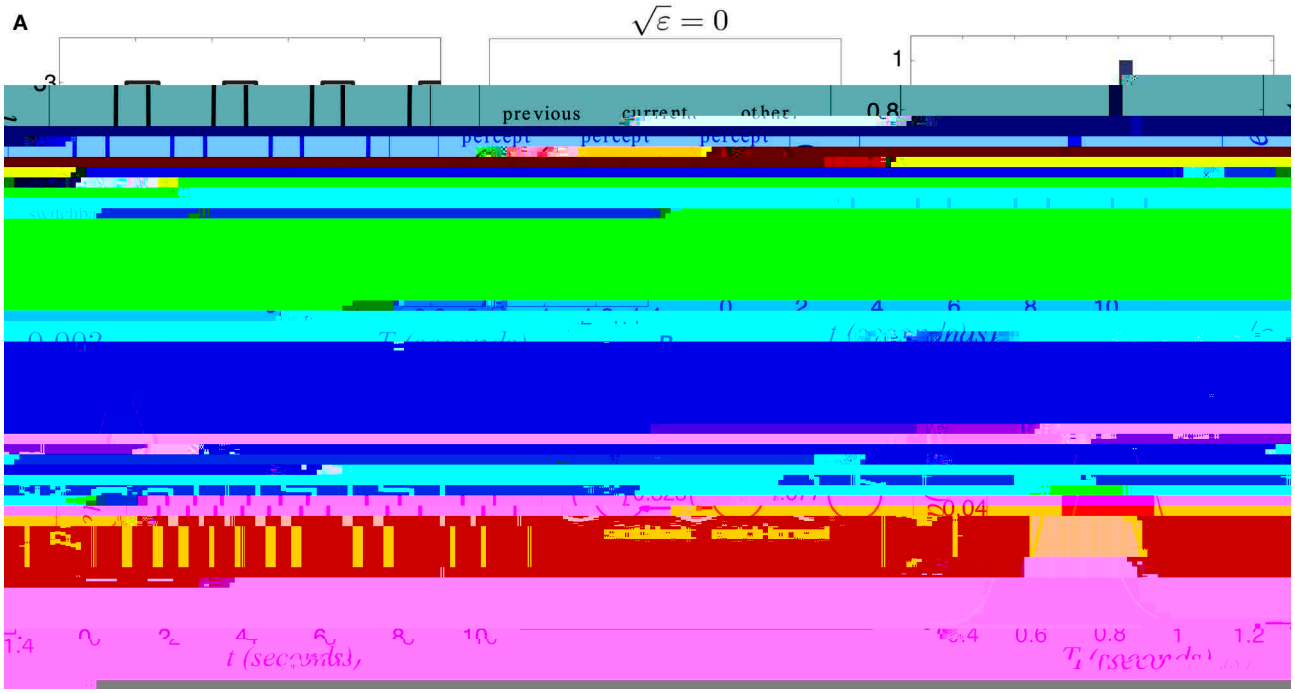
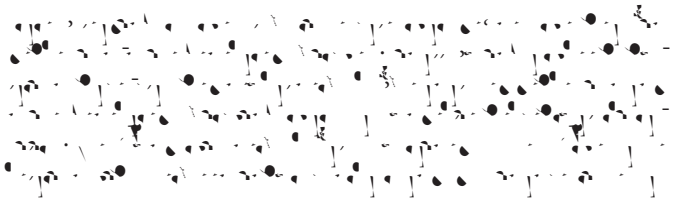


FIGURE 13, Noise degrades o so rces of informa ion pro ided b dominance s i ches. (A) h c · · , h · c c · m c , hc h · h · · q . m c m · c m c c c · c . **(B( )-13.3(i)-6.8(0p[ )2-465dc83 nce)-466**



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Conflict of Interest Statement:

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