Modélisation aléatoire de la dynamique adaptative et branchement évolutionnaire

Sylvie Méléard, Ecole Polytechnique, Palaiseau

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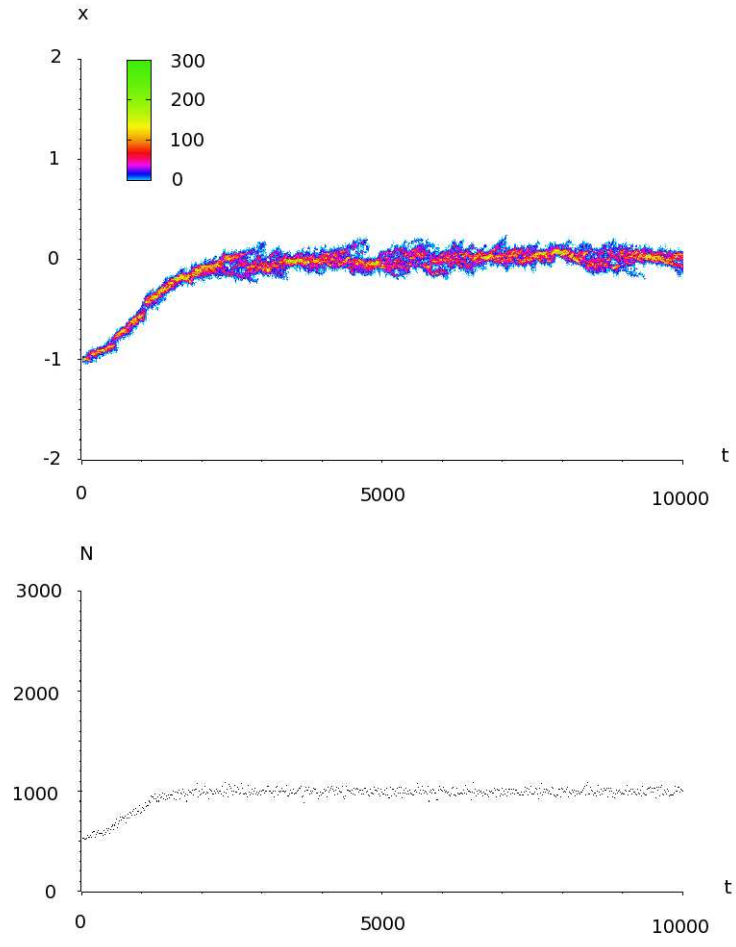
Example

Roughgarden (1979), Dieckmann-Doebeli (1999)

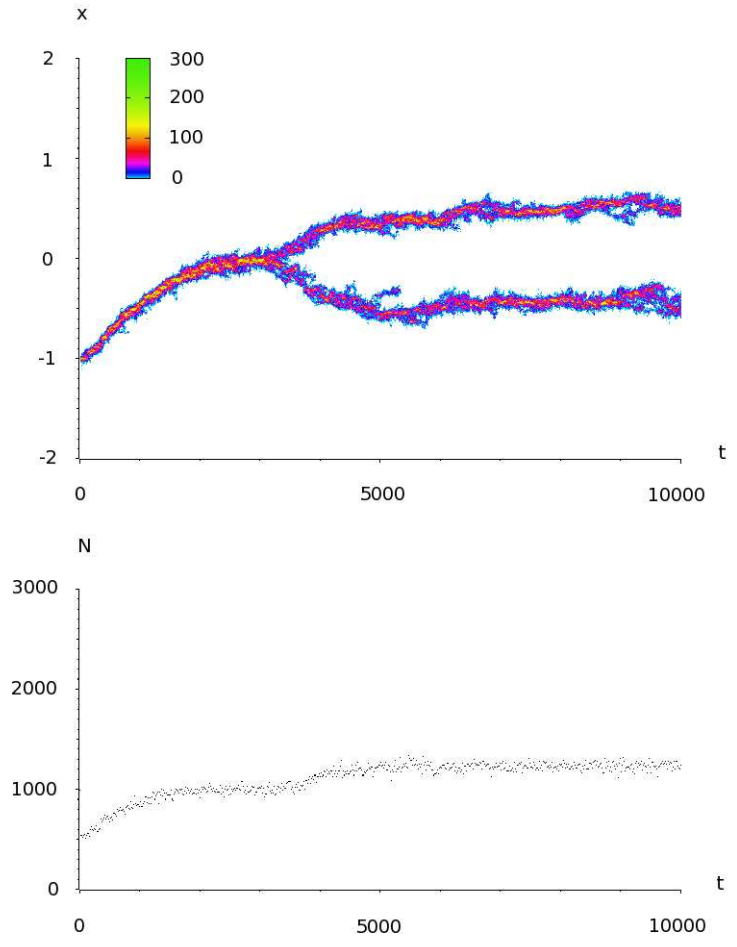
- $\mathcal{X} = [-2, 2] \quad d(x) \equiv 0 \quad u_K = 1 \quad p(x) = p.$
- $m(x, h)dh = \mathcal{N}(0, \sigma^2)$ (conditioned on $x + h \in \mathcal{X}$).
- $b(x) = \exp(-x^2/2\sigma_b^2)$, maximum at 0.
- Symmetric competition for resources :

$$\alpha(x, y) = \alpha(x - y) = \exp(-(x - y)^2/2\sigma_\alpha^2).$$

Simulations

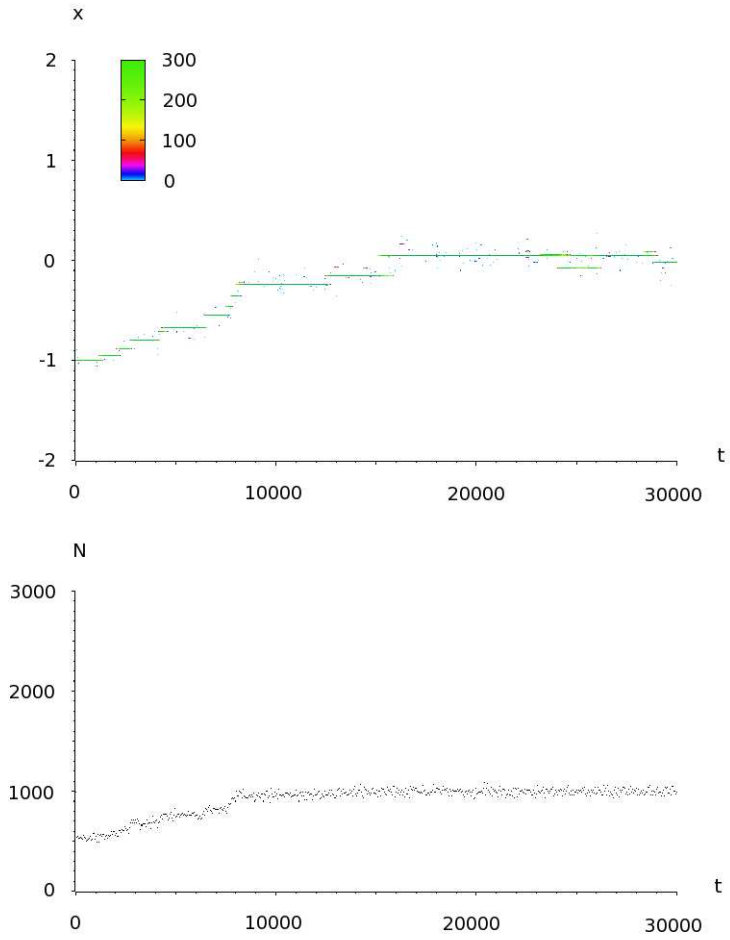


(a) $p = 0.1$, $K = 1000$, $\sigma = 0.01$, $\sigma_b = 0.9$, $\sigma_\alpha = 1.0$.

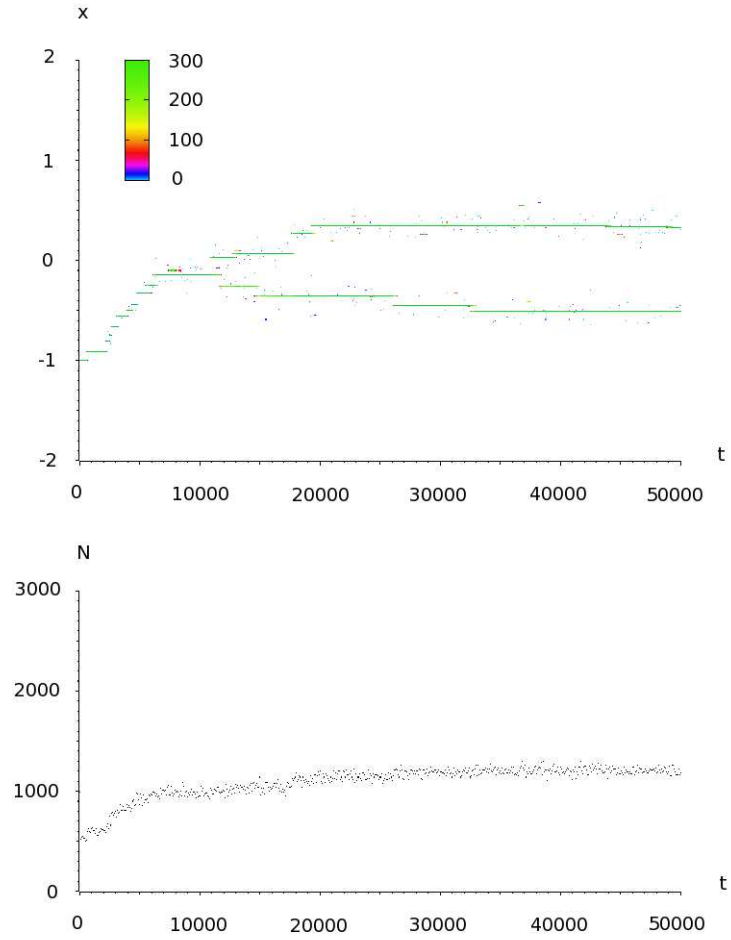


(b) $p = 0.1$, $K = 1000$, $\sigma = 0.01$, $\sigma_b = 0.9$, $\sigma_\alpha = 0.7$.

Simulation : rare mutations

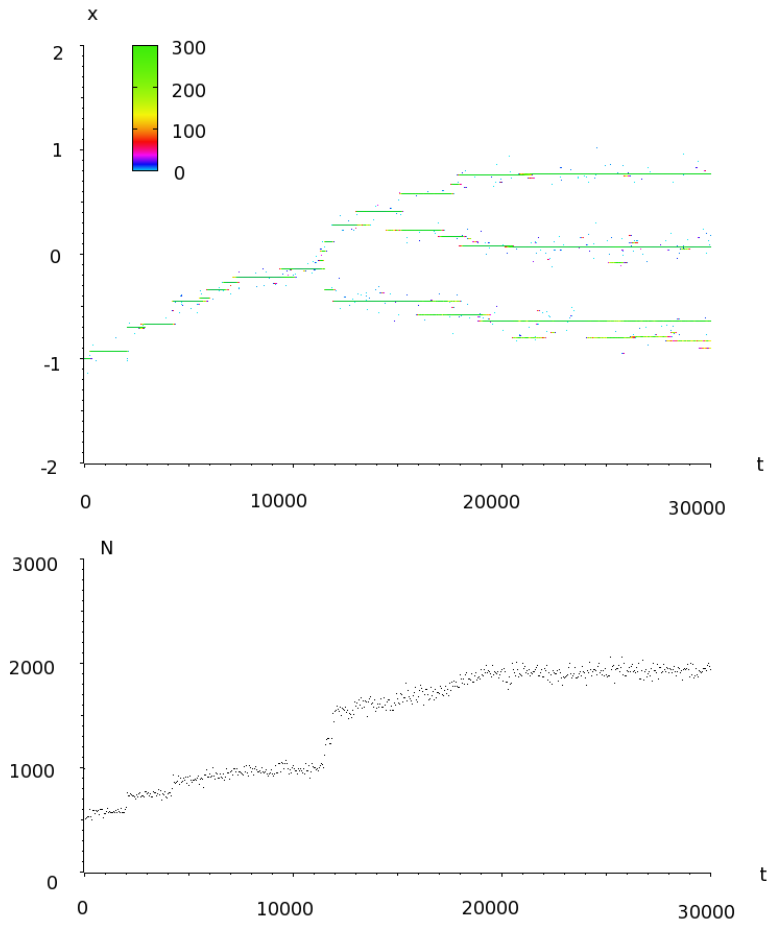


(a) $p = 0.0001$, $K = 1000$, $\sigma = 0.08$, $\sigma_b = 0.9$, $\sigma_\alpha = 1.0$.

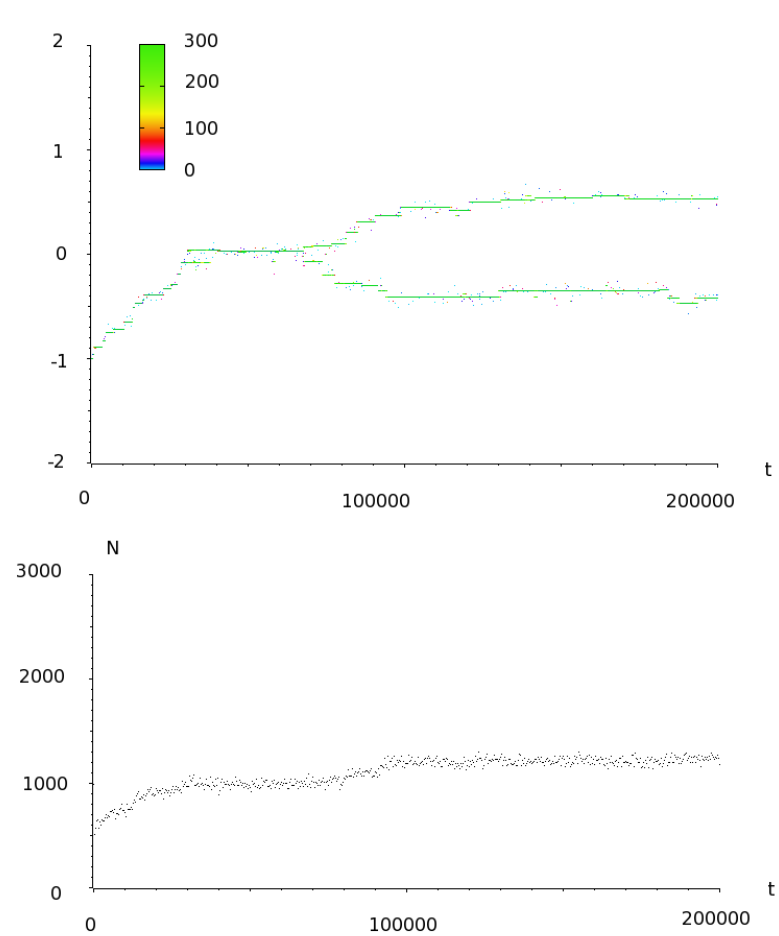


(b) $p = 0.0001$, $K = 1000$, $\sigma = 0.08$, $\sigma_b = 0.9$, $\sigma_\alpha = 0.7$.

Simulation : rare mutations

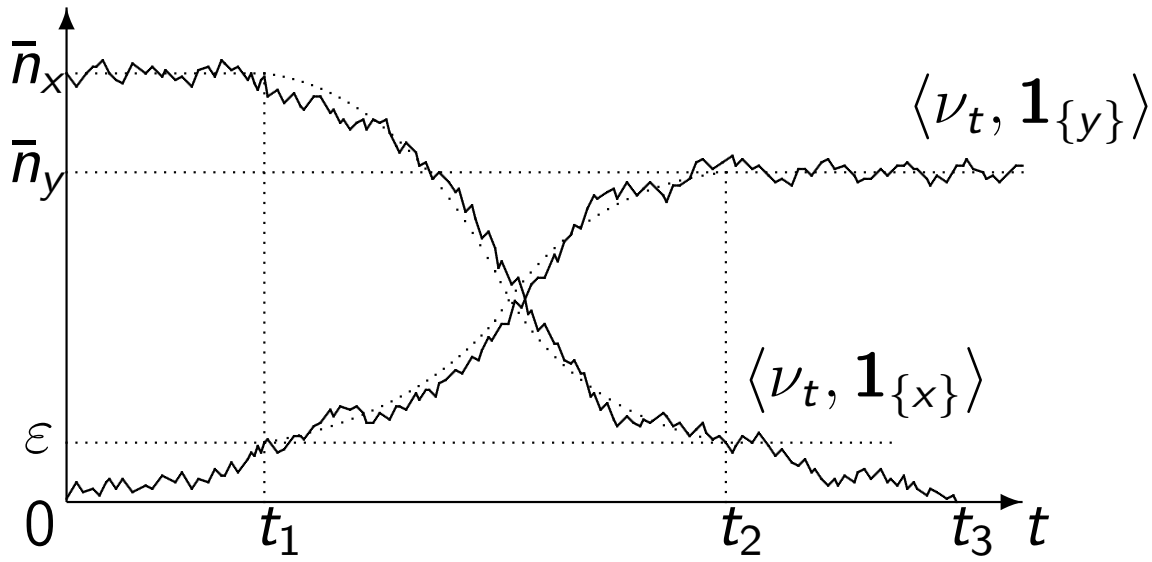


(a) $p = 0.0001$, $K = 1000$, $\sigma = 0.08$, $\sigma_b = 0.9$, $\sigma_\alpha = 0.4$.



(b) $p = 0.0001$, $K = 1000$, $\sigma = 0.04$, $\sigma_b = 0.9$, $\sigma_\alpha = 0.7$.

After the first mutation



Classification of 3d competitive LV systems (M.-L. Zeeman, 1993)

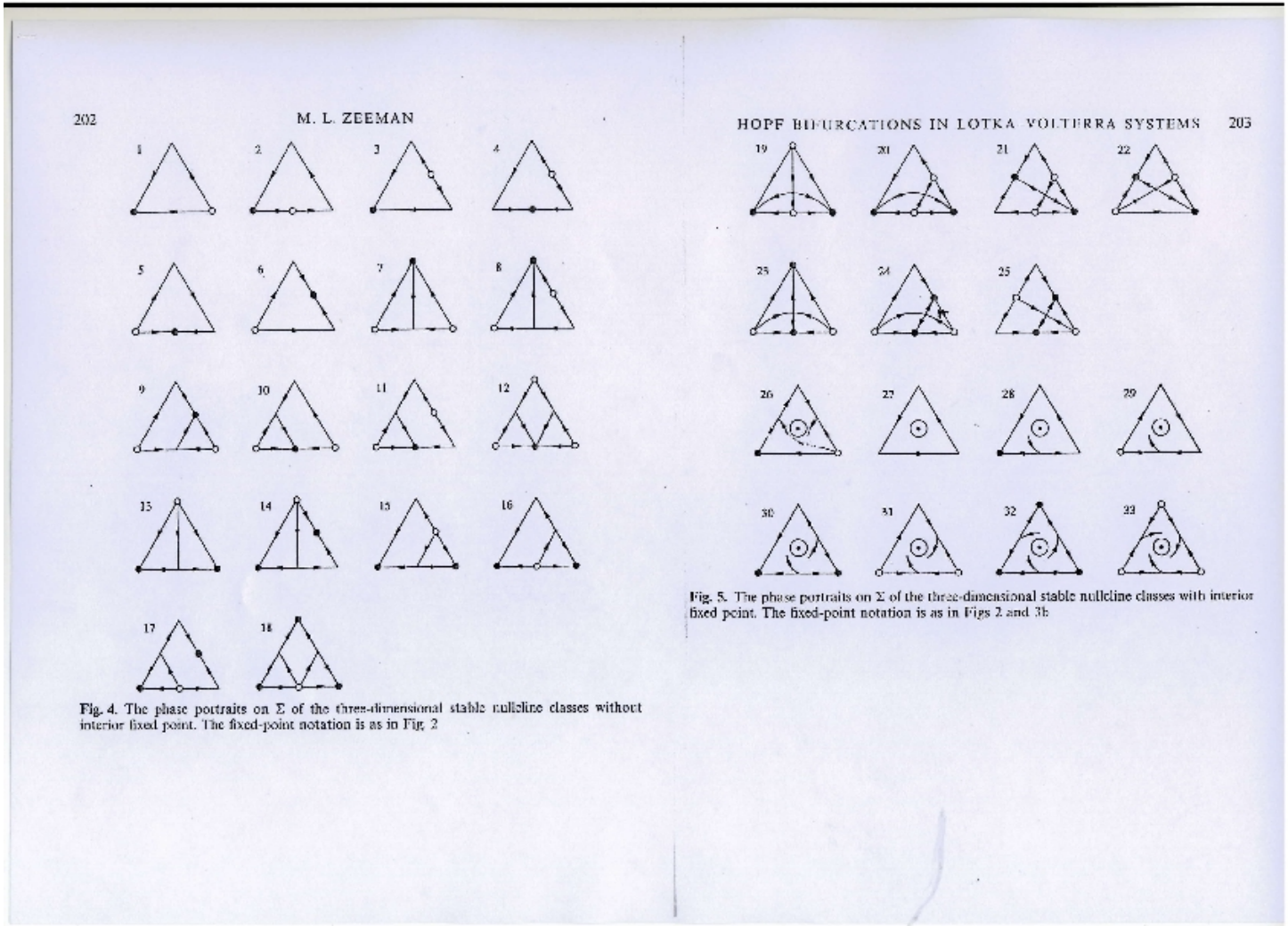


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Fig. 4. The phase portraits on Σ of the three-dimensional stable nullcline classes without interior fixed point. The fixed-point notation is as in Fig. 2

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Fig. 5. The phase portraits on Σ of the three-dimensional stable nullcline classes with interior fixed point. The fixed-point notation is as in Figs 2 and 3b

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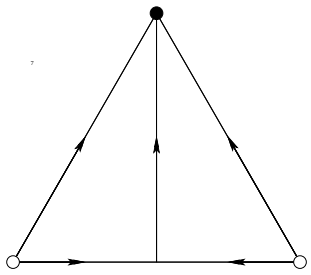

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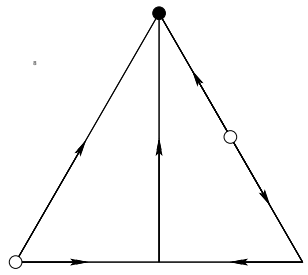

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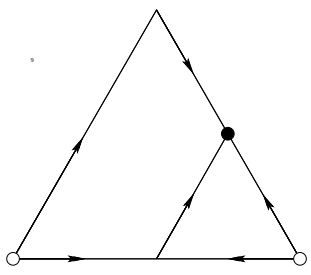

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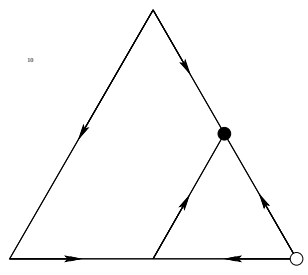

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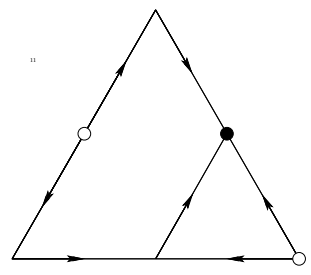

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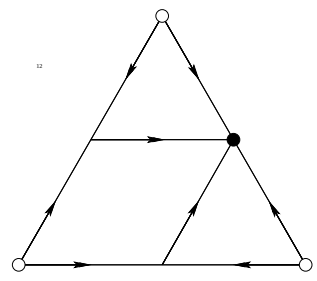

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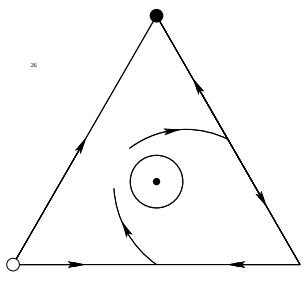

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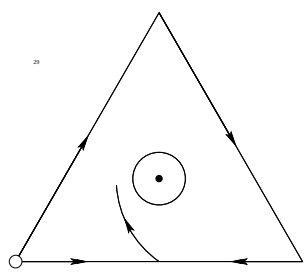

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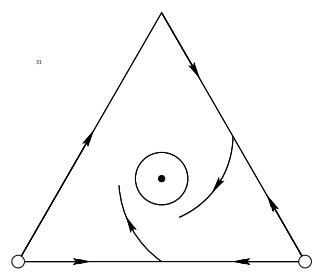

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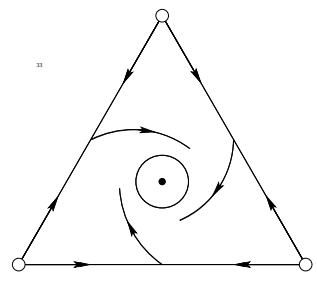
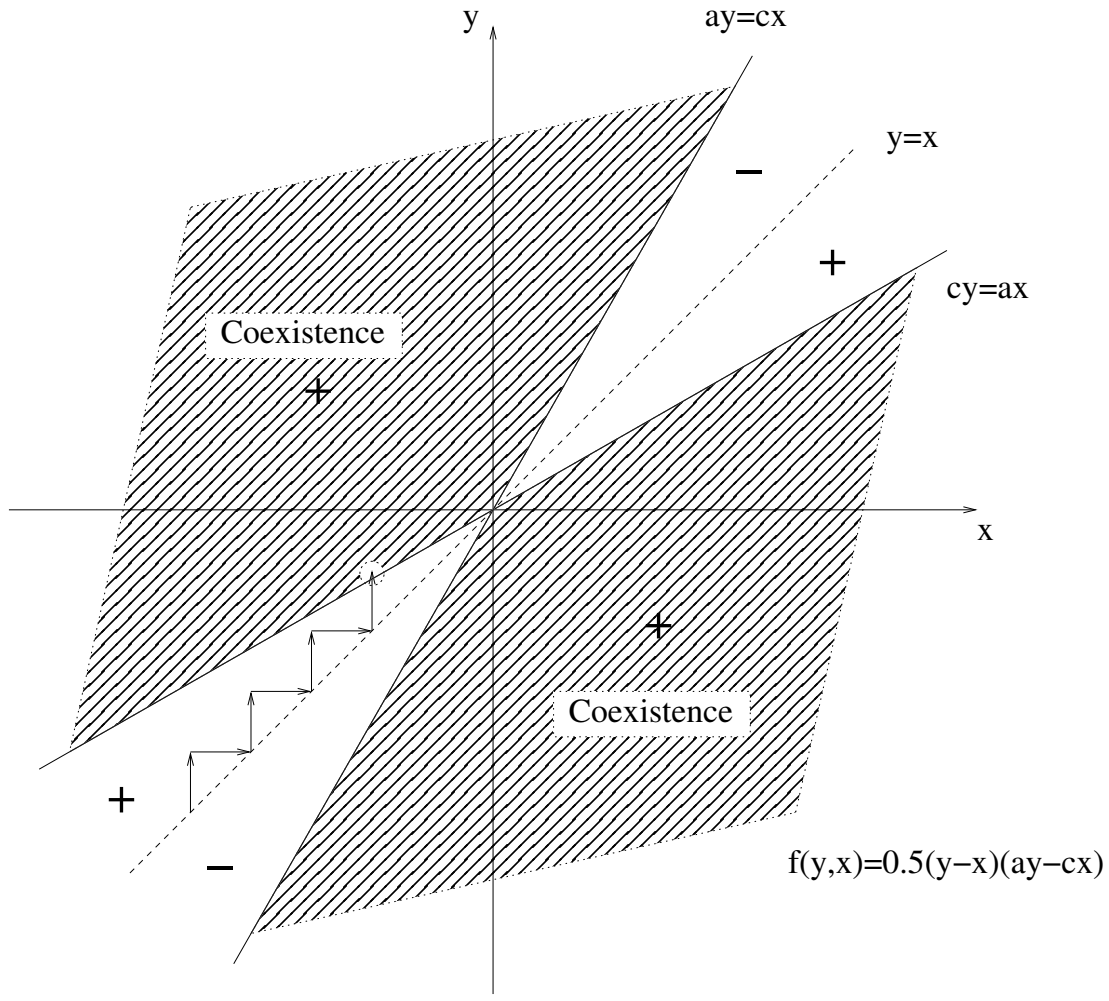
Coexistence region, case $c > a > 0$