Distributional chaos in planar polynomial equations

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We investigate different methods of generating chaos in planar polynomial nonautonomous differential equations of the type

$$\dot{z} = R_n(t, z, \overline{z}) \tag{1}$$

where R_n is a polynomial of degree n in variables z and $\overline{z}$ which coefficients are periodic mappings from $\mathbb{R}$ to $\mathbb{C}$.

Methods presented in [3, 4, 5] do not reveal all mechanisms of generating chaos in equation (1). We present another one and illustrate it with equation

$$\dot{z} = e^{i\kappa t}\left(\overline{z}^2 - 1\right) \tag{2}$$

where $\kappa > 0$ is small enough.

The type of chaos we prove is distributional one (see [1, 2]). It is also possible to prove Srzednicki-Wójcik chaos (see [5]) but it involves much more complicated calculations.

References

[1] Piotr Oprocha and Paweł Wilczyński. Distributional chaos via isolating segments. *Discrete Contin. Dyn. Syst. Ser. B*, 8(2):347–356 (electronic), 2007.

[2] Piotr Oprocha and Paweł Wilczyński. Distributional chaos via semiconjugacy. *Nonlinearity*, 20(11):2661–2679, 2007.

[3] Leszek Pieniążek. Isolating chains and chaotic dynamics in planar nonautonomous ODEs. *Nonlinear Anal.*, 54(2):187–204, 2003.

[4] Leszek Pieniążek. On detecting of chaotic dynamics via isolating chains. *Topol. Methods Nonlinear Anal.*, 22(1):115–138, 2003.

[5] Roman Srzednicki, Klaudiusz Wójcik, and Piotr Zgliczyński. Fixed point results based on the Ważewski method. In *Handbook of topological fixed point theory*, pages 905–943. Springer, Dordrecht, 2005.