

Pole Shifts Explained by Dirac Delay in a Ştefănescu Magnetic Flow

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Abstract - We model the behaviour of the magnetic flow for some special configurations of some spatial electric circuits. Starting with a heteroclinic connection between equilibrium points and with Dirac perturbation, we determine: the values of delay time for which the new model of magnetic flow has only heteroclines; the critical values of the parameter, who are candidates for producing Hopf bifurcation; the values of delay time for which the partial-delay magnetic flow has heteroclines and a limit cycle around one of the equilibrium points; the shift of the limit cycle from an equilibrium point to another; the cyclization of shifts of the limit cycle between "north" and "south"; the shape of the flow on centre manifold; the similarities between our theoretical model and the pole shifts theory in Geophysics.

Key words and phrases : Ștefănescu magnetic flow, Dirac delay, pole shifts

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1 Introduction

Since 1925 Magnetic Field around piecewise rectilinear electric circuits and their applications to Geodynamics, Thermonuclear Fusion and Confinement of Plasma have been intensively studied by a leading scientist in the field, the former Acad. Sabba Ștefănescu (1902-1994). Some ideas of Sabba Ștefănescu [12]-[14] were developed by Constantin Udriște [14]-[17], which showed that a general magnetic vector field together a Riemannian metric determine a geodesic motion in a gyroscopic field of forces.

For real applications, Sabba Ștefănescu suggested the study of magnetic fields having symmetry with respect to the plane x^1Ox^3 . Our idea was to change the magnetic flow into one with delay time defined by changing the component $x^2(t)$ of the point $(x^1(t), x^2(t), x^3(t))$ in the transform $\tilde{x}^2(t)$, via a probability distribution. Different types of densities of probability induce different transforms (perturbations) of the form $x^2(t-\tau)$, and each magnetic kinetics obtained from the original one is a functional-differential system in the sense of [1] - [2], [4]-[7], [9], [18]. The delay time τ can be considered