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# Limit cycles of generic piecewise center-type vector fields in $\mathbb{R}^3$ separated by either one plane or by two parallel planes

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## ABSTRACT

While the limit cycles of the piecewise differential systems in the plane  $\mathbb{R}^2$  have been studied intensively during these last twenty years, this is not the case for the limit cycles of the piecewise differential systems in the space  $\mathbb{R}^3$ .

The goal of this article is to study the continuous and discontinuous piecewise differential systems in  $\mathbb{R}^3$ , formed by linear vector fields similar to planar centers separated by one or two parallel planes. We call those “center-type” differential systems, which have two pure imaginary numbers and zero as eigenvalues. When these kinds of piecewise differential systems are continuous or discontinuous separated by one plane, then they have no limit cycles. Also, if they are continuous separated by two planes, then generically they do not have limit cycles. But when the piecewise differential systems are discontinuous separated two parallel planes, we show that generically they can have at most four limit cycles, and that there exist such systems with four limit cycles. The genericity here means that the statements hold in a residual set of the space of parameters associated to the differential system.

We recall that the same problem but for discontinuous piecewise differential systems in  $\mathbb{R}^2$  formed by linear differential

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