

## **SINGULAR CYCLES AND CHAOS IN A CLASS OF 3D THREE-ZONE PIECEWISE AFFINE SYSTEMS**

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**Abstract:** Little results seem to be known about singular cycles and chaos in three dimensional (3D) piecewise smooth dynamical systems with two or more discontinuous boundaries (DBs). This report first introduces a new class of 3D three-zone piecewise affine systems with two DBs and then obtains some criteria for existence of singular cycles under the following three cases: (i) one saddle point and two saddle-focus points, (ii) two saddle points and one saddle-focus point, (iii) three saddle points, respectively. Moreover, sufficient conditions of the existence of chaos are established. Rigorously mathematical analysis is provided to prove that. Finally, two numerical examples are offered to show the feasibility of our theoretical results.

