Chapter 8

CONCLUSIONS AND FUTURE EXPANSIONS

Some phenomena related to chaotic behavior of piecewise linear systems with switching nonlinearity are investigated for two power electronic circuits with all parasitic effect. The circuits are taken for our study are pure dc fed current controlled dc-dc boost converter and single phase full wave rectified dc fed current controlled dc-dc boost converter. In both systems the dynamics are governed by two sets of state variable equations. Each sets of equation corresponding to two switching status switching on and switching off. Map based models of the systems are formulated in the form of a mapping from one switching instant to another without any assumptions for simplification. This enables capturing and analysis of nonlinearity of the circuits. Earlier such type of modeling was done for pure dc fed current controlled dc-dc boost converter but all parasitic effect were not considered. The operation of our converters are studied from two points of view. Since the input clock has an periodicity that can be controlled externally, we identified the periodicity as the number of clock in a period of the output waveform which is termed as non autonomous system. Here the samplings are done at clock frequency and poincare section can be obtained. In the second method we are concerned only with the output states and we defined the periodicity as the repetitive behavior of the output waveform as seen in the phase plot of the state variables. This termed as autonomous system. Here the peaks of the output waveform of one of the state variables are identified and the periodicity is determined from the data.

In both the circuits, the period doubling cascade are the route to chaos which is established for others boost converter also. Like others boost converter the periodic windows are noted within the chaotic zone for both the circuits. In boost converter the capacitor voltage peak coincides with arrival of the clock pulse. For this reason, the bifurcation diagram obtained

from non autonomous system and autonomous system are identical for most parameter values. Differences between them occur when the on period have more than one clock pulses, which are identified from the bifurcation diagrams in terms of parameter region. A stair case like structure are also observed indicating more and more clock pulses in an output cycle.

The above phenomena are also observed for map based model of three phase full wave rectified dc fed current controlled dc-dc boost converter with all parasitic effect and six phase half wave rectified dc fed current controlled dc-dc boost converter with all parasitic effect. The bifurcation diagrams for different no of phase of input voltage of multi phase half wave rectified dc fed current controlled dc-dc boost converter with all parasitic are determined by which we can conclude that the operation is stable for higher number of phases.

We have applied the theory of bifurcations in 1-D piecewise smooth piecewise monotonic maps for both the pure dc fed current controlled dc-dc boost converter and single phase full wave rectified dc fed current controlled dc-dc boost converter. We have shown that however complicated the map of a real system may be, the border collision bifurcations can be understood in terms of its piecewise affine approximation at the border. We have developed the 1-D modeling for both the boost converter with parasitic effect. We presented the different Bifurcations diagram for the developed 1-D modeling which are useful in analyzing, identifying and describing the nonlinear phenomena in such circuits

We have also applied the theory of bifurcations in 1-D discontinuous piecewise smooth piecewise monotonic maps. We have developed the 1-D discontinuous modeling of the current controlled boost converter with parasitic effect for two types of source voltage one for pure DC & another for Rectified DC. We presented the different Bifurcations diagram for the developed 1-D discontinuous modeling which are useful in analyzing, identifying and describing the nonlinear phenomena in such circuits.

We have applied the theory of bifurcation control in the current controlled boost converter with parasitic effect for two types of source voltage one for pure DC & another for Rectified DC. We are able to present a successful method for controlling the bifurcation in the circuits. We presented the different Bifurcation diagrams and time diagram for the developed method, which are useful in identifying , analyzing and describing bifurcations and chaos due to the nonlinear phenomena in such circuits.

The results obtained in all the analysis and investigation may be compared experimentally . It can be said safely that our studies will be supported experimentally as the same is verified without parasitic effects.

Further studies and investigations may be done with different number of phases and with different types of filters for different types of load. The results obtained in all the cases may be verified experimentally and compared also with different software/simulation packages like MATLAB, PSPICE etc.

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