PREFACE

This work deals with a dynamical systems which are piecewise linear, with an overall nonlinear behaviour contributed by discrete switching of the devices. All the circuits used in power electronics are in this category due to switching on and off operation of the power electronic devices like Thyristors, Power BJTs , Power MOSFETs, IGBTs, GTOs etc. The system equations are formed with linear differential equations and the switching from one set to another is controlled by feedback process.

The current mode controlled rectified voltage fed DC-DC boost converter with all the parasitic effects is taken for our study and investigations to conform the very practical situation.

The occurance of an unusually high amount of noise and erratic behaviour in power electronic circuits is a universal experience of practicing engineers for a long time. Such phenomena is diagnosed as chaos. The detailed study and investigation of nonlinear phenomena and chaos in the current mode controlled rectified voltage fed DC-DC boost converter circuits are necessary.

Since the power electronic circuits with the current mode controlled rectified voltage fed DC-DC boost converters have wider applications, it is important to study and investigation of nonlinear phenomena, bifurcation and chaos in the current mode controlled rectified voltage fed DC-DC boost converter which may help to develop methods to control chaos in the system. The control of bifurcations / chaos has justified implications. It offer way to stabilize those circuits which tend to develop chaotic behaviour. It has also the wide variety of unstable periodic orbits available in chaotic attractor those can be utilized by stabilizing the system in the most desirable orbit. It helps in the current mode controlled rectified voltage fed DC-DC boost converter for desired output characteristics.

This thesis is presented in the following fashion.

Chapter 1 introduces the basic ideas of power electronic circuits, devices, components, control methods, nonlinear phenomenas, modelings, mappings, bifurcations, bifurcation controls, chaos controls.

Chapter 2 introduces the basic concepts of nonlinear dynamics , bifurcations and chaos. We are familiarized and get the ideas of characterizing the chaos through various dimensions, lyapunov exponent, poincare section, eigen values, attractors etc.

Chapter 3 introduces the non linear phenomena in boost converter. We get the idea of modeling, mapping of boost converter. We are familiarized and get the ideas of characterizing the chaos of boost converter through various dimensions, lyapunov exponent, poincare section, eigen values, attractors etc.

Chapter 4 introduces the practical boost converter i.e. with all parasitic effects. We make the model of i. Pure dc fed current mode controlled DC-DC boost converter ii. Rectified dc fed current mode controlled DC-DC boost converter. We present the modeling and mapping of the circuits and study the bifurcation, chaos.

Chapter 5 introduces the development of the 1-D modeling for both the pure dc fed current controlled dc-dc boost converter & single phase full wave rectified dc fed current controlled dc-dc boost converter with parasitic effect for the application of the theory of bifurcations in 1-D piecewise smooth piecewise monotonic maps for both the circuits. The different Bifurcation diagrams are presented for the developed 1-D modeling which are useful in analyzing, identifying and describing the nonlinear phenomena in such circuits

Chaper 6 introduces the theory of bifurcations in 1-D discontinuous piecewise smooth piecewise monotonic maps to develop 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. The different Bifurcation diagrams are presented for the developed 1-D discontinuous modeling which are useful in analyzing, identifying and describing the nonlinear phenomena in such circuits

Chapter 7 introduces the methods for bifurcation control and chaos, as they are twins. It gives the idea of various bifurcations control circuits. We apply variable ramp compensation technique for control.

Chapter 8 gives us the conclusions and future expansions of the work.

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