CHAPTER 8

SUMMARY AND SUGGESTIONS FOR FUTURE WORK

8.1 SUMMARY

To design and implement a suitable Controller for Brushless DC Motor, Switched Reluctance Motor and Permanent Magnet Synchronous Motor using Soft Computing techniques. The Controllers that are taken into task are PID controller, Fuzzy controller, Fuzzy PID and Neuro Fuzzy and the soft computing techniques used for the study are PSO, ANT and GA. The performances of different motors are analyzed using various controllers and soft computing techniques and a suitable one is suggested.

The speed control of the above mentioned motors are controlled by various controllers and the characteristics parameters are taken into account are: Speed, Torque, Voltage and Current. The Characteristics curves are analyzed and a suitable controller and Optimization Algorithm are suggested for a particular Motor.

In this work a new design method to determine PID controller parameters using the PSO method is presented. The working performances is obtained through simulation of BLDC motor through MATLAB working environment, the results show that the proposed controller can perform an efficient search for the optimal PID controller. By comparison with PID and Fuzzy PID methods, it shows that this method can improve the dynamic performance of the system in a better way. The problem of BLDC such as overshoot is reduced and this increases the efficiency and working grounds of the drive.
This work presents a suitable controller for BLDC motor to control the speed of the motor effectively and economically. Based on the settling time response of various controller and different soft computing techniques it is concluded that for PSO – PID controller, for ANT – Fuzzy – PID controller and for GA – Neuro controllers are suggested as a suitable one for this work.

SR Motor is one of the most efficient and robust type of motor which is best at many environmental aspects. But the main problem concerned with SR Motor is torque ripples and acoustic noise which reduces the efficiency and working ability of SR Motor. This property of SR Motor reduces its extended usage. But coming out from the conventional PID controller the new controllers are introduced to control the SR Motor which not only gives an effective control but also reduces the complexity in controlling motor by using various soft computing techniques. It is inferred that for PSO- Fuzzy PID controller, for ANT – Neuro controller and for GA- Neuro Fuzzy controller gave better performance based on its settling time value.

For the closed loop speed controller for PMS motor drive, PID parameters are tuned with three different Optimization techniques such as ACSA, PSO and GA. It is found that the closed loop system has very fast rise time, settling time and zero maximum overshoot to sustain the system stability under servo condition. From the transient response, it is observed that the Soft Computing method gives fast response.

For the same model, the closed loop control system requires the controller for improvement of transient response of the error signal. The tuning of PID controller in real time is bit difficult and hence the work was extended for other controllers. From the study it is explored that for PSO- PID
controller, for ANT – Neuro Controller and for GA – Fuzzy PID controller, simulation results proved to be a suitable one.

8.2 SUGGESTIONS FOR FUTURE WORK

In future, more advance techniques than PSO Method may be implemented for the optimum control of BLDC, SRM and PMS motor drive. This work can be extended for various combinations of controllers and a few optimization techniques. This algorithm was devised for a special case study. This can be further implemented as software for other cases in the start-up stages of driver during the installation and start-up period which includes on-line identification of unknown motor parameters and off-line optimization of BLDC motor drive, Switched Reluctance Motor drive and PMS Motor parameters. Based on the contributions and the investigations carried out for the proposed research work, some recommendations are presented for future studies related to this work are given below:

1. The proposed method may be extended for the Optimum Design of controllers using Bacterial Foraging Optimization (BFO)

2. The proposed method may also be implemented using Field Programmable Gate Array (FPGA)

3. The proposed procedure may also be extended for Optimum Controller design using DSP Processor.

4. The concept of this work may be applied for Optimum design of controllers using Firefly Algorithm

5. The proposed procedure may also be implemented using Bees Algorithm for Optimum Controller design
6. The proposed scheme may be applied for Optimum Controller design using Bat Algorithm

7. This procedure may be extended using Intelligent Water Drops Algorithm for Optimum Controller design

8. The concepts and Procedures derived in this thesis can be extended for the design of feedback controller for MIMO systems

9. This Procedure may be applied for practical applications in industry oriented Problems