CHAPTER 7

SUMMARY AND CONCLUSIONS
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7. SUMMARY AND CONCLUSIONS

7.1 CONCLUSIONS

Many researchers all around the world have continuously shown interest on performance of direct torque controlled AC drives. Among the various electric drives, the induction motor drives and synchronous motor drives have found an extensive range of applications due to their ruggedness and simplicity.

The conventional DTC is a simple technique to control the flux and torque of AC drives directly. In DTC, the hysteresis controllers process the error between reference torque and estimated torque and the error between reference flux and estimated flux. The electromagnetic torque and stator flux errors are made to confine within the respective hysteresis bands in the process of inverter switching logic. The disadvantages of this method are high-torque ripples and effect of stator current harmonics at steady-state condition. The simulation has been carried out at different operating conditions like no load, speed reversal and sudden change in load torque to validate the DTC method, and the simulation results are presented. It can be observed from the simulation results that implementation of the conventional DTC technique in AC drive results in high-torque ripples and increased stator current harmonic distortion during the steady state operation.

- This thesis deals with implementation of control techniques to reduce torque ripples and the effect of stator current harmonics
at steady-state condition. At first Fuzzy logic controller based DTC has been developed to reduce the steady state ripples. Then, a Neural network controller based DTC strategy has been presented.

❖ To verify the proposed intelligent controllers based DTC drives, several simulation studies have been carried out and tested under different operating conditions like steady state, speed reversal, and sudden change in load torque and the results are presented.

❖ The simulation results obtained from the implementation of the proposed intelligent controllers show the effectiveness in reducing the torque ripple and the effect of stator current harmonics without increasing the number of switches and thereby avoiding an increase of cost of design and increase of further switching losses.

The implementation of Fuzzy controller and Neural controller gives an improved performance compared to conventional DTC method. The design and implementation of Neural network controller are relatively easier compared to Fuzzy controller as it has definite values in design and simple in architecture and requires less execution time.

7.2 FUTURE WORK

The research work presented in this thesis can be further improved based on few possible suggestions listed below.

❖ The simulation results are to be verified experimentally.
The size of a rule matrix of the fuzzy logic controller can be increased to improve the feasibility in the selection of voltage vector strategy and hence improve DTC operation of AC drives.

The hidden layers of Neural network controller can be increased to improve the feasibility of appropriate voltage vector selection to enhance the performance characteristics of the AC drive.

The DTC operation of AC drives can further be improved by considering different membership functions in Fuzzy logic controller, various Neural networks incorporated with different learning laws as mentioned in chapter 5 and a combination of both Fuzzy logic and Neural network techniques resulting as Adaptive neuro fuzzy inference system (ANFIS).