5.1 INTRODUCTION

A BLDC machine is simulated using MATLAB and a procedure is formulated to operate it in all the four quadrants. A digital controller is implemented for four quadrant operations. Speed Control is achieved during no-load and on-load conditions. An attempt is also made to conserve energy during the braking period and to store it in a chargeable battery.

The inference arrived at from the results of simulation and developed prototype, the application in which the proposed work can be implemented and the scope for future work are presented in this final chapter of the thesis.

5.2 INFERENCE

The servo and regulatory changes on the speed are simulated for the BLDC machine. The simulation results indicate that better speed control can be achieved when the applied torque is positive, compared to the negative torque. Also maximum energization is achieved for positive torque.

The results from the developed prototype proves that the digital signal controller dsPIC30F4011 is able to bring the motor to a steady state within a short time even when there is sudden disturbance in the motor. The sudden disturbance can be either due to the application of brake or due to a
change in the reference speed. The servo and regulatory response of the motor are analysed.

The stator currents of three-phase BLDC motor are directly proportional to the applied load. From the measured voltage and current of the battery, it is inferred that the charging of battery is inversely proportional to the mechanical load. This may be due to the mechanical loading arrangement.

The proposed concept of four quadrant control and energy saving in BLDC motor can be implemented in sewing machine or an embroidery machine. As it is inferred from the results that the maximum energization can be achieved when there is frequent braking and direction reversal, which is a feature of sewing/embroidery machine.

5.3 SCOPE FOR FUTURE WORK

The proposed work can be implemented for a wireless control of three-phase BLDC motor using a Zigbee protocol. Zigbee is a low-cost, low-power, wireless mesh networking standard based on IEEE 802.15.4.

Conventional PI controller was considered in this research work. A fuzzy logic or adaptive control procedure may be used to get improved performance characteristics.

5.4 CONCLUSION

The operation of three-phase BLDC motor in all the four quadrants is analysed by simulation and by developing a hardware circuit. The results are presented.