CHAPTER 7

CONCLUSION

7.1 SUMMARY

This thesis has discussed the characteristics of solar PV module and various MPPT methods in the beginning. The Cuk converter based solar PV system was considered for the analysis in this research. Based on the electrical equations of the solar PV module, a MATLAB/Simulink model was designed to validate and study the effects of temperature and irradiation. The solar PV module of L1235-37Wp was used to analyze the Cuk converter-based PV system. The Adaptive Perturb And Observer MPPT was simulated and implemented using ATMEGA 16 micro-controller with Cuk converter to track maximum power from solar PV module. The effectiveness of the MPPT algorithm was tested for the change in irradiation and compared with traditional PAO algorithm. The APAO algorithm improved the dynamic response without affecting stability.

To improve the steady state performance and converter conversion efficiency, various control methods such as zero voltage, zero current switching and chaotic PWM were implemented in Cuk converter-based solar PV system. The ripple content was examined for each method experimentally and inferred that chaotic PWM based control minimized the ripples in the output voltage and improved spectral performance of the Cuk converter-based solar PV system.
The input voltage (Output voltage of the solar PV module) of the Cuk converter-based solar PV system was regulated for the change in irradiation using a voltage controller. Also the DC-DC Cuk converter used in solar PV system was stable and the input voltage was kept within the specified range under disturbances at the source voltage and the change in irradiation.

The experimental investigation of existence of non-linear dynamics such as chaos was reported in Cuk converter-based solar PV system which leads to undesirable operation. An adaptive feed forward controller was designed so that the input voltage of the DC-DC Cuk converter was chaotic free.

7.2 SCOPE FOR FUTURE WORK

The investigation of non-linear dynamics such as chaos in solar PV powered Cuk DC-DC converter system was analyzed in this research. The non-linear dynamic analysis may be extended to grid connected solar PV system to avoid undesirable operation.

Future work includes the small signal modelling of current controller design for regulation of solar PV powered system and then regulation of PV array is to be carried out with both voltage and inner current loop for the change in irradiation.