Abstract
Switching mode power electronic converter with feedback loop control makes itself work as a constant power load (CPL). CPLs have negative input impedance which may cause system instability. This is known as input impedance instability problem. Both passive and active stabilization methods can solve this problem. However, active stabilization methods is more power efficient. Many active stabilization methods have been proposed for DC/AC inverter based CPL. However, active stabilization methods for DC/DC converter in voltage mode control based CPL receive little concern. In this project, a direct active method and the optimal active method for DC/DC buck converter in voltage mode control have been proposed. Comparing with the direct method, the optimal method can make the settling time shorter and have smaller undesirable effect on the load performance. Simulation and experimental results are reported to verify the effectiveness of these two methods.

Introduction
Instability problem of CPL and its LC input filter
Switching mode power electronic converter with feedback loop control are very popular in modern electric power systems. Because, it can provide:
• Fast dynamic response for AC loads (motors).
• Constant output voltage for DC loads.
At the same time, the input power of the converter is regulated to be instantaneously constant as shown in Fig. 1. Therefore, this type of loads are also named as constant power loads (CPLs). They have inverse proportional function i-v characteristic as shown in Fig. 2. In small signal model, it performs as a negative resistance.

Effectiveness and Sensitivity
The effectiveness of the stabilization methods can be seen from the root locus as shown in Fig. 6(a).

Experimental Results

Conclusion
This project proposed two active methods, direct method and the optimal method for stabilization of LC input filter and DC/DC converter with voltage mode control. The optimal method can achieve shorter settling time and cause smaller undesirable load performance.

References

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