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Abstract
With the fast development of high technology, the quality of supplying power is increasingly concerned nowadays. ac voltage regulators are becoming more and more important, because the development of industry is growing fast, resulting in the rapid descent of quality of power system in many developing countries. Therefore, it is very practical to develop high quality ac voltage regulator. This thesis presents a novel control algorithm for the compensation of ac source voltage fluctuation. The proposed idea can be used to regulate both the overvoltage and undervoltage situations with only uni-directional energy transmission control. It is different from the conventional strategy which can regulate only one voltage fluctuation case (overvoltage or undervoltage) with the same circuit structure. Theoretical analysis has been achieved based on the power flow theory. Factors contributing to the power flow direction have been discussed in detail including two types of voltage fluctuation and three types of load characteristic. Traditional ac voltage compensation techniques have also been reviewed in this thesis, and a low cost, simple circuit structure has been proposed. Case study for regulating both the overvoltage and undervoltage cases is demonstrated by means of prototype experiment to prove its performance and effectiveness. Finally, this research proposes an off-line UPS topology which includes the ac voltage regulator. The case is demonstrated by means of experiment to prove its performance.
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