

Control of Single Switch Inverters

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The single switch inverter was introduced to generate a pure sinusoidal output voltage. The system behaves like a non-minimum phase system in all operating ranges except when it is operating to produce negative half cycle in buck mode. When addressed from a control perspective, the right half plane zeros or the non-minimum phase zeros in the transfer function complicate the control design scheme.

The Dual Feed-forward Predictive Control (DFPC) is a method of feed-forward control is used to force the non-minimum phase system to behave like a minimum phase system. The controller successfully isolates the non-minimum phase part of the system from the minimum phase. Both separated minimum phase and non-minimum phase sub-systems were used in the dual feed-forward scheme to generate desired references. The non-minimum phase dynamics are transformed to minimum phase by using an inverse system transfer function as parallel compensator.

In this method, the plant is split into two parts to generate two signals. One signal is to make the plant track $r_{ff}(t)$ with a feed-forward control signal $u_{ff}(t)$ that drives the plant to track the reference signal. The signals produced by the feed-forward transfer functions are assumed to contain bounded energy and have no influence on the closed loop stability. For perfect tracking, the error should reach zero which can be accomplished using various types of controller including a simple gain. However, in the new inverter circuit, an adaptive PI controller is required to adjust the gains continuously.

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