order to attain fixed switching frequency operation, the cost function based modulation scheme was incorporated in the direct MPC control algorithm. It is evident from Fig. 10 (bottom) that the harmonic spectrum of the grid current (phase-a) resulted in a concentrated spectrum with a switching frequency of 25 kHz.

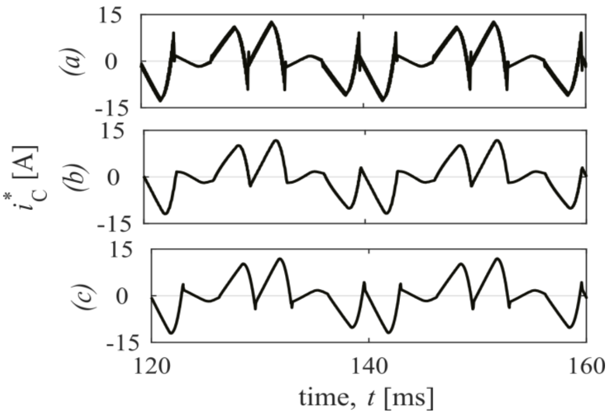

Fig. 9. Compensating reference current by using (a) Lagrange, (b) vector angle, (c) repetitive-predictor method.

Table II. – Comparison of Extrapolation Methods

Methods	**THD$_i$ (Phase-a)**	**Absolute Reference Tracking Error (A)**
Lagrange method	4.23 %	1.3141
Vector angle method	5.36 %	0.5998
Repetitive prediction	3.69 %	0.7646

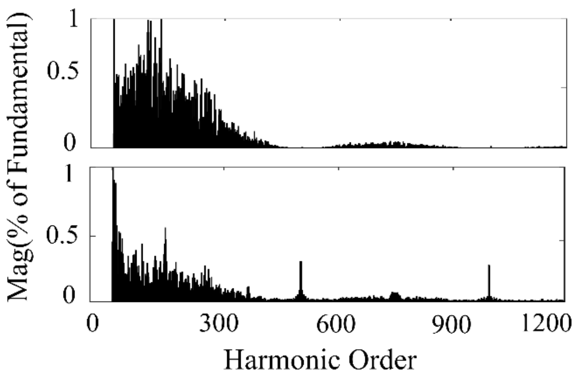

Fig. 4. Harmonic spectrums of grid current for direct MPC (top) and modulated MPC (bottom).

6. Conclusion

In this paper the direct MPC based active filter controller is presented for shunt active power filtering application. The use of direct MPC technique for inner current control loop provided an efficient reference tracking response under steady state and transient conditions. The presented simulation results demonstrate that the direct MPC technique can be a viable alternative for conventional control techniques. Moreover, the effort is put forth to analyse the impact of extrapolation methods on the control performance. The drawback of variable switching frequency has been resolved by implementing a modulation scheme in the control algorithm. The simulation results verify the compensation capabilities of shunt active power filter, the THD of grid current has been reduced from 25.02 % to 3.69 %. The performance variation due to parameter error is in the future scope.

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