

Figure 25. Case-IV Harmonic Spectrum

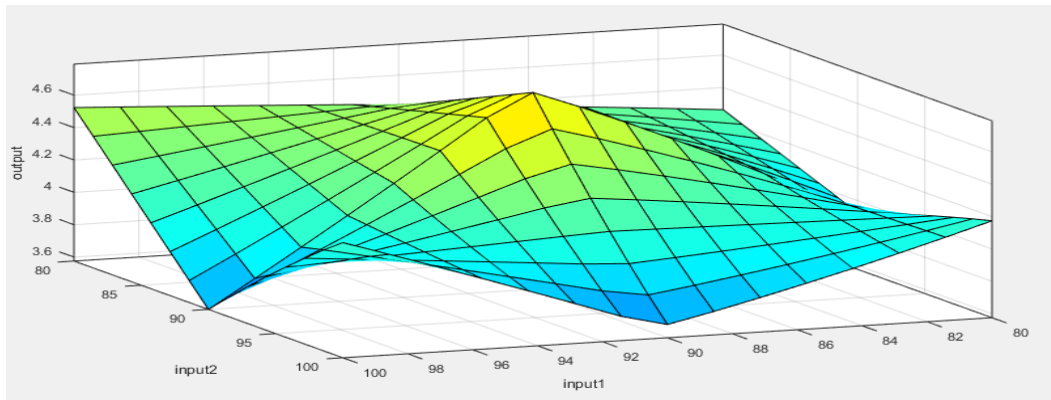


Figure 26. Control surface for the fuzzy model found by the GA

Table I. Lookup table of optimized switching angles and voltages

Cases	Actual Voltages (V)			Approximated Voltages (V)			Firing angle obtained from the lookup table ⁽⁰⁾			%THD w.r.t actual values (From GA)	%THD w.r.t approximated values (From ANN)	%THD w.r.t approximated values (From FL)
	V ₁	V ₂	V ₃	V ₁	V ₂	V ₃	α_1	α_2	α_3			
I	88	89.5	90.5	90	90	95	10 ⁰	20 ⁰	28 ⁰	14.39	11.39	9.59
II	90.2	92	93	95	95	95	6 ⁰	17 ⁰	10 ⁰	14.02	11.58	9.63
III	95	93.4	96.6	95	95	100	9 ⁰	15 ⁰	30 ⁰	13.69	11.91	9.64
IV	97.2	88.6	95.4	100	90	100	10 ⁰	17 ⁰	38 ⁰	16.09	11.80	9.79
V	92.6	85	89.8	95	85	90	7 ⁰	13 ⁰	32 ⁰	14.52	11.77	9.60
VI	99.8	89.7	96.3	100	90	100	9 ⁰	19 ⁰	39 ⁰	15.59	11.63	9.61

Table II. Error Between GA-ANN and GA-FL

Cases	% Error (GA-ANN)	% Error (GA-FL)
I	3	4.8
II	2.44	4.39
III	1.78	4.05
IV	4.29	6.3
V	2.75	4.92
VI	3.96	5.98

As shown in the table firing angle for PV connected 7 level CHB-MLI system are optimized during actual as well as in approximated condition. It has been observed that error comes out to be lesser in case of GA optimized ANN system as compared to GA optimized FL system. Therefore we can say that GA optimized ANN system is superior in performance from FLC system.

CONCLUSION

In this paper two AI techniques- ANN and FL are used and Lookup Table employed angle optimization schemes are implemented for PV fed seven level Cascaded H- Bridge MLI system. These method are implemented and they gives the results of lower harmonics and of higher accuracy. All these results are justified in MATLAB by taking voltage variation of about 20%. It is detected that the techniques worked suitably for intermediate values of voltage and as well as with very less difference in the harmonic. Whenever there is a small difference in approximate voltages and actual voltage, ANN and FL- using GA optimized lookup table methodology can be applied. From results, it can be seen that error is lesser in case of GA-ANN than that of GA-FL. Further these techniques are extended to hybrid system like ANFIS that is a combination of ANN and FL. The work done in this paper is first step prior to field installation in order to experimentally authorise the effectiveness of the proposed system.

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