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FUZZY LOGIC CONTROL BASED DC – DC CONVERTER FOR FUEL CELL APPLICATION

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ABSTRACT

The power required day to day highly, the non conventional energy are available,(solar, wind) this type of energy's depended only weather condition, but Fuel Cell are independent sources, the proposed converter Fuzzy logic control based DC-DC converter for fuel cell application, a control strategy that combines the use of a dc-dc boost converter, fuzzy logic control, It is believed that this research will lead to improvement in the efficiency of DC DC Converter fuel cell.

Keywords—Fuel Cell, DC-DC converter,Efficiency.

1. INTRODUCTION

Implementingthe optimal maximum affiance andimplementation andsuitabilityandcompatibility totheend user'srequirements [1],[2].Different MPPTtechniques havebeenusedfordifferentsetups,dependingon thetaskbeing Performed[2]–[5].Ongoingresearchaddressingthese issues [6]–[8]andstate-of-the-art technologies isemerging[9]–[13]. Power harnessedfromsolar photovoltaic (PV) systems hasnotgainedcommercial statusasitscounterpart nonrenewablepowergenerationtechnologies [14].Asstatedinthe surveyandcomparisonofvariousMPPTtechniquesin[1], "These methods vary in complexity, sensors required, convergence speed, cost, and range of Effectiveness, implementation hardware and other factors." As a matter of fact, these are the basic criterion for selecting an MPPT technique. The functioning and performance of more than 90 MPPT methods are discussed and compared in [1]. A general short- coming of nearly all of the known MPPT techniques is the in- capability of handling uncertain weather conditions due to the assumption of standard solar irradiance and ambient temperature values. To address these issues, a dynamic model of Fuel Cell considering the variability of irradiance and ambient temperature on a real-time basis is reported. The dynamic model is simulated and verified, using the data acquisition system and has achieved model accuracy of 97.97%.The maximum power point varies over the
Whole day with the variation of the fuel Cell chemical conditions. In order to track it exactly, an appropriate value of load has to be matched. In this work, the dynamic Fuel model developed earlier it is used in conjunction with a dc-dc boost converter for harnessing the instantaneous maximum output power through real-time robust load matching. The duty cycle can be estimated using proportional integral (PI) controller as where andare the proportional and integral constants. However, the conventional PI controller has the major draw-back of control chattering; i.e., the controller output is a discontinuous high-frequency switching signal. This makes the PI controller not suitable for this application because of the continuous nature of variables and high-frequency switching requirement of the dc-dc converter. Simulation results in MATLAB/Simulink environment, for fixed and variable loads, are presented to demonstrate the effectiveness of the proposed MQBGA-based FLC control scheme. This manuscript is divided into six sections. Real-time robust load matching for a fuel cellsystem is outlined in this Section.InSectionthesecontrolstrategyisproposed.Modelingand the FLCand the Fuel Cellis achieved throughthemodeldevelopedearlierandthedesiredvoltageis achievedbytheboostedoutput voltageofthedc-dcconverter.Theoverallsupervisorycontrol forreal-timerobustload matchingandcontrolofdutycycle of the dc-dc converterisachievedthroughFLC.BasicsofFLCisdescribedin. Throughtheprocessingofheuristicinformation,anFLCinterpolate samongtheconsequentofalltherulesaccordingtotheirfiringstreng th.There- fore,anFLCcanbeseenasmultiplePID/PIcontrollers with smoothinterpolationcapability,withoutchatteringphenomena forreal-timeapplications.Asuitablelearningmechanism oftheknowledge baseofFLCandthetuningofthecontroller parametersarerequiredtoachievethedesiredreal-timeperformance.Learningmechanisms suchasgeneticalgorithm (GA) canbeimplementedtotunethecontrolparametersinsuchcases. GAperformsanintelligent searchforasolutionfroma very large

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numberofpossiblesolutions.Hence,thechancesof converging tolocalminimahavebeenreducedandglobaloptimumcanbeapproachedwithhigherprobability.Thus, ithas beentriedtoenhancetheperformance ofFLCfortheproper loadmatchingofFCmoduleforstandaloneapplication.

2. CONTROL STRATEGY

The overall objective is to make the output power at the load level equal to the harvestable maximum power by the FC model, while maintaining the dc-dc booster voltage at a desired constant level. To harness the instantaneous maximum power, the MPPT model estimates the load seen by the Fuel Cell module.The ambient and FC module temperature are find. The value of the load computed by the MPPT model fluctuates with the solar FC module's temperature dynamics, ambient temperature. The load seen by the FC module not only gets affected by the above-mentioned factors,but also by the duty cycle of the boost converter. During one complete control cycle, the maximum voltage,current,maximum power, and the maximum possible load are calculated through the MPPT model. The output power available at the load is calculated and compared with the maximum power. The actual load matching condition can be expressed as follows. Represents the proposed scheme for maximum power harvesting at MPP from a standalone FC system under uncertain environmental conditions. The value of is computed by the MPPT model, and the constant dc-dc converter's output voltage to be achieved is given in (3) in terms of the output voltage of the FC module the inputs to the FC module and the MPPT model are real-time ambient temperature. The instantaneous boost output voltage of the dc-dc converter is compared with the reference voltage. The error in voltage is input as error and change in voltage error. Finally it calculates the temperature and output voltage of FC and finally these inputs are given to DC – DC converter Topology circuits and it find maximum power from the FC module. In feature works it designs the DC DC boost converter. These diagrams mention only FLC inputs.

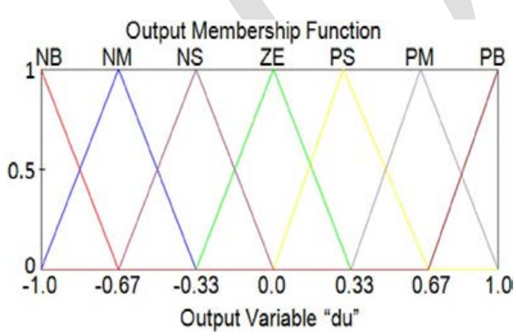
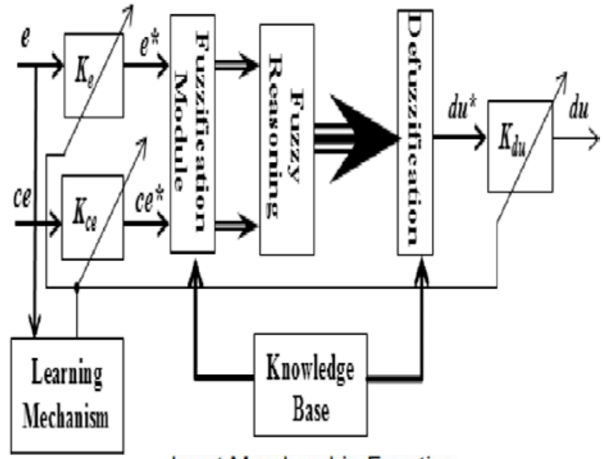


Fig 1. Gaussian membership function



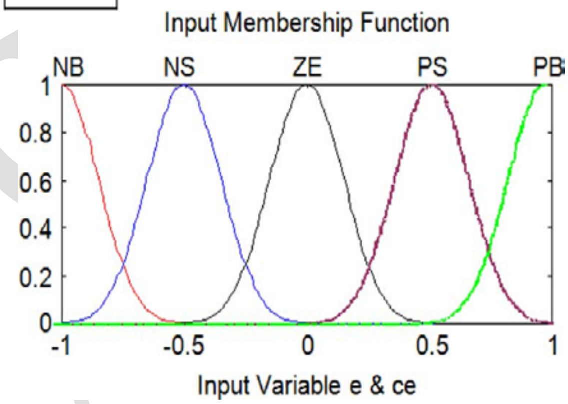


Fig 2. Gaussian membership function for inputs

e* \ ce*	NB	NS	ZE	PS	PB
NB	1. NB	2. NB	3. NM	4. NS	5. ZE
NS	6. NB	7. NM	8. NS	9. ZE	10. PS
ZE	11. NM	12. NS	13. ZE	14. PS	15. PM
PS	16. NS	17. ZE	18. PS	19. PM	20. PB
PB	21. ZE	22. PS	23. PM	24. PB	25. PB

Fig 3. Membership function for inputs tables

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3. CONCLUSION

This Proposed Converter topology are find out the six set of values the following words are mention it NB,NM,NS,ZE,PS,PM, and PB. In Future works using these types of FLC is giving the gate pulse for converter circuit and find maximum efficiency. These types of converters are reducing the switching loss.

REFERENCE

[1]T.Esramand P. Chapman,"Comparis on of photo voltaic array max- imum power point rackingtechniques, "*IEEETrans.EnergyConvers.*, vol.22,no.2,pp.439–449, Jun. 2007.

[2]A.MellitandS.A.Kalogirou,"Artificialintelligencetechn iquesfor photovol taicapplications: Areview,"*J.Prog.EnergyCombustionSci.*, vol.34,pp.574–632, 2008.

[3]E.KoutroulisandF.Blaabjerg, "Anewtechnique fort rackingthe global maximum power pointo fP Varraysoperating underpartial- shadingconditions ,"*IEEEJ.Photovoltaics*,vol.2,no.2,pp.184–190, Apr.2012.

[4]L.Peng,L.Yaoyu,andJ.Seem,"SequentialESC-based global MPPT control for photovol taicarray with variablehading ,"*IEEETrans.Sus- tain. Energy*,vol. 2,no. 3,pp.348–358,Jul. 2011.

[5]B.Alajmi,K.Ahmed,S.Finney,andB.Williams,"Fuzzy-logic-con-troll approach of amo difiedhill-climb in gmethodformaximumpower point in microgridstandalone photovoltaicsystem," *IEEE Trans. Power Electron.*,vol. 26, no. 4, pp. 1022–1030,Apr.2011.

[6]M.Elgendy,B. Zahawi,andD.Atkinson,"Assessmentof perturband observeMPPT algorithm implementation techniques for PV pumping applications," *IEEETrans. Sustain.Energy*,vol.3,no.1,pp.21–33, Jan.2012.

[7]Y.Riffonneau, S.Bacha, F.Barruel, and S.Ploix,"Optimalpower flow management for grid connected PV system swithbatteries,"*IEEE Trans. Sustain. Energy*,vol. 2,no. 3, pp. 309–320,Jul. 2011.

[8]R.ShayaniandM.deOliveira,"Anewindexforabsoluteco mparison of standalone photovoltaic system sinstalledatdifferentlocations," *IEEETrans.Sustain .Energy*,vol.2,no.4,pp.495–500,Oct.2011.

[9]G.Velasco-Quesada, F.Gispert, R.Pique-Lopez, M.Roman-Lum-breras ,andA. Conesa-Roca," Electrical PV arrayreconfiguration strategyfor energy extraction improvement in grid- connected PV systems, "*IEEETrans.Ind.Electron.*,vol.56,no.11,pp. 4319–4331, Nov.2009.

[10]R.Tonkoski, L.Lopes,andT.El-Fouly,"Coordinated activepower curtailment of grid connected PV inverters for overvoltage preven- tion, "*IEEETrans. Sustain.Energy*,vol.2,no.2,pp.139–147,Apr.2011.