JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

FAULT DETECTION AND DIAGNOSATION USING MULTILEVEL CASCADED INVERTER

Dr.K.Umamaheswari [#], Gomathi.S ,Maheshwari.V , Sujatha.G,Swathi.G

[#] Professor, Department of Electrical and Electronics Engineering,*Final year Student, Department of Electrical and Electronics Engineering, VSB Engineering College, Karudayampalayam, Karur-639111

ABSTRACT

Multilevel inverter drives have become widely applied in high voltage and high power application. Therefore fault diagnosis of voltage source inverters is becoming more important. It is difficult to diagnosis a multilevel inverter drive system using a mathematical model because multilevel inverter drive system consists of many switching devices and their system complexity has a nonlinear factor. This project presents a technique to detect and diagnosis of faults occurring in a single phase five level inverter by using Artificial Neural Network without affecting the continuity of the output. The faults like over voltage, under voltage, open circuit, short circuit and losing drive pulse which occurred in the multilevel inverter are considered in this project. The method is used to identify the type and location of occurring faults from inverter by output voltage measurements. The neural network algorithm is trained to detect the faults with the help of the data sets and tested in order to eliminate the faults occurring in a multilevel inverter. By utilizing the proposed neural network fault diagnostic system, a better understanding about fault behaviours, diagnostic and detections of a multilevel inverter drive system can be accomplished. The result of the project can be shown in Hardware Experimental set up.

1.INTRODUCTION

Numerous industrial applications have begun to require higher power apparatus in recent years. Some medium voltage motor drives and utility applications require medium voltage and megawatt power level. For a medium voltage grid, it is troublesome to connect only one power semiconductor switch directly. As a result, a multilevel power converter structure has been introduced as an alternative in high power and medium voltage situations. A multilevel converter not only achieves high power ratings, but also enables the use of renewable energy sources. Renewable energy sources such as photovoltaic, wind, and fuel cells can be easily interfaced to a multilevel converter system for a high power application.

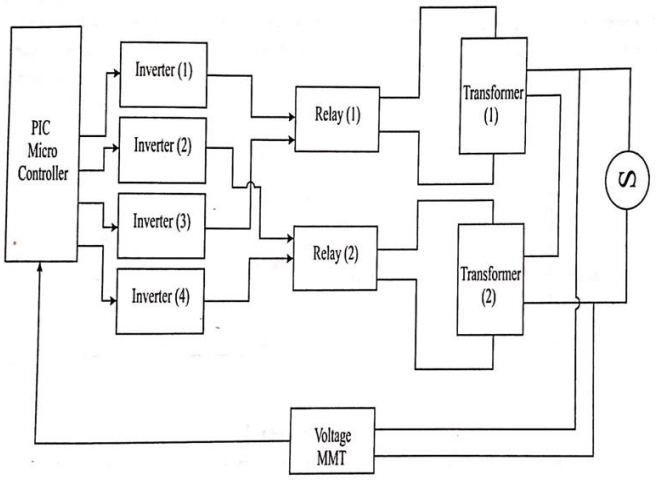
The commutation of the power switches aggregate these multiple de sources in order to achieve high voltage at the output; however, the rated voltage of the power semiconductor switches depends only upon the rating of the dc voltage sources to which they are connected. A multilevel converter has several advantages over a conventional two-level converter that uses high switching frequency pulse width modulation (PWM).

Neural Network Based Fault Diagnosis and Reconfiguration Method for Multilevel Inverter". This project aims at the detection and diagnosition

of the various faults occurring in a single phase five level inverter based on Artificial Neural Networks. The role of Artificial Neural Network in fault diagnosition is studied and simulated in MATLAB/SIMULINK. The single phase five level inverter system is designed and their characteristics are observed. The datas like voltage,current and the error values are collected by varying the load conditions. The neural network algorithm is trained to detect the faults with the help of the data sets and tested in order to eliminate the faults occurring in an inverter. As a result of the analyzed works, it can be concluded that multilevel inverters can significantly increase their availability and are able to operate even with some faulty conditions.

II. VOLTAGE MEASUREMENT

Voltage measurement is obtained with an operational amplifier in order to have a circuit behaving like an ideal diode or rectifier. The full wave rectifier is the combination of half wave precision rectifier and summing amplifier. When the input voltage is negative, there is a negative voltage on the diode, too, so it works like an open circuit, there is no current in the load and the output voltage is zero. When the input is positive, it is amplified by the operational amplifier and it turns the diode on. There current in the load and, because of the feedback, the output voltage is equal to the input.In this we see, when the input is greater than zero, D2 is ON and DI is OFF, so the output is Tro. When the Input is less than zero, D2 is OFF and DI is ON, and the output is like the input with amplification rectifier nd the summing amplifier.0n of-Ra / R. The full-wave rectifier depends on the fact that both the half-wave summing amplifier are precision circuits. It operates by producing an inverted half 33plifier. The result is a reversal of the selected polarity of the input signal he output of the rectified voltage is adjusted to 0-5v with the help of variable resistor rectified signal and Gate signal and then adding that signal at double amplitude to the original signal in the given to ripples are filtered by the CI capacitor. After the filtration the corresponding Dcis given to ADC or other related circuit.



III. Employing Artificial Neural Networks

Perhaps the greatest advantage of ANNs is their ability to be used as an arbitrary function approximation mechanism that "learns' from observed data. However, using them is not so straightforward and a relatively good understanding of the underlying theory is essential.

Choice of model: This will depend on the data representation and the application. Overlycomplex models tend to lead to problems with learning.

Learning algorithm: There are numerous trade-offs between learning algorithms. Álmostanyalgorithm will work well with the correct hyperparameters for training on a paticular fixeddata set. However selecting and tuning an algorithm for training on unseen data requires aSignificant amount of experimentation. applio ennlications. Their simple implementation and the existence of mostly local dependencies exhibited.

Robustness: If the model, cost function and learning algorithm are selected appropriately the resulting ANN can be extremely robust.with the correct implementation, ANNs can be used naturally in online learning and large data setin the structure allows for fast, parallel implementations in hardware.

IV. HARDWARE IMPLEMENTATION

The utility of artificial neural network models lies in the fact that they can be used to inferfunction from observations. This is particularly useful in

applications where the complexity of thedata or task makes the design of such a function by hand impractical.

a.Real-Life Applications

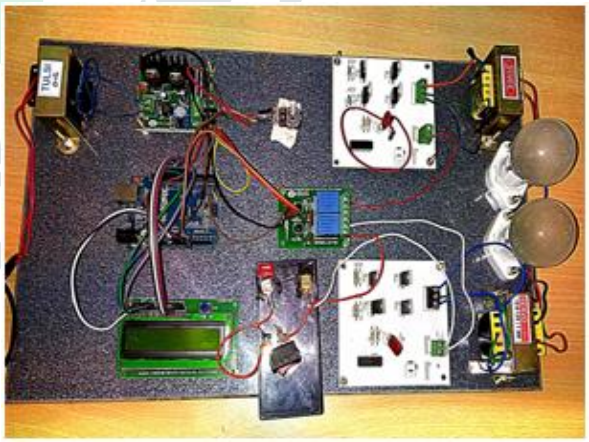
The tasks artificialData processing, including filtering, clustering, blind source separation and compression.Robotics, including directing manipulators, Computer numerical control.

Application areas include system identification and control (vehicle control, process control, ural resources management), quantum chemistry,game-playing and decision making natural Cgammon, chess, poker), pattern recognition (radar systems, face identification, object backion and more), sequence recognition (gesture, speech, handwritten text recognition), medical S,inancial applications (automated trading systems), data mining (or knowledge discovery diagno ADases, "KDD'"), visualization and e-mail spam filtering. in databases.

b.Circuit Working Description

A 12v Transformer is used to step down the normal 230v AC to 12v AC. Then it connectedto the Diode Bridge circuit.This Bridge circuit converts the 12v AC into 12v DC. Then a 2200fcapacitor is used to clear the noise in +12v DC current. We need +5v to drive the microcontroller.Sothe IC7805 is used in this circuit to convert +12v DC to +5v DC. Microcontroller(pic16F877A) isused in this project. This microcontroller needs 4MHz clockpulse and it was connected to the pin 13,14 of pic16F877A. power supply +5V are connected to the pin 11,32 and also ground is connectedto pin 12,31. The first pin MCLR is connected to +5V via 1K resistor. If there is an active low onthis pin may erase the program. So we should care on that pin. Neural network program is trained inthis microcontroller.Multilevel inverter is connected to the microcontroller. If any faults occur in the multilevel nverter like losing drive pulse, over voltage, under voltage means bypassing of multilevel inverter is laking place. From microcontroller, by using neural network coding we can choose the required output. Through this we are getting continuous output, without affecting the continuity of the outputeven a fault occurs.

In amultilevel inverter. It is an electrically operated switch.Current flowing through the coil of the elay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw switches.In Isolation transformer, we are getting same output voltage level as given in the input. It is a alo isolation transformer. The range between 0-220V level is obtained as an output. Ico 1:1vnodule was used to display the fault identification. The LCD'sare used widely in all applications namely microcontroller instead of LCD's or other multi segments LCD's.This is used to thecontrast to L.ED's, wliich aro limlted to numbers and a fow characters. Incorporation of a refreshingdeeline prices of'i LCD's. It hus the nbility to display numbers,characters and graphics. This is in microntroller into the LCD, thercby, relcving of the task of refreshing the LCD. In contrast the LED ust be relresied by the keep displaying the data easy of programming for characters and graphics.



V.RESULT AND DISCUSSION:

When the input is greuler than zero, D2 is ON and DI is OFF, so the output is zero. When theinput is less than zero, D2 is OFF and DI is ON, and the output is like the input with an amplification of -R2 / R. The full-wave rectifierdepends on the fact that both the half-wave retifier and the summing amplifier are precision circuits. It operates by

producing an inverted halfwave-rectificd signal and then adding that signal at double amplitude to the original signal in thesumming amplifier. The result is a reversal of the selected polarity of the input signal.The overall experimental setup of this project is shown. Then the output of the rectified voltage is adjusted to 0-5v with the help of variable resistor VRI. Then given to ripples are filteredby the Cl capacitor. ANcr the filtration the corresponding DC voltage is given to ADC or otherrelated circuit.

CONCLUSION

By using this project the various faults like over voltage, under voltage and losing drive pulsecan be detected and diagnosed in Multilevel inverter. The feature extraction system is an important process because bad transformation signals will lead to poor classification performance. The classification performance decreases when the operating point of the multilevel inverter drive isdifferent from the training set. For a medium voltage grid, it is troublesome to connect only onepower semiconductor switch directly. The multilevel inverters can significantly increase theiravailability and are able to operate even with some faulty conditions. The main advantage of thisproject is that the multilevel inverter can operate even in faulty conditions without affecting thecontinuity of the operation. All the twelve POs and PSOs were obtained from the project.

REFERENCES

1. Abul Masrur, M. and Chen, Z.(2010), 'Intelligent Diagnosis Of Open and Short Circuit Faults In Electric Drive Inverters For Real-Time Applications', IEEE Journal On PowerElectronics, Vol.3,pp.279-291.

2. Abdul Masrur.M,ZhiHang Chen et al.,(2007), Model-BasedFault Diagnosis In Electric Drive Inverters Using Artificial Neural Network',IEEE Journal On PowerElectronics.pp.1-7.

3. Alian Chen, Lei Hu and Chen.L et al.(2005), 'A Multilevel Converter Topology With Fault-Tolerant Ability,' IEEE Transactions On Power Electronics, Vol.20, No. 2, pp. 405415.

4. Bo Li,Mo-yuen chow et al.,(2000), Neural-Network Based Motor Rolling Bearing FaultDiagnosis',IEEE Transactions On lndustrial Electronics, Vol 47,No.5.pp.1060-1069. 5. DembalDiallo, Benbouzid.M.H,Hamad.D and Pierre.X.(2005), Fault Detection AndDiagnosis In An Induction Machine Drive: A Pattern Recognition Approach Based OnConcordia Stator Mean Current Vector', IEEE Transactions on Energy Conversion, Vol. 20,No. 3, pp. 512-519.

6. Fan Bo and Dong Ming(2010), Three-Phase Inverter Fault Diagnosis Based On OptimizedNeural Networks', IEEE International Conference on Computer Application and SystemModeling, Vol.14,pp.482-485.

7. Ghate.V and Dudul.S(2010), * Cascade Neural Network Based Fault Classifier for ThreePhase Induction Motor, IEEE Transactions on Power Electronics,Vol.99,No.4.pp. 1-1 8. Ho.In.Son, Tae.Jin.Kim et al.,(2004), "Fault Diagnosis And Neutral Point Voltage Control When The 3-Level Inverter Faults Occur,' in Proc.EEE Power Electronics Specialists Conference.pp.4558-4563.

9. Jose Rodriguez, Hammond.P. W et al.,(2005), 'Operation Of Medium-Voltage Drive Under Faulty Conditions,' IEEE Transactions on Industrial Electronics, Vol.52, No.4,pp.1080-1085.

10. Jose Rodriguez,Jih-Sheng Lai and Fang Zheng Peng(2002), 'Multilevel Inverters:ASurvey Of Topologies Controls And Applications', EEE Transactions on IndustrialElectronics, Vol.49,No.4