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Single Source Inverter for Domestic Application

G.Sivagovind[1], P.Avirajamanjula[2],
[1]*Department of Electrical and Electronics Engineering, Prist University, Vallam, Thanjavur*
[2]*Department of power system, Prist University, Vallam, Thanjavur*

Abstract-

Another prescient methodology for current control of a solitary - stage inverter is displayed. It depends on a discrete-time model of the framework, used to foresee future estimations of the heap current and voltage of the capacitors in the DC-connect, for every conceivable exchanging state created by the inverter. The express that limits a given quality function"g" is chosen to be connected amid the following testing interim. A few creations of g are proposed, including terms devoted to accomplish reference following, adjust in the DC-connection and lessening of the exchanging recurrence. The calculation utilizes the repetition of exchanging states, regular of a three-level inverter, by methods for a straightforward technique. In correlation with great PWM current control, the technique displays a momentous execution. The proposed strategy accomplishes tantamount reference following with bring down exchanging recurrence per semiconductor and a somewhat enhanced short lived conduct. It requires a more noteworthy testing recurrence, which ought not be an issue, considering the present advances accessible in computerized flag processors. The fundamental preferred standpoint of the strategy is that it doesn't require any sort of direct controller or adjustment method, accomplishing an alternate way to deal with control a power converter

Keywords: inverter,H bridge inverter, VSI (Voltage Source Inverter), PWM (Pulse Width Modulation).

INTRODUCTION

Inverters are the power electronic circuit, which converts the DC voltage into AC voltage. The DC source is normally a battery or output of the controlled rectifier. The output voltage waveform of the inverter can be square wave, quasi-square wave or low distorted sine wave. The output voltage can be controlled with the help of drives of the switches. The pulse width modulation techniques are most commonly used to control the output voltage of inverters. Such inverters are called as PWM inverters. The output voltage of the inverter contain harmonics whenever it is not sinusoidal. These harmonics can be reduced by using proper control schemes. Inverters can be broadly classified into two types.

They are

Voltage Source Inverter (VSI)

Current Source Inverter (CSI)

When the DC voltage remains constant, then it is called voltage inverter (VSI) or voltage fed inverter (VFI). When input current is maintained constant, then it is called current source inverter (CSI) or current fed inverter (CFI). Sometimes, the DC input voltage to the inverter is controlled to adjust the output. Such inverters are called variable DC link inverters. The inverters can have single phase or three-phase output.

A voltage source inverter is fed by a stiff dc voltage, whereas a current source inverter is fed by a stiff current source.

- A voltage source can be converted to a current source by connecting a series inductance and then varying the voltage to obtain the desired current.
- A VSI can also be operated in current-controlled mode, and similarly a CSI can also be operated in the voltage control mode.
- The inverters are used in variable frequency ac motor drives, uninterrupted power supplies, induction heating, static VAR compensators, etc.

The following sections give us the comparative study between VSI and CSI 2.1.1 Voltage Source Inverters (VSI)

- VSI is fed from a DC voltage source having small or negligible impedance.
- Input voltage is maintained constant.
- Output voltage does not dependent on the load.
- The waveform of the load current as well as its magnitude depends upon the nature of load impedance.
- VSI requires feedback diodes.
- The commutation circuit is complicated.
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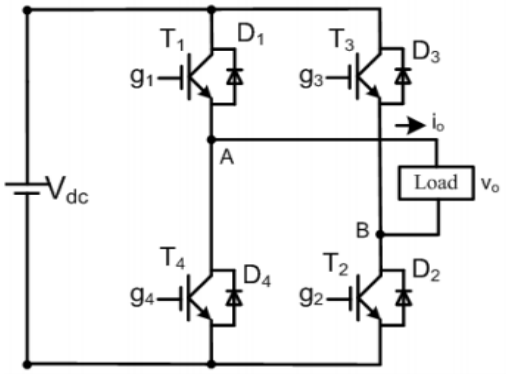
- Power BJT, Power MOSFET, IGBT and GTO with self-commutation can be used in the circuit.



CURRENT SOURCE INVERTERS:

CSI is fed with adjustable current from a DC voltage source of high impedance.

♣ The input current is constant but adjustable.

♣ The amplitude of output current is independent of the load.

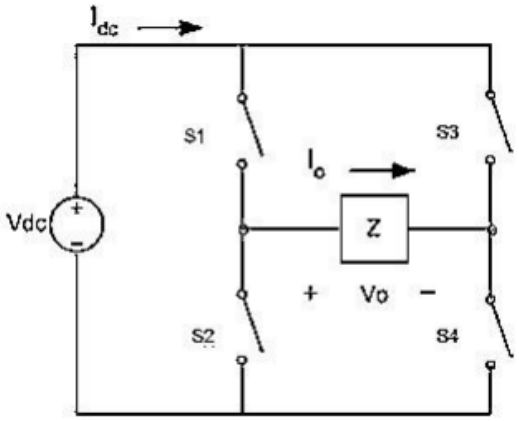
♣ The magnitude of output voltage and its waveform depends upon the nature of the load impedance.

♣ The CSI does not require any feedback diodes.

♣ Commutation circuit is simple as it contains only capacitors

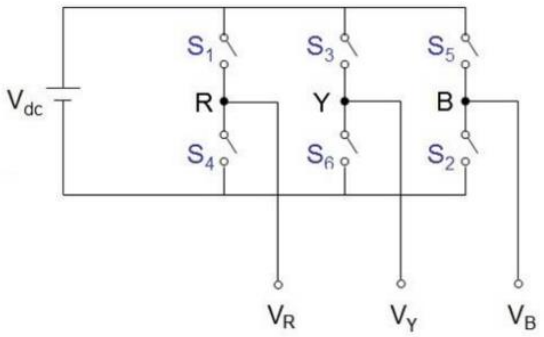
H-BRIDGE INVERTERS:

As previously mentioned, the purpose of an inverter is to convert DC power to AC power. Inverters are an integral part of many technologies including uninterruptable power supplies, induction heating, high-voltage direct current power transmission, variable frequency drives, electric vehicle drives, and multiple renewable energy applications. All of these technologies use inverters to achieve different goals, but all produce AC power from a DC input. There are many varieties of inverter designs. The most common topology us and is referred to as the H-bridge topology. The term H Bridge is derived from the typical graphical representation of such a circuit. An H bridge is built with four switches (solid-state or mechanical). When the switches S1 and S4 are closed a positive voltage will be applied across the motor. By opening S1 and S4 switches and closing S2 and S3 switches, this voltage is reversed, allowing reverse operation



Using the nomenclature above, the switches S1 and S2 should never be closed at the same time, as this would cause a short circuit on the input voltage source. The same applies to the switches S3 and S4. This condition is known as shoot-through. Its basic configuration is shown in figure. This topology is used in conjunction with either the square wave, or pulse width modulation (PWM) switching schemes. The square-wave switching scheme is a method for controlling the switches (labeled S1 through S4) in order to achieve a square wave AC output signal. The AC output is achieved by using a control signal with a 50% duty cycle wired to S1 and S4. An inverted copy of the same signal is also wired to S2 and S3. This switching scheme ensures that S1 and S4 are always on when S2 and S3 are off. It should be easily seen how such a switching scheme creates the square wave output shown in figure. The advantage of using an H-bridge inverter is that only a single, simple control signal is required to control four transistors. The disadvantage, however, is that the square wave output is a low quality AC signal that injects many harmonics into any loads to which it is powering. We thus aim to reduce the harmonics in the output AC voltage by use of various modulation techniques.

THREE PHASE INVERTER



A Basic three phase inverter consists of three legs, each attached to the phase output line. The upper and lower switching transistor are S1 & S4 for R phase, S3 & S6 for Y phase and S5 & S2 for B phase respectively.

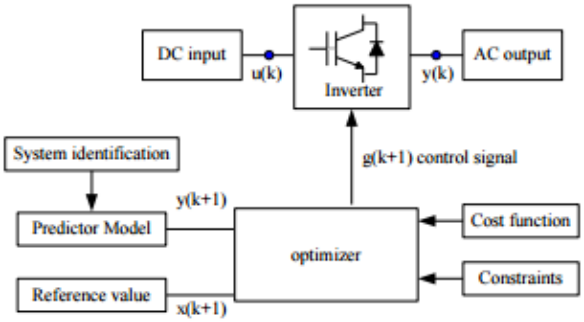
INVERTER APPLICATIONS:

- DC power source utilization an inverter converts the DC electricity from sources such as batteries or fuel cells to AC electricity.
- Uninterrupted powers source utilization an uninterruptible power supply (UPS) uses batteries and an inverter to supply AC power when main power is not available. When main power is restored, a rectifier supplies DC power to recharge the batteries.
- Electric motor speed control Inverter circuits designed to produce a variable output voltage range are often used within motor speed controllers. The DC power for the inverter section can be derived from a normal AC wall outlet or some other source. Control and feedback circuitry is used to adjust the final output of the inverter section which will ultimately determine the speed of the motor operating under its mechanical load

PROPOSEDSYSTEM

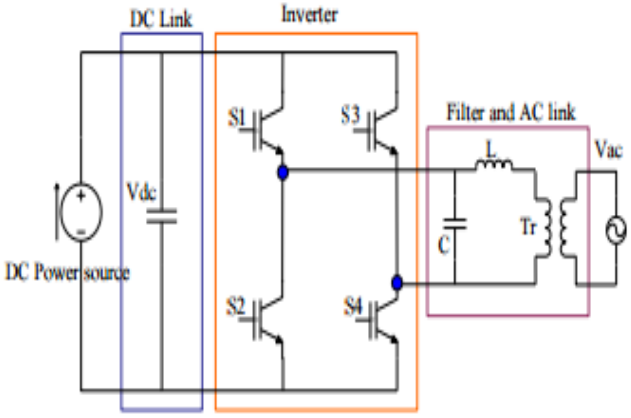
Model predictive control (MPC) refers to a class of computer

control algorithms that utilize an explicit process model to predict the future response of a plant. MPC is based on iterative, finite horizon optimization of a plant model as. The model predicts the future dynamic behavior of the system over a prediction horizon Tp. At each control interval an MPC algorithm attempts to optimize future plant behavior by predicting a control horizon Tc . Only the first step of the control strategy from cost function optimization is implemented, then the plant state is sampled again and the calculations are repeated starting from the now current state, yielding a new control and new predicted state path. The prediction horizon keeps being shifted forward and for this reason MPC is also called receding horizon control. Then a receding horizon strategy so that each instant the horizon is moved towards the future which involves the application of the first control signal of the sequence calculated at each step. An optimization cost function of Predictive control is given by without violating constraints

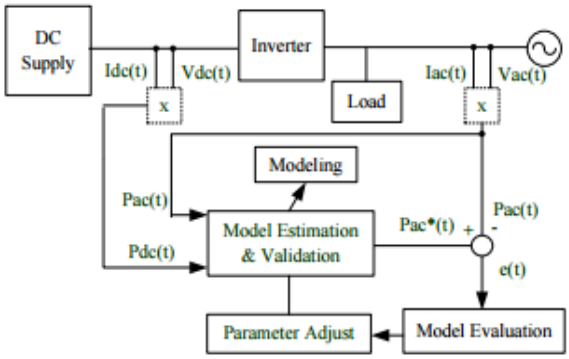


SINGLE PHASE INVERTER AND CONTROL TOPOLOGY:

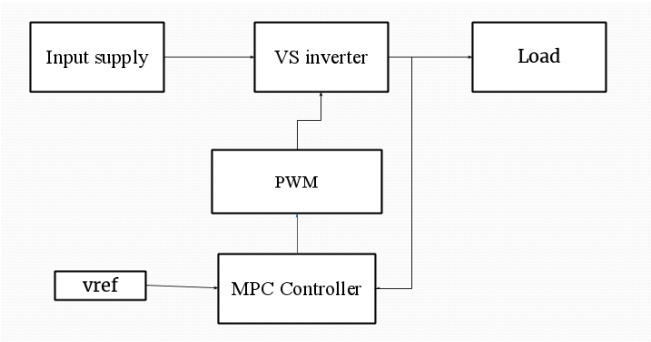
The inverter composed of DC-link, four switched of power electronics such IGBT or MOSFET and output filter and AC link for synchronization to the power system and equivalent circuit of each status is transformed in to the circuit . The equation of single phase inverter is shown in equation. The constraint of switching of inverter, in one branch t allow only one switch active and blanking time is used for avoid this situation. There are four possible switching patterns which compose of two active vectors and 2 zero vectors as shown in Table I. In table the number 1 of switch is stand for switch on and 0 is mean switch off



proposed methodology achieves commensurate reference following with cut down trading repeat per semiconductor and a to some degree upgraded brief lead. It requires a more significant testing repeat, which should not be an issue, considering the present advances available in automated banner processors. The central favored outlook of the procedure is that it doesn't require any kind of direct controller or modification technique, achieving a substitute method to manage control a power converter



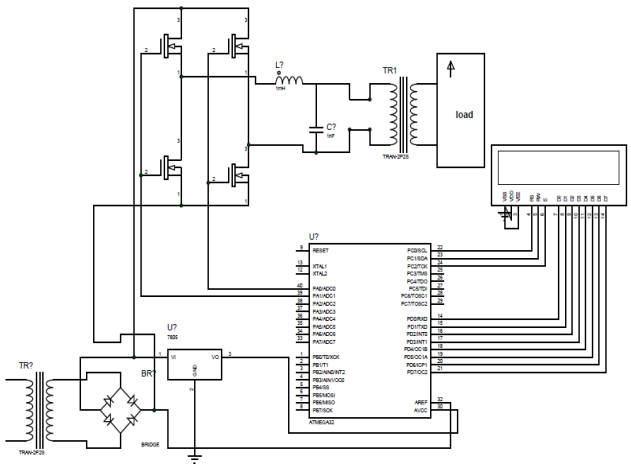
Only the first step of the control strategy from cost function optimization is implemented, then the plant state is sampled again and the calculations are repeated starting from the now current state, yielding a new control and new predicted state path. The prediction horizon keeps being shifted forward and for this reason MPC is also called receding horizon control. Then a receding horizon strategy so that each instant the horizon is moved towards the future which involves the application of the first control signal of the sequence calculated at each step. An optimization cost function of Predictive control is given by without violating constraints



RESULTS

To approve the execution of the proposed proposed strategy accomplishes tantamount reference following with bring down exchanging recurrence per semiconductor and a somewhat enhanced short lived conduct. It requires a more noteworthy testing recurrence, which ought not be an issue, considering the present advances accessible in computerized flag processors. The fundamental preferred standpoint of the strategy is that it doesn't require any sort of direct controller or adjustment method, accomplishing an alternate way to deal with control a power converter

OVER ALL IMPLEMENTATION CIRCUIT DIAGRAM



CONCLUSION

A few creations of g are proposed, including terms devoted to accomplish reference following, adjust in the DC-connection and lessening of the exchanging recurrence. The calculation utilizes the repetition of exchanging states, regular of a three-level inverter, by methods for a straightforward technique. In correlation with great PWM current control, the technique displays a momentous execution. The proposed strategy accomplishes tantamount reference following with bring down exchanging recurrence per semiconductor and a somewhat enhanced short lived conduct. It requires a more noteworthy testing recurrence, which ought not be an issue, considering the present advances accessible in computerized flag processors. The fundamental preferred standpoint of the strategy is that it doesn't require any sort of direct controller or adjustment method, accomplishing an alternate way to deal with control a power converter

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