Dual closed loop inverter voltage control

Is there a dual closed-loop repetitive control strategy for single-phase grid-connected inverters?
In this paper,a novel dual closed-loop repetitive control strategy based on grid current feedback is proposedfor single-phase grid-connected inverters with LCL filters. The proportional-integral inner loop is stabilized by using an inherent one-beat delay achieved by digital controller.

Can Dual-loop control improve steady-state performance of single-phase inverter power supply?
Secondly,using the pole configuration method,the parameters of the double closed-loop PI can be obtained. Finally,the model is built by SIMULINK. The simulation results verify that the dual-loop control can improveand improve the steady-state performance and dynamic performance of single-phase inverter power supply.

What is a dual loop control method?
The repetitivedual-loop control method is adopted. The outer loop is controlled by the RC,which makes the grid-connected current ig track the sinusoidal reference iref without a steady-state error. The PI control method is applied in the inner loop,which can increase the damping of the system to suppress the resonance peak.

What is the circuit topology of a single-phase grid-connected inverter?
The main circuit topology is a single-phase grid-connected inverter with LCL filter. The repetitive dual-loop control method is adopted. The outer loop is controlled by the RC,which makes the grid-connected current ig track the sinusoidal reference iref without a steady-state error.

How can a single-phase inverter improve performance?
By establishing the mathematical model of the single-phase inverter,the current inner loop control can obtain rapid dynamic performance,and the voltage outer loop controlcan improve the steady-state performance of the system. Secondly,using the pole configuration method,the parameters of the double closed-loop PI can be obtained.

What is the closed-loop transfer function of a repetitive dual-loop controller?
To summarize,the closed-loop transfer function of the repetitive dual-loop controller has been obtained as (15) G (z) = G c l (z) (R C (z) +1) 1 +R C (z) G c l (z)where RC (z)= z-NS (z)/(1- Q (z) z-N). Fig. 12 shows the frequency characteristics of the repetitive dual-loop controller.

As aforementioned, in all dual-loop control schemes sug-gested for the single-phase UPS inverters, the inner and outer loops are used for current and voltage control, respective-ly [4, 8, 16-24]. While these techniques exhibit an accept-able performance, the design of the feedback control loops is complicated.

This paper has analyzed in detail the implementation principles and process of the three-phase LCL grid-tied

inverter, and has adopted the dual closed-loop feedforward control ...

Furthermore, the authors in [] and [] presented a very complicated closed-loop control technique for the SBI to confirm its suitability for DC nanogrid applications.Adda et al. in [] also used a very complex d-q frame model to control the AC output voltage of the SBI. To raise the inverter output AC-voltage, authors in [] proposed a step-up transformer that increases the ...

where m is the inverter modulation index. The voltage setpoint Vset may be constant, or may follow a droop characteristic that is dependent upon the reactive power delivered to the grid. The phase of the inverter voltage is regulated to control the active power output of the inverter. The basic idea behind this strategy is proposed in [4].

Regarding the grid-connected three-phase inverter, the mathematical model of the two-phase rotary coordinate system is initially constructed. Subsequently, the double closed-loop control ...

The technical scheme that the utility model is taked is: a kind of two closed-loop control formula Single-Phase Inverter Sources, comprise ac input end, ac input end connects the first current rectifying and wave filtering circuit, the first current rectifying and wave filtering circuit connects bridge inverter main circuit, bridge inverter main circuit connects voltage and current double ...

Virtual synchronous generator (VSG) is a control scheme applied to the inverter of a distributed generating unit in order to support power system stability by imitating the behavior of a synchronous generator. A lot of effort has been dedicated to investigating the power stage control of VSG, but the waveform quality of VSG is not fully discussed. This paper analyses a VSG ...

This paper presents a double-closed-loop PWM design and control method for single-phase inverter current inner loop and voltage outer loop. By establishing the ...

Stability analysis as well as control design of dual-loop and single-loop voltage PI controllers intended for voltage-controlled VSI are established in . Researchers in [25] covered the modelling and design of the CCL and VCL by integrating a P ...

Dual-loop control of the instantaneous values plays an important role in inverters whose output waveform has fast dynamic response, high steady-state accuracy, and strong ...

This paper first analyzes the effect of passive damping method on the resonance peak; then a double closed-loop control strategy with the inner loop of capacitor current and the outer loop ...

This study presents an innovative dual closed-loop DC control system for intelligent electric vehicle (EV) charging infrastructure, designed to address the challenges of high power factor, low harmonic pollution, and high efficiency in EV charging applications. The research implements a three-level Pulse Width Modulation

(PWM) rectifier with a diode ...

This letter proposes a passivity-based dual-loop vector voltage and current control method for grid-forming voltage-source converters (GFM-VSCs). A passive output impedance of GFM-VSC is guaranteed in both the voltage control mode and the current-limiting mode with a wide range of time delay. The frequency-domain analysis, simulation and experimental tests validate the ...

The proposed dual closed-loop PI control method for neutral point voltage deviation and fault residual voltage can stabilize the residual voltage of the grounded fault phase to below 10 V, forcing ...

Virtual oscillator control (VOC) is an emerging decentralized control technique for grid-forming inverter applications. In contrast to conventional phasor-based droop control or virtual synchronous machine control, VOC is a time-domain controller designed to emulate the dynamics of a nonlinear oscillator. VOC is a current-controlled voltage source, lacking the ability to ...

It is a double closed-loop controller. Usually, the current control loop is in the inner loop and the voltage control loop is in the outer loop. The bandwidth of the current loop (that is, the response speed) is greater than that of the voltage loop so it can achieve current limiting. The third example is the MAX1978 temperature controller. It ...

A single-phase inverter is a power supply device that converts direct current into single-phase alternating current. Since the feedback information of the inverter is AC sinusoidal signal, the PI control method under the traditional static coordinate system cannot realize the sinusoidal signal of tracking feedback without static error, so this paper adopts the synchronous rotating ...

Double Closed-Loop Control Strategy for Photovoltaic Inverter Based on Improved Average Current Control Abstract: Aiming at the resonance peak problem existing in the LCL type three ...

Performance of DC/AC Inverters is decreased due to variable load parameters. Based on a voltage and current double closed-loop control inverter model, a novel load on-line parameter estimation control method is proposed. In this method, load parameters of inverters are calculated on-line. And then, controller coefficients of inverters are modified according to load ...

In this paper, a novel dual closed-loop repetitive control strategy based on grid current feedback is proposed for single-phase grid-connected inverters with LCL filters. The proportional-integral inner loop is stabilized by using an inherent one-beat delay achieved by ...

The system dynamics of an inverter and control structure can be represented through inverter modeling. It is an essential step towards attaining the inverter control objectives (Romero-cadaval et al. 2015).The overall process includes the reference frame transformation as an important process, where the control variables including voltages and currents in AC form, ...

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The output characteristics of a single phase inverter with voltage and current dual closed-loop feedback control are analyzed and the equivalent model of the parallel operating single phase ...

This paper presents an evaluation for the voltage regulators adopted in the digital dual-loop voltage-controlled, LC-filtered voltage-source converters. Given the proportional control on the filter inductor current, four different capacitor voltage regulators implemented in the ?? frame are compared. The analysis elaborates that the basic proportional and resonant voltage regulator ...

The proposed control strategy for dual two-level inverter (DTLI)-based PV system includes two cascaded loops: (i) an inner current control loop that generates inverter voltage references, (ii) an outer dc-link voltage control loop to generate current reference. ... Then, the closed-loop transfer function is (11) For, the ...

15 and 16, a voltage and current double closed loop control method for the boost circuit is introduced, which determined the coupling inductance of the interleaved parallel boost circuit under the condition of a large duty cycle. ... changing the pulse width to achieve the role of voltage dual-loop control, 24 ...

The output characteristics of a single-phase inverter with voltage and current dual closed-loop feedback control are analyzed, and the equivalent circuit model of a parallel single-phase inverter system is introduced. By taking both resistance and inductance components of the equivalent output impedance into consideration, a current decoupling control strategy of the ...

Abstract: The output characteristics of a single phase inverter with voltage and current dual closed-loop feedback control are analyzed and the equivalent model of the parallel operating single phase inverter system is introduced. The relationship between the circulating current and the amplitude/phase of inverter reference signal is analyzed, based on which a current ...

connected current outer loop. Voltage-current double closed loop control for grid-connected inverter consists of grid-connected current inner loop and grid voltage outer loop. Because the control principle is different be-tween the two, it cannot adopt a similar method to the latter to design current double closed loop controller in this paper ...

An improved bus voltage control strategy, utilizing LADRC to control the voltage outer loop of the traditional double-closed-loop control, is proposed in this paper. A mathematical model of the inverter is presented, and first- and second-order LADRC controllers are ...

Grid-connected inverter is an important part of the grid-connected system. Compared with the traditional L or LC filter, LCL filter has a better high-frequency harmonic attenuation performance. However, LCL filter has resonant peak, which has a great influence on the stability of the system. This paper first analyzes the effect of passive damping method on the resonance peak; then a ...

This paper analyzes the stability of digitally dual-loop voltage-controlled inverters with consideration of grid impedance. It is revealed that both the digital delay and controller affect the system stability through adjusting the phase at the resonant frequency of the LCL filter. Then an optimal control for inner current loop is proposed to deal with different switching frequencies. ...

Repetitive-based Dual Closed-loop Control Approach for Grid-connected Inverters With LCL Filters [J]. Proceedings of the CSEE, 2017, 37 (10): 2944-2954. DOI: 10.13334/j.0258 ...

In this paper, An average switch model of a boost converter with double closed loop control is presented by using the method of average state space. A detailed design procedure of both voltage and current feedback loops are given in a boost converter. The proposed circuit shows the characteristics of the fast dynamic response. Besides, the output voltage ripple is reduced ...