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NEIZRAZITO ADAPTIVNO UPRAVLJANJE POGONOM S ASINKRONIM MOTOROM

Mohamed Rachid Chekkouri, PhD Student, e-mail: chekkour@eel.upc.es
Dr. Jordi Catal i L pez, Product Engineer, Control Techniques Iberia SA, e-mail: catala@eel.upc.es;
Dr. Emiliano Aldabas Rubira, Lecturer, e-mail: aldabas@eel.upc.es
Dr. Luis Romeral Martínez, Senior Lecturer, e-mail: Romeral@eel.upc.es;
Electronic Engineering Department, Technical University of Catalonia, Campus Terrassa, TR2. C/Colom, no. 1, 08222. Terrassa, Catalonia, Spain, Phone number: +34 93 739 8194 Fax number: +34 93 739 8016

Industrijske primjene sve više trebaju električne pogone s dobrim svojstvima pozicioniranja i regulacije tereta. To se može postići jedino adaptivnim načinom upravljanja, jer se uvjeti terećenja, momenti inercije kao i ostali parametri sustava mijenjaju tijekom gibanja.
U članku je razvijen adaptivni regulator brzine vrtnje za izmjenični pogon s asinkronim motorom koji koristi jednostavan računski algoritam. Autori predlažu samopodešavajuće upravljanje zasnovano na neizrazitoj adaptaciji s nadzornog nivoa. Nadzorni algoritam neprestano prati stanje sustava i mijenja parametar K_i standardnog PDF regulatora da bi ga adaptirao na promjene stanja u postrojenju.
Neizrazita adaptivna strategija realizirana je bez poteškoća, sa svojstvom vrlo brzog učenja te vrlo dobrim svojstvima pozicioniranja i regulacije tereta. Analiza stabilnosti razvijenog regulatora također je napravljena, a eksperimentalni rezultati pokazuju robustnost predloženog algoritma pri uvjetima djelovanja poremećaja u obliku promjenljivog momenta tereta.
(Sl. 14, Tab. 1, Lit. 10 – original na engleskom) *Autori*

adaptivno upravljanje, pogoni podesive brzine vrtnje,
neizrazita logika, upravljanje gibanjem,
pogoni promjenljive brzine vrtnje

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Prethodno priopćenje

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PRIMJENA, PRORAČUN I ANALIZA DVOSTRUKO NAPAJANOG STATORA LINEARNOG MOTORA ZA ŽELJEZNIČKI NBP ISPITNI POLIGON (NBP – nova prijevozna tehnika Paderborn)

M. Sc. Bo Yang, Prof. Dr. -Ing. Horst Grotstollen
University of Paderborn, Institute of Power Electronics and Electrical Drives, FB 14/250
Warburger Str. 100, 33098 Paderborn, Germany
Email: {yang, grotstollenć@lea.upb.de http://wwwlea.upb.de

Na sveučilištu Paderborn razvijen je novi mehatronički vučni pogon za željeznički transport. Vučni pogon je realiziran s linearnim motorom s dvostruko napajanim statorom, pri čemu se koristi postojeći mehanički sustav kotača s tračnicama. Statorski dio linearnog motora je postavljen između tračnica a rotorski ispod pomičnih vučnih kola. Modeliranje, proračun i analiza mehatroničkog vučnog pogona načinjeni su na prototipnom modelu u razmjeri 1:2,5.
(Sl. 5, Tab. 1, Lit. 6 – original na engleskom) *Autori*

električni strojevi
linearni pogoni
modeliranje

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Stručni članak

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UPRAVLJANJE STRUJOM TROFAZNIH PARALELNO SPOJENIH AKTIVNIH FILTARA S ČETIRI VODIČA

Antonio Dell'Aquila, Professor; Agostino Lecci, PhD student
Dipartimento di Elettrotecnica ed Elettronica, Politecnico di Bari, Via E. Orabona 4, 70125 Bari, Italy
Phone: +39-080-5963.366/433, Fax: +39-080-5963.410
dellaqui@poliba.it lecci@ieee.org http://dee.poliba.it

Opisan je aktivni filtar za kompenzaciju harmonijskog izobličenja, struje nultog sustava i jalove snage u trofaznim sustavima s četiri vodiča.
Pozornost je usmjerena na upravljanje strujom da se postigne optimalno slijeđenje struje s pomoću konstantne frekvencije pobudnog signala. Djelotvornost predloženog upravljanja ispitana je simulacijom, gdje su harmonijsko zagađenje i neravnoteža, uzrokovani jakom distorzijom tereta, drastično reducirani.
(Sl. 11, Tab. 2, Lit. 18 – original na engleskom) *Autori*

aktivni filtri
neizrazita logika
harmonici
kvaliteta snage

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Prethodno priopćenje

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O EMISIJI BUKE IZ IZMJENIČNIH POGONA UPRAVLJANIH PULSNO-ŠIRINSKOM MODULACIJOM

Dr. Eng. Stefan Laurentiu Capitaneanu
STIE (Schneider Toshiba Inverter Europe); 33, rue André Blanchet, 27120 Pacy sur Eure, France
Tel.: +33 232781947, Fax: +33 232781889
Prof. Dr. Eng. Bernard de Fornel, Prof. Dr. Eng. Maurice Fadel
LEEI (Laboratoire d'Electrotechnique et d'Electronique Industrielle UMR ENSEEIHT/CNRS)
2, rue Camichel, B.P. 7122, 31071 Toulouse Cedex 7, France
Tel.: +33 561588255, Tel.: +33 561588336, Fax: +33 561638875
Dr. Eng. Fabrice Jadot
STIE (Schneider Toshiba Inverter Europe); 33, rue André Blanchet, 27120 Pacy sur Eure, France
Tel.: +33 232781495, Fax: +33 232781889

U radu se izlaže eksperimentalna analiza buke emitirane iz izmjeničnih pogona upravljanih različitim postupcima pulsno-širinske modulacije (PWM). Nakon izlaganja utjecaja izbora PWM postupka na stupanj redukcije buke, uspoređeni su i interpretirani mjerni rezultati. Uzeto je u obzir pet kriterija: tip motora, snaga motora, brzina vrtnje, sklopna frekvencija i tip PWM postupka.
(Sl. 19, Lit. 10 – original na engleskom) *Autori*

akustička i elektromagnetska buka
strategije modulacije
izmjenični strojevi
pogoni s promjenljivom brzinom vrtnje

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ANALIZA SATELITSKOG PROPAGACIJSKOG KANALA S POMOĆU »RAY-TRACING« SIMULACIJE

Mr. Sc. Zoran Blažević; Dr. Sc. Igor Zanchi, Red. Prof.; Mr. Sc. Ivan Marinović
University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture
Split, Ruđera Boškovića bb, 21000 Split, Croatia

U članku je opisana analiza satelitskog propagacijskog kanala s pomoću metoda potvrđenih u znanstvenoj literaturi kao što su: »ray-tracing«, jedinstvena geometrijska teorija ogiba i Fourierova transformacija. Ti su postupci lako programabilni te stoga mogu poslužiti kao osnova analitičke programske podrške za razne radio kanale. Da bi oslikali njihove mogućnosti, odabran je primjer radio kanala Low-Earth Orbit satelita za različite kutove elevacije (ozračeno ili područje sjene) koji emitira na prijenosnoj frekvenciji 1625 MHz. U skladu s tim, prikazani su i analizirani dijagrami impulsnog odziva i Dopplerovi spektri. Može se zaključiti da se opisana simulacija može uspješno primijeniti pri analizi višestaznih radio kanala, posebno u slučajevima kada je potrebno odrediti temeljne parametre radio kanala poput koherentne širine pojasa ili koherentnog vremena.

(Sl. 6, Lit. 12 – original na engleskom)

Autori

satelitski propagacijski kanal
»ray-tracing«
jedinstvena geometrijska teorija ogiba
impulsni odziv
Dopplerov spektar

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ODREĐIVANJE POROZNOSTI PRIMJENOM STOHASTIČKE METODE

Assoc. Prof. Dr. Vojko Matko
University of Maribor, Faculty of Electrical Engineering and Computer Science
Smetanova 17, 2000 Maribor, Slovenia
phone: +386-02-220-7111, E-mail: vojko.matko@uni-mb.si

Razvijena je metoda za mjerenje poroznosti malih čvrstih uzoraka tla (približne mase od 1 g) s pomoću kapacitivno osjetljivog kristala. U radu je opisano novorazvijeni senzor i osjetljivost probe (ovisnost promjene frekvencije o volumenu). U nastavku je prikazana nova ideja pobude cijelog senzora stohastičkim ispitnim signalima kao nova metoda mjerenja poroznosti. Ona uključuje utjecaj ispitnog signala na težinsku funkciju mjerne nesigurnosti. Prikazani su eksperimentalni rezultati mjerenja poroznosti vulkanskih stijena. Kod mjerenja poroznosti dobivena je mjerna nesigurnost manja od 0,1 % u temperaturnom području od 10 do 30 C.

(Sl. 9, Lit. 33 – original na engleskom)

Autor

poroznost
vulkanska stijena
kapacitivno osjetljivi kristal
stohastička metoda

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Izvorni znanstveni članak

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KLIZNI REŽIMI U DISKRETNIM SUSTAVIMA UPRAVLJANJA

Prof. Dr. Asif Šabanović, Professor
Sabanci University, Faculty of Engineering and Natural Sciences, 34956 Istanbul-Tuzla, Turkey
Tel +90 216 483 9502, Fax +90 216 483 9550, e-mail: asif@sabanciuniv.edu
Dr. Nadira Šabanović
Sabanci University, Faculty of Engineering and Natural Sciences, 34956 Istanbul-Tuzla, Turkey
Tel +90 216 483 9542, Fax +90 216 483 9550, e-mail: nadira@sabanciuniv.edu
Karel Jezernik, Professor
University of Maribor – FERI, Maribor, Slovenia
Tel +386 2 220 7500, e-mail: karel.jezernik@uni-mb.si

Primjena algoritama kliznih režima rada, koji spadaju u grupu algoritama s promjenljivom strukturom upravljanja, može u diskretnim sustavima upravljanja rezultirati neželjenim oscilacijama regulirane varijable. U svrhu spriječavanja ovih oscilacija u radu je predložen jedan novi pristup u sustavu upravljanja s kliznim režimom rada. Predloženim postupkom eliminira se računanje ekvivalentnog upravljanja, smanjuje utjecaj neodređenosti sustava i značajno smanjuju oscilacije izlazne regulirane varijable. Postupak je jednako primjenljiv na linearne i na nelinearne sustave. On omogućuje sintezu sustava bez transformacije u diskretnu formu (z-područje). Gornja granica vrijednosti vremena uzorkovanja određena je iz zahtjeva za ograničenjem promjene funkcije klizanja unutar vremena intervala uzorkovanja. Analiziran je sustav s estimatorom stanja. Kao pokazatelj kvalitete predloženog algoritma prikazani su simulacijski i eksperimentalni rezultati ispitivanja.

(Sl. 9, Lit. 16 – original na engleskom)

Autori

vremenski diskretni sustav, linearni sustav
sinteza po Ljapunovu,
klizni režim, sustavi s promjenljivom strukturom

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Original scientific paper

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POROSITY DETERMINATION BY USING STOCHASTICS METHOD

Assoc. Prof. Dr. Vojko Matko
University of Maribor, Faculty of Electrical Engineering and Computer Science
Smetanova 17, 2000 Maribor, Slovenia
phone: +386-02-220-7111, E-mail: vojko.matko@uni-mb.si

In response to a need for a more accurate porosity measuring method for small solid samples (approximately 1 g in mass) the porosity measurement sensor using the sensitive capacitive-dependent crystal was developed. This paper presents the new sensor and the probe sensitivity (dependence of df on the volume). In addition, the new idea of excitation of the entire sensor with stochastic test signals is described, and the porosity measuring method is provided. The latter includes the influence of test signals on the weighting function uncertainty. The experimental results of the porosity determination in volcanic rock samples are presented. The uncertainty of the porosity measurement is less than 0.1 % (Temp = 10–30 C).

(Fig. 9, Ref. 33 – original in english)

Author

porosity
volcanic rock
capacitive-dependent crystal
stochastics method

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IFAC IA 5.8.3
Preliminary communication

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SATELLITE PROPAGATION CHANNEL ANALYSIS VIA RAY-TRACING SIMULATION

Mr. Sc. Zoran Blažević; Dr. Sc. Igor Zanchi, Red. Prof.; Mr. Sc. Ivan Marinović
University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture
Split, Ruđera Boškovića bb, 21000 Split, Croatia

The paper deals with a satellite propagation channel analysis via powerful methods such as ray-tracing, uniform geometrical theory of diffraction and Fourier Transform, already confirmed in various scientific literature. These procedures are easily programmable, and thus can be used as basis for analysing software of various radio channels. In order to present theirs suitability, an example of radio channel of Low-Earth Orbit satellite that emits at central frequency 1625 MHz at various elevation angles (illuminated and shadow zone) is exploited. Accordingly, the diagrams of impulse response and Doppler power spectra are shown and commented. It can be concluded that presented simulation can be successfully applied for multipath radio channel analysis, especially when fundamental channel parameters such as coherence bandwidth or coherence time are to be determined.

(Fig. 6, Ref. 12 – original in english)

Authors

satellite propagation channel
ray-tracing
uniform geometrical theory of diffraction
impulse response
Doppler spectrum

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SLIDING MODES IN SAMPLED-DATA SYSTEMS

Prof. Dr. Asif Šabanović, Professor
Sabanci University, Faculty of Engineering and Natural Sciences, 34956 Istanbul-Tuzla, Turkey
Tel +90 216 483 9502, Fax +90 216 483 9550, e-mail: asif@sabanciuniv.edu
Dr. Nadira Šabanović
Sabanci University, Faculty of Engineering and Natural Sciences, 34956 Istanbul-Tuzla, Turkey
Tel +90 216 483 9542, Fax +90 216 483 9550, e-mail: nadira@sabanciuniv.edu
Karel Jezernik, Professor
University of Maribor – FERI, Maribor, Slovenia
Tel +386 2 220 7500, e-mail: karel.jezernik@uni-mb.si

The sliding mode application in discrete-time systems can result in unwanted oscillations of the controlled variable (so called chattering). To avoid above-mentioned oscillations a new approach in the design of sliding mode control is proposed in this paper. In the proposed approach the calculation of the equivalent control is not necessary while the influence of the system uncertainty and chattering are reduced. The proposed method is applicable to linear as well as nonlinear systems. It allows the design of the control without transformation of the system description to the discrete-time form (z-domain). Upper bound of the sapling time is determined from the switching function changes during the sampling period. The systems with state observers are analyzed. Experimental and simulation results are presented to clarify the design procedure and the features of the proposed algorithm.

(Fig. 9, Ref. 16 – original in english)

Authors

discrete-time systems, linear systems
Liapunov design, nonlinear systems
sliding mode, variable structure systems

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APPLICATION, CALCULATION AND ANALYSIS OF DOUBLY FED LONG STATOR LINEAR MOTOR FOR NBP TEST TRACK

M. Sc. Bo Yang, Prof. Dr. -Ing. Horst Grotstollen
University of Paderborn, Institute of Power Electronics and Electrical Drives, FB 14/250
Warburger Str. 100, 33098 Paderborn, Germany
Email: {yang, grotstollen}@lea.upb.de http://wwwlea.upb.de

At the University of Paderborn a novel mechatronic railway system is developed, whose shuttles are guided by ordinary wheels and rails and driven by a doubly fed linear motor automatically. The primary (stator) is installed between the rails, and the secondary (rotor) fixed below the undercarriage. In this paper the modeling, calculation and analysis of a prototype of such a linear motor on a scale 1:2.5 are described in detail.

(Fig. 5, Tab. 1, Ref. 6 – original in english)

Authors

electrical machines
linear drives
modeling

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FUZZY ADAPTIVE CONTROL OF AN INDUCTION MOTOR DRIVE

Mohamed Rachid Chekkouri, PhD Student, e-mail: chekkour@eel.upc.es
Dr. Jordi Catal i L pez, Product Engineer, Control Techniques Iberia SA, e-mail: catala@eel.upc.es;
Dr. Emiliano Aldabas Rubira, Lecturer, e-mail: aldabas@eel.upc.es
Dr. Luis Romeral Martínez, Senior Lecturer, e-mail: Romeral@eel.upc.es;
Electronic Engineering Department, Technical University of Catalonia, Campus Terrassa, TR2. C/Colom, no. 1, 08222. Terrassa, Catalonia, Spain, Phone number: +34 93 739 8194 Fax number: +34 93 739 8016

Industrial applications increasingly require electric drives with good position command tracking and load regulation responses. These conditions can only be achieved by adaptive-type control because of the loading conditions, inertias and system parameters all change during the motion.
For this paper an Adaptive Speed Controller for AC drives with a very low computational algorithm was developed. The authors propose self-tuning control based on a supervisory fuzzy adaptation. The supervisor continuously monitors the status of the system and changes the K_i parameter of a standard PDF controller to adapt it to the plant's evolution.
The fuzzy logic adaptive strategy was readily implemented and showed very fast learning features and very good tracking and regulation characteristics. The stability of the controller developed was also analysed, and experimental results demonstrated the robustness of the suggested algorithm in contending with varying load and torque disturbance.

(Fig. 14, Tab. 1, Ref. 10 – original in english)

Authors

adaptive control, adjustable speed drives
fuzzy logic, motion control, variable speed drives

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ON THE ACOUSTIC NOISE RADIATED BY PWM AC MOTOR DRIVES

Dr. Eng. Stefan Laurentiu Capitaneanu
STIE (Schneider Toshiba Inverter Europe); 33, rue André Blanchet, 27120 Pacy sur Eure, France
Tel.: +33 232781947, Fax: +33 232781889
Prof. Dr. Eng. Bernard de Fornel, Prof. Dr. Eng. Maurice Fadel
LEEI (Laboratoire d'Electrotechnique et d'Electronique Industrielle UMR ENSEEIHT/CNRS)
2, rue Camichel, B.P. 7122, 31071 Toulouse Cedex 7, France
Tel.: +33 561588255, Tel.: +33 561588336, Fax: +33 561638875
Dr. Eng. Fabrice Jadot
STIE (Schneider Toshiba Inverter Europe); 33, rue André Blanchet, 27120 Pacy sur Eure, France
Tel.: +33 232781495, Fax: +33 232781889

The paper presents and analyses the experimental acoustic noise of AC motors controlled by drives using different PWM techniques. After a discussion upon PWM methods concerning noise reduction, measure based comparisons are interpreted. Five criteria are taken into account: motor type, motor power, rotor speed, switching frequency and PWM method.

(Fig. 19, Ref. 10 – original in english)

Authors

noise acoustical and electromagnetic
modulation strategies
AC machines
variable speed drives

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Professional paper

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A CURRENT CONTROL FOR THREE-PHASE FOUR-WIRE SHUNT ACTIVE FILTERS

Antonio Dell'Aquila, Professor; Agostino Lecci, PhD student
Dipartimento di Elettrotecnica ed Elettronica, Politecnico di Bari, Via E. Orabona 4, 70125 Bari, Italy
Phone: +39-080-5963.366/433, Fax: +39-080-5963.410
dellaqui@poliba.it lecci@ieee.org http://dee.poliba.it

An active filter has been proposed to compensate for harmonic distortion, line neutral current and reactive power in three-phase four-wire systems.
The focus is concentrated on current control in order to achieve optimum current tracking by means of fixed frequency driving signals. The effectiveness of proposed control was proved in simulations where the harmonic pollution and imbalance caused by a highly distorting load have been drastically reduced.

(Fig. 11, Tab. 2, Ref. 18 – original in english)

Authors

active filters
fuzzy logic
harmonics
power quality

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