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AKTIVNI SUSTAVI ZA ZAŠTITU OD BUKE U CIJEVIMA

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Uz dani prikaz razvoja aktivne zaštite od buke, analizirani su elementi sustava aktivne zaštite od buke u cijevima, a na temelju te analize napravljen je model elemenata. Posebno je provedena analiza zvučnika te je napravljen model zvučnika u z-domeni, prikladan za analizu sustava koji imaju analogne i digitalne dijelove. Primjenom takvog modela možemo u vremenskoj domeni analizirati rad i konvergenciju pojedinih adaptivnih algoritama obrade signala. Kao primjer provedena je analiza rada sustava aktivne zaštite na pojednostavljenom modelu ventilacijskog kanala primjenom FXLMS algoritma, te je pokazan jak utjecaj prijenosne karakteristike zvučnika na spektar snage zvučnog signala preostale buke.

(Sl. 12, Tabl. 2, Lit. 25 – original na engleskom)

Autori

adaptivni filtri
aktivna zaštita od buke
elektroakustički pretvornici
ventilacijski kanali
zvučnici

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Pregledni članak

AUTOMATIKA 42(1–2),13–22(2001)

EVOLUCIJSKI ALGORITMI (I) – POBUDE I NAČELA

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U tekstu je sažeto prikazan povijesni razvoj i osnovna zamisao primjene mehanizma prirodne evolucije pri optimiranju, učenju i modeliranju. Usporedo su objašnjeni glavni pojmovi i postupci prirodne i formalno predočene evolucije poznate pod skupnim imenom evolucijski algoritmi (skraćeno EA). Navedena je podjela inteligentnih algoritama u koje spadaju i EA, te navedene njihove značajke, prednosti i područja primjene. Jednostavnim primjerom ilustrirana je praktična predodžba pojmova i postupci EA.

(Sl. 4, Tabl. 1, Lit. 35 – original na hrvatskom)

Autor

evolucija
evolucijski algoritmi
fenotip
genotip
izbor
jedinka
optimiranje
populacija
primjerenost

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KOMPENZACIJA TRENJA U MIKROSUSTAVIMA UPRAVLJANJA NA DALJINU

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Opisana je izvedba mikrosustava za rad na daljinu koji omogućava bez stresa obavljanje mikroradnji, kao što su montaža i proizvodnja. Prikazano je haptičko sučelje kojim se oponaša dodir uvećanog mikroobjekta prstima rukovatelja. Također je opisan koncept sustava i simulator sustava.
Istraživanje izloženo u ovome radu, osim što može uvesti daljinsko upravljanje na mikro razini u mnogim granama industrije, otvara i mogućnosti primjene za štednju resursa, energije i troškova.

(Sl. 7, Lit. 8 – original na engleskom)

Autori

upravljanje na daljinu, haptičko sučelje
paralelna veza, serijska veza
bilateralnost, mikrorad
mreža, simulator

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VEKTORSKI UPRAVLJANI ELEKTROMOTORNI POGONI S RELUKTANTNIM SINKRONIM MOTORIMA UZ DEFINIRANU DINAMIKU ZATVORENOG KRUGA BRZINE VRTNJE

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Prikazana je nova koncepcija sustava upravljanja brzinom vrtnje elektromotornog pogona s reluktantnim sinkronim motorima, temeljena na dvijema metodama upravljanja. Konvencionalna vektorska metoda nadograđena je elementom sustava koji predstavlja dinamiku zatvorenog kruga po brzini vrtnje. Budući da je dinamika zatvorenog sustava prikazana proporcionalnim članom prvog reda, čiji pol odabire korisnik, predložena koncepcija može biti šire primjenjiva. Da bi se poboljšala robusnost sustava, dodana je vanjska petlja upravljanja zasnovana na adaptivnom upravljanju s referentnim modelom. Simulacijski rezultati prikazani u radu potvrđuju valjanost predložene koncepcije.

(Sl. 6, Lit. 9 – original na engleskom)

Autori

linearizacija
adaptivno upravljanje s referentnim modelom
nelinearni sustav upravljanja
estimator
reluktantni sinkroni motor
klizni režimi

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Review

AUTOMATIKA 42(1–2),13–22(2001)

EVOLUTIONARY ALGORITHMS (I) – INSPIRATIONS AND PRINCIPLES

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Text shortly presents the basic idea and historical development of application of a natural evolution mechanism for optimizing, learning and modeling. The main concepts and methods of natural and formal representation of evolution known under the common name »evolution algorithms« (EA for short) are explained side by side. Types of intelligent algorithms including EA are mentioned and its characteristics, advantages and fields of application are given. Simple examples illustrate the practical representation of EA notions and methods.
(Fig. 4, Tab. 1, Ref. 35 – original in Croatian) *Author*

evolution
evolutionary algorithms
evolutionary computing
fitness
genotype
individual
optimization
phenotype
population
selection

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Originaln scientific paper

AUTOMATIKA 42(1–2),5–12(2001)

ACTIVE NOISE CONTROL IN DUCTS

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After reviewing the development of active noise control principles, we analyzed the elements of the active noise control system in ducts. On the basis of this analysis, we created a model of these elements. Especially, we brought a model of the loudspeaker in the *z*-domain, suitable for description of systems containing analog and digital parts. Such model enabled us to analyze work and convergence of the adaptive signal processing algorithms applied to active noise control. As an example, we analyzed performance of FXLMS algorithm on simplified model of active noise control system in ventilation duct, and have shown a strong influence of the loudspeaker's transfer function on the power spectrum of the error signal.
(Fig. 12, Tab. 2, Ref. 25 – original in English) *Authors*

active noise control
adaptive filters
electroacoustical transducers
loudspeakers
ventilation ducts

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AUTOMATIKA 42(1–2),29–36(2001)

VECTOR-CONTROLLED RELUCTANCE SYNCHRONOUS MOTOR DRIVES WITH PRESCRIBED CLOSED-LOOP SPEED DYNAMICS

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A new speed control system for electric drives employing reluctance synchronous motors is presented. Design control system combines two control methods. Conventional vector control method is here completed with forced dynamics closed-loop control. Since the closed-loop system response is a first order lag whose pole location can be chosen by the user, the drive may be included as an actuator in a larger scale control scheme to which linear control system design methods can be applied. To improve robustness of the design control structure, the outer control loop based on model reference adaptive control is added. Simulation results presented show good correspondence with theoretical predictions and MRAC outer control loop improves overall drive performances.
(Fig. 6, Ref. 9 – original in English) *Authors*

linearisation
model reference adaptive control
non-linear system control
observers
reluctance synchronous motor
sliding-mode control

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FRICTION COMPENSATION FOR MICRO TELE-OPERATION SYSTEMS

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In this project, we construct micro tele-operation systems which enable human operators to performe micro tasks, such as assembly or manufacturing, without feeling a stress. We introduce haptic interfaces that give operators the impression as if he/she were touching the expanded micro objects with his/her fingers. We construct simulator systems modeled on remote environment. In this paper we give an outline and concept of this project.
This research project can not only extend bilateral tele-operation to many other industries, it can also extend this human-friendly technique and thus help realize savings in resources, energy, costs and human support.
(Fig. 7, Ref. 8 – original in English) *Authors*

tele-operation, haptic interfaces
parallel link, serial link
master-slave, bilateral
micro works, network
simulator, scaling

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KASKADNO UPRAVLJANJE PARALELNO SPOJENIM IZMJENJIVAČIMA ZASNOVANO NA KLIZNIM REŽIMIMA

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U ovom se članku opisuje postupak projektiranja sustava upravljanja modularnim izmjenjivačkim sustavom sačinjenim od N paralelno spojenih izmjenjivača. Sustav upravljanja osigurava regulaciju izlaznog izmjeničnog napona i ravnomjerno strujno opterećenje svih izmjenivača, što se postiže pomoću skupa kliznih površina i odgovarajućeg upravljanja koje osigurava gibanje sustava po njima. Postupak projektiranja sustava upravljanja dodatno je pojednostavljen postavljanjem skupa ograničenja u vidu ograničenja parametara invertera te ograničenja amplitude i frekvencije izlaznog napona. Funkcionalnost sustava upravljanja ilustrirana je simulacijskim i eksperimentalnim rezultatima dobivenim uz otporno i nelinearno opterećenje izmjenivačkog sustava.

(Sl. 12, Lit. 12 – original na engleskom) *Autori*

izmjenjivač, kaskadno upravljanje
paralelni moduli, klizni režimi

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Prethodno priopćenje

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VISOKOFREKVENCIJSKI INTERFERENCIJSKI SIGNALI GENERIRANI U SUSTAVIMA S PWM IZMJENJIVAČIMA, DUGAČKIM KABELIMA I ASINKRONIM MOTORIMA

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Pri radu asinkronih izmjeničnih motora napajanih iz statičkih izmjenivača pojavljuju se visokofrekvencijski interferencijski signali koji su posljedica parazitnih struja između faza i parazitnih struja prema zajedničkoj točki. Ovi interferencijski signali mogu nepoželjno utjecati na rad obližnjih telekomunikacijskih i signalnih kabela i raznih elektroničkih uređaja. Ove se pojave u članku analiziraju teoretskim razmatranjima, koja su potkrijepljena eksperimentalnim rezultatima specijalnih mjerenja smetnji izazvanih parazitnim strujama. Evaluirane su uglavnom frekvencijske karakteristike odabranih dijelova sustava i njihov doprinos ukupnom harmonijskom spektru.

(Sl. 15, Lit. 4 – original na engleskom) *Autori*

struje zajedničkog spoja
diferencijalne parazitne struje
visokofrekvencijski interferencijski signali
asinkroni motori
parazitne pojave

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KOREKCIJA FAKTORA FAZNOG POMAKA TROFAZNOG TRORAZINSKOG UZLAZNOG ISPRAVLJAČA ZASNOVANOG NA PWM-U

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U radu je razvijen PWM algoritam za upravljanje matrično-strukturiranim trofaznim trorazinskim ispravljačem. Takav način upravljanja uzet je radi mogućnosti korekcije faktora pomaka ($\cos\varphi$) na jediničnu vrijednost. Veza između prekidačkih funkcija i zahtjeva na impulsno-širinski modulator jasno opisuje sva ograničenja modulacijskog algoritma. Razvijeni modulacijski algoritam omogućuje korekciju faktora pomaka bez mjerenja ulazne struje pretvarača. Za potrebe te korekcije dovoljno je samo mjerenje faznog kuta između napona i struje na ulazu ispravljača.

(Sl. 7, Tabl. 2, Lit. 7 – original na engleskom) *Autori*

matrični pretvarač
ispravljač
prekidačka funkcija
impulsno-širinska modulacija
faktor pomaka – $\cos\varphi$

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LIMITERI UZBUDE MALIH SINKRONIH GENERATORA

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Mali sinkroni generatori pri radu u elektroenergetskom sustavu slijede promjene napona sustava. Limitiranje uzbudne struje generatora omogućava rad generatora unutar granica pogonske karte te povećava sigurnost i raspoloživost generatora u sustavu. Ovaj članak sadrži algoritme za određivanje limita maksimalne i minimalne uzbudne struje te za implementaciju u digitalnom sustavu regulacije napona generatora. Ponašanje limitera uzbudne struje generatora eksperimentalno je potvrđeno na laboratorijskom modelu.

(Sl. 9, Lit. 6 – original na engleskom) *Autori*

uzbudni sustav sinkronog generatora
limiter maksimalne uzbude
limiter minimalne uzbude

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Preliminary communication

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HIGH-FREQUENCY INTERFERENCES PRODUCED IN SYSTEMS CONSISTING OF PWM INVERTER, LONG CABLE AND INDUCTION MOTOR

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The operation of inverter-fed asynchronous motor drives is inherently accompanied by high-frequency interferences caused particularly by parasitic currents of the common and differential modes. These emissions propagated by conduction and radiation may unfavourably affect the operation of nearby telecommunication and signal cables and various low-current devices. The paper deals with an analysis of these phenomena based on theoretical considerations and results of special measurements of the common and differential mode disturbances. Evaluated are mainly the frequency characteristics of selected parts of the system and their contributions to the resultant harmonic spectra.

(Fig. 15, Ref. 4 – original in English) *Authors*

common mode currents
differential mode currents
high-frequency interferences
induction motor
parasitic phenomena

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MASTER-SLAVE SLIDING-MODE CONTROL DESIGN IN PARALLEL-CONNECTED INVERTERS

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This work presents the design of a master-slave sliding-mode control scheme for a modular inverter system composed of N parallel-connected Buck-based single inverters. AC output voltage regulation and balanced current-sharing among the single inverters is achieved by means of a set of switching surfaces and the corresponding sliding control laws. On the other hand, a set of design restrictions is established in terms of inverter parameters and AC output signal amplitude and frequency, this facilitating the subsequent design procedure. Simulation and experimental results for both resistive and nonlinear loads are provided to illustrate the application of the method.

(Fig. 12, Ref. 12 – original in English) *Authors*

buck inverter, master-slave
parallel modules, sliding-mode control

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EXCITATION LIMITERS FOR SMALL SYNCHRONOUS GENERATORS

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Small synchronous generators connected to electrical power system operate by following changes in the system voltage. Limiting of the generator excitation current enables generator operation within limits of the power chart diagram and increases the safety and availability of generator in the system. This paper includes algorithms for the determination of maximum and minimum excitation current limits and the implementation within digital control system of generator voltage. The performance of generator excitation current limits was experimentally verified on a laboratory model.

(Fig. 9, Ref. 6 – original in English) *Authors*

synchronous generator excitation system
maximum excitation limiters
minimum excitation limiters

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INPUT DISPLACEMENT FACTOR CORRECTION FOR THREE-PHASE THREE-LEVEL AC TO DC PWM-BASED BOOST RECTIFIER

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Pulse width modulation (PWM) strategy for a matrix structured three-phase three-level AC to DC boost rectifier is developed. Such approach has been used on purpose to control the input displacement power factor close to unity. The connection between matrix switching function and PWM requirement very well describes all restrictions that occur in the modulation algorithm. This modulation algorithm enables the input displacement factor correction without an input current sensor. The only necessary control variable is the measured displacement angle between input voltage and input current.

(Fig. 7, Tab. 2, Ref. 7 – original in English) *Authors*

matrix converter
ac-dc converter
switching function
pulse width modulation
input displacement factor

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ELEKTROTOPLINSKO MODELIRANJE I SIMULACIJA UČINSKOG MOSFET-A

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Za postizanje što bolje optimizacije sklopova i sustava energetske elektronike danas se zahtijeva elektrotoplinska simulacija učinskih poluvodičkih sklopki. Za to su potrebni točni, no ne i presloženi elektrotoplinski modeli učinskih poluvodičkih sklopki, pogodni za primjenu u tržišno dostupnim simulatorima sklopova energetske elektronike. U članku je prikazana IsSpice realizacija elektrotoplinskog modela učinskog MOSFET-a. Model se sastoji od električnog i toplinskog dijela koji međusobno izmjenjuju vrijednost varijabli. Elektrotoplinski model ispitan je mjerenjem na stvarnom sklopu.

(Sl. 7, Lit. 10 – original na engleskom) *Autori*

elektrotoplinska simulacija
modeliranje
učinski MOSFET

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ELECTRO-THERMAL MODELLING AND SIMULATION OF A POWER-MOSFET

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Electro-thermal simulation of power electronic semiconductors is now required in accurate optimisation of power electronic circuits and systems. This requires accurate, but not too complex, electro-thermal models of power semiconductors to be used in commercially available power electronic circuit simulators. Realization of one such electro-thermal model for power MOSFET in IsSpice is described in the paper. Model consists of electrical and thermal part with interactive exchange of variables. Electro-thermal model was tested on real circuit example.

(Fig. 7, Ref. 10 – original in English) *Authors*

electro-thermal simulation
modelling
power MOSFET

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