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Izvorni znanstveni članak

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PRORAČUN STATIČKIH, KVAZISTATIČKIH I DINAMIČKIH KARAKTERISTIKA PREKIDAČKO-RELUKTANTNOG MOTORA

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Rad opisuje postupke proračuna statičkih karakteristika (ulančeni tok, magnetska koenergija i moment), kvazistatičkih karakteristika (brzina i moment) i dinamičkih karakteristika (brzina, struja i moment) prekidačko-reluktantnog motora. Raspodjela magnetskog vektor potencijala na poprečnom presjeku motora računata je metodom konačnih elemenata. Ulančeni tok, induktivnost, magnetska koenergija i statički moment računati su za različite pozicije rotora i struje statora. Kvazistatičke i dinamičke karakteristike su računate pomoću posebno razvijenih programa u programskim jezicima Fortran 77 i Matlab/Simulink. Svi proračuni provedeni su za prekidačko-reluktantni motor sa 8 polova statora i 6 polova rotora. Rezultati proračuna su potvrđeni eksperimentom.

(Sl. 26, Lit. 10 – original na engleskom)

Autori

prekidačko-reluktantni motor
karakteristike
modeliranje

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NEIZRAZITO ADAPTIVNO UPRAVLJANJE SILOM DODIRA SLIJEDNIH MEHANIZAMA S JEDNIM STUPNJEM SLOBODE GIBANJA

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Članak prikazuje upravljanje položajem/silom dodira slijednog mehanizma s jednim stupnjem slobode gibanja korištenjem neizrazitog adaptivnog sustava upravljanja silom. Predložena shema upravljanja silom dodira sadrži adaptivni neizraziti regulator sile i podređeni neizraziti regulator brzine vrtnje. Koristeći referentni model drugog reda, neizraziti na modelu zasnovani adaptacijski mehanizam u stanju je držati razliku između odziva modela i odziva sustava u zadanim granicama. Rezultati dobiveni numeričkim simulacijama pokazuju stabilno vladanje sustava upravljanja silom dodira za široki raspon varijacija krutosti okoline. Predložena metoda adaptivnog upravljanja silom se pokazala uspješnom i u slučaju dodira s neravnom površinom ili s radnim predmetom složena oblika.

(Sl. 24, Tab. 1, Lit. 25 – original na engleskom)

Autori

upravljanje položajem/silom
neizraziti algoritmi upravljanja
adaptivno upravljanje

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PLANIRANJE GIBANJA ROBOTA METODOM OGRANIČENOG PROSTORA

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Planiranje gibanja robota u višedimenzijskom prostoru zahtijeva veliki model i traje predugo, te stoga nije pogodno za procese u realnom vremenu. Metoda ograničenog prostora (LSM), korištena u ovom radu, umjesto da traži optimalnu putanju gibanja (u matematičkom smislu), istražuje 3D realni fizički prostor (dvije translacije i jedna rotacija) i pronalazi logičnu putanju robota (logičnu u smislu čovjekovog rješenja istog problema). Njezina osnovna prednost je mali model i brzo rješenje. Iako metoda ograničenog prostora nije sveobuhvatna kao npr. metoda konfiguracijskog prostora, ona pokazuje dobru primjenjivost za inženjerske potrebe.

(Sl. 9, Lit. 13 – original na engleskom)

Autori

detekcija sudara
planiranje gibanja
izbjegavanje prepreka
metoda ograničenog prostora

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FOTONSKO-MIKROVALNA KONVERZIJA U POLUVODIČIMA KONTROLOM VALA NOSIOCA U OPTIČKOM PODRUČJU

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Proučavana je dinamika ultrabrzog nosioca u optički pobuđenim poluvodičima promatranjem generiranja zraka u THz području. Razvijen je sustav za generiranje THz zrake pumpe i probe s temperaturnom kontrolom varijabilnim uzorkom. Sustav je korišten za ispitivanje procesa raspršenja ultrabrzog nosioca. Rezultati ukazuju na činjenicu da je generiranje THz zraka, a posebno metoda pumpe i probe, snažan alat za proučavanje ultrabrzih pojava. Predložen je novi model za objašnjenje dinamike ultrabrzog nosioca, upravo nakon upada fotona GaAs dobiven pomoću niskotemperaturnog procesa. Model sadrži proces raspršenja među energetskim pojasevima.

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

Autor

femtosekundni laser
zračenje u terahercnom području
dinamika ultrabrzih nosilaca
GaAs dobiven pomoću niskotemperaturnog procesa
emisija vala pumpe i probe u terahercnom području

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Pregledni članak

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RAZVOJ ANTENSKIH NIZOVA NA NAPUHAVANJE

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Antenski su nizovi na napuhavanje razvijeni da bi se značajno smanjila masa, zapremina skladišnog prostora i cijena budućih svemirskih letjelica. Tri su nova antenska sustava na napuhavanje razvijena za primjenu na svemirskim letjelicama: antenski niz izmjera 3,3 m × 1,0 m za radar sa sintetičkom antenom (SAR) u području frekvencija L, refleksijski niz promjera 1 m u frekvencijskom području X za telekomunikacijske primjene i refleksijski niz promjera 3 m u frekvencijskom području Ka, također za telekomunikacijske primjene. Sve su tri antene slične po izvedbi. Sve se tri sastoje od cjevaste strukture koja se napuhava te podržava i napinje višeslojnu tanku zračeću površinu s mikrotrakastim antenama. Ove su antene pokazale da su antenski nizovi na napuhavanje primjenjivi u cijelom mikrovalnom i milimetarskom valnom području. Smatra se da je potrebno daljnje unapređenje ovih antena posebno u području prilagodbe primjeni u svemirskim uvjetima.

(Sl. 9, Lit. 7 – original na engleskom) *Autor*

antene
strukture na napuhavanje
planarni nizovi
refleksijski nizovi
svemirska letjelica

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NIZOVI AKTIVNIH ANTENA S TRANSFORMATOROM IMPEDANCIJE I TRANZISTORSKIM OSCILATOROM SPREGNUTI U RAVNINAMA E I H

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Mikrotrakasta *patch* antena unutar koje je ugrađen tranzistorski oscilator i linijski transformator impedancije osnovni je element antenskih nizova za prostorno slaganje snage koji su prikazani u ovom radu. Projektirani su i pokusima ispitani antenski nizovi od dva elementa. Elementi su jednom spregnuti u ravnini E, a drugi puta u ravnini H. Udaljenost između elemenata antenskih nizova je optimizirana tako da bi se postigao željeni koeficijent sprege i međusobna sinkronizacija. Mjerenjima je utvrđena visoka razina zračene snage i iznimno dobra djelotvornost prostornog slaganja snage. Pokusima je potvrđen stabilan rad oba antenska niza i izmjeren je čist spektar. Prikazana je i mogućnost elektroničkog zakretanja glavnog snopa zračenja. Izmjereni su dijagrami zračenja osnovne i križne polarizacije za oba niza u slučaju zračenja okomito na os niza kao i u oba zakrenuta položaja glavnog snopa zračenja. Mjerenja su pokazala niske razine križne polarizacije.

(Sl. 9, Lit. 11 – original na engleskom) *Autori*

antena
aktivna antena
mikrotrakasta antena
antenski niz
prostorno slaganje snage
sinkronizacija

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SINTEZA NEUSMJERENE CILINDRIČNE MIKROTRAKASTE ANTENE S PARAZITSKIM REZONATOROM

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Prikazana je neusmjerena mikrotrakasta antena s parazitskim rezonatorom, izvedena na višeslojnoj cilindričnoj strukturi. Upotrijebljen je numerički simulator povezan s optimizacijskim algoritmom, kako bi se ostvarilo dobro prilagođenje i neusmjeren dijagram zračenja u azimutalnoj ravnini. Antena je izrađena, te su na njoj provedena mjerenja dobitka i dijagrama zračenja. Izmjereni dijagram zračenja ima valovitost od 4 dB, što pokazuje opravdanost rabljenja mikrotrakaste antene s parazitskim rezonatorom na višeslojnoj cilindričnoj strukturi za postizanje neusmjerenog dijagrama zračenja.

(Sl. 5, Tab. 2, Lit. 6 – original na engleskom) *Autori*

antene
metoda momenata
mikrotrakaste antene

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MULTIMEDIJSKI UDŽBENIK O TEORIJI I PRIMJENI ELEKTROMAGNETIZMA

Zbyněk Raida, Dušan Černohorský, Zbyněk Škvor, Zdeněk Nováček, Stanislav Goňa, Vlastimil Navrátil, Petr Poměnka, Tomáš Urbanec, Václav Michálek, Geert Vanderstegen, Bart Vandijck, Viktor Otevřel
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Podučavanje sveučilišnih kolegija koji se bave fenomenima elektromagnetizma prilično je zahtjevno zbog apstraktnosti gradiva koje se iznosi. Podučavanje stoga valja popratiti jasnim objašnjenjima i simulacijama koje ilustriraju teme koje se obrađuju. Upravo je zato priređen multimedijski udžbenik koji donosi teorijski opis elektromagnetskih fenomena i istodobno omogućava njihovo simuliranje.
Struktura udžbenika je dvodimenzionalna što omogućava njegovu primjenu na dodiplomskom i poslijediplomskom studiju korištenjem gotovih programa koji su dio udžbenika ili izradbom vlastitih programa od strane korisnika. Udžbenik je opremljen sustavom kazala s objašnjenjima, što olakšava korištenje i čitateljima koji ne poznaju područje.

(Sl. 3, Lit. 12 – original na engleskom) *Autori*

antena
elektromagnetizam
frekvencijski selektivne površine
mikrovalne prijenosne linije
multimedijski udžbenik
optoelektronika

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Original scientific paper

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E- AND H-PLANE COUPLED POWER COMBINING ARRAYS OF ACTIVE PATCHES WITH LINE TRANSFORMER AND TRANSISTOR OSCILLATOR

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A patch antenna integrated with a transistor oscillator and a line impedance transformer has been used as a building element for two-element power combining arrays. Arrays coupled in E and H planes have been theoretically and experimentally investigated. The inter-element distance in the arrays has been optimized to obtain in-phase operation and mutual injection locking. High EIRP and excellent power combining efficiency are measured. The measured spectra are clean and stable. Electronic beam scanning is demonstrated. The co-polarization and cross-polarization radiation patterns are measured for the case of broadside radiation and scanned positions of the main beam. The cross-polarization levels are low.

(Fig. 9, Ref. 11 – original in English)

Authors

antenna
active antenna
microstrip antenna
antenna array
spatial power combining
injection locking

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Review

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THE DEVELOPMENT OF INFLATABLE ARRAY ANTENNAS

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Inflatable array antennas are being developed to significantly reduce the mass, the launch vehicle's stowage volume, and the cost of future spacecraft systems. Three inflatable array antennas, recently developed for spacecraft applications, are a 3.3 m × 1.0 m L-band synthetic aperture radar (SAR) array, a 1.0 m-diameter X-band telecom reflectarray, and a 3 m-diameter Ka-band telecom reflectarray. All three antennas are similar in construction, and each consists of an inflatable tubular frame that supports and tensions a multi-layer thin-membrane radiating surface with printed microstrip patches. These antennas demonstrated that inflatable arrays are feasible across the microwave and millimeter-wave spectrums. Further developments of these antennas are deemed necessary, in particular, in the area of qualifying the inflatable structures for space-environment usage.

(Fig. 9, Ref. 7 – original in English)

Author

antennas
inflatable structure
planar arrays
reflectarray
spacecraft

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Professional paper

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A MULTIMEDIA TEXTBOOK OF EM THEORY AND TECHNIQUES

Zbyněk Raida, Dušan Černohorský, Zbyněk Škvor, Zdeněk Nováček, Stanislav Goňa, Vlastimil Navrátil, Petr Poměnka, Tomáš Urbanec, Václav Michálek, Geert Vanderstegen, Bart Vandijck, Viktor Otevřel
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Teaching university courses, which deal with the phenomena of electromagnetic nature and their application, is rather difficult due to their abstract nature. Therefore, the teaching has to be accompanied by clear explanation, and by simulation illustrating the examined topics. That is why a multimedia textbook was developed, which presents the theoretical description of electromagnetic phenomena, and at the same time, enables to simulate them.
The textbook is of a two-dimensional structure, which enables the book to be used by bachelor's students and master's ones for studying, by users of incorporated programs for guiding, and by programmers for developing their own applications. The textbook is completed by an explanatory indexing mechanism, which makes the book readable even for an inexperienced reader.

(Fig. 3, Ref. 12 – original in English)

Authors

antennas
electromagnetic phenomena
frequency selective surfaces
microwave transmission lines
multimedia textbook
optoelectronics

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SYNTHESIS OF OMNIDIRECTIONAL CIRCULAR CYLINDRICAL STACKED PATCH ANTENNA

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The stacked conformal omnidirectional patch antenna, manufactured on cylindrical multilayered structure is presented. In order to obtain good wideband matching as well as omnidirectional azimuthal radiation pattern, the numerical simulation is used in conjunction with optimization procedure. The antenna was built and its gain and radiation pattern were measured. These measurements, including the measured radiation pattern with 4 dB omnidirectionality approved the idea of applying stacked patch configuration for wideband operation of circular cylindrical patch antennas.

(Fig. 5, Tab. 2, Ref. 6 – original in English)

Authors

antennas
method of moments
microstrip antennas

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Preliminary communication

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FUZZY RULE-BASED ADAPTIVE FORCE CONTROL OF SINGLE DOF SERVO MECHANISMS

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The paper presents position/force control with a completely fuzzified adaptive force control system for the single degree of freedom servo mechanisms. The proposed force control scheme contains an adaptive fuzzy force controller and a subordinated fuzzy velocity controller. By using a second-order reference model, a model reference-based fuzzy adaptation mechanism is able to keep the error between the model and system output responses within desired limits. The results obtained by computer simulations indicate a stable performance of the force control system for a wide range of environment stiffness variations. The proposed adaptive force control method has also been effective in case of a contact with a rough surface or a complex form workpiece

(Fig. 24, Tab. 1, Ref. 25 – original in English)

Authors

force/position control
fuzzy logic control algorithms
adaptive control

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COMPUTATION OF STATIC, STEADY-STATE AND DYNAMIC CHARACTERISTICS OF THE SWITCHED RELUCTANCE MOTOR

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This paper gives on overview of the procedures of determination of static characteristics (flux linkage, magnetic coenergy and torque), steady state characteristics (current and torque) and dynamic characteristics (speed, current and torque) of switched reluctance motor. A two dimensional distribution of magnetic vector potential inside a motor is computed using finite element method. The flux linkage, magnetic coenergy and static torque are calculated for different rotor positions and stator currents. Steady-state and dynamic characteristics are calculated using specially developed software routines. All calculations are realized for switched reluctance motor with 8 stator and 6 rotor poles. Numerically obtained results are verified by experiment.

(Fig. 26, Ref. 10 – original in English)

Authors

switched reluctance motor
characteristics
modelling

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Original scientific paper

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PHOTON-MICROWAVE CONVERSION IN SEMICONDUCTORS BY OPTICAL CARRIER CONTROL

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The ultrafast carrier dynamics in the optically excited semiconductors is studied by observing the THz radiation. We developed the pump and probe THz beam generation system with variable sample temperature control, and employed it to examine the ultrafast carrier scattering processes. The results proved that the THz beam generation, especially pump and probe method, is a powerful tool to study the ultrafast phenomena. We propose the new model to explain the ultrafast carrier dynamics just after photon arrivals in low-temperature-grown GaAs, which includes the intervalley scattering process.

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

Author

femtosecons laser
terahertz radiation
ultrafast carrier dynamics
low-temperature-grown GaAs
pump and probe terahertz emission

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Preliminary communication

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ROBOT MOTION PLANNING BY LIMITED SPACE METHOD

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Robot motion planning in multidimensional space is very time-consuming and requires a big model; therefore, it is not very suitable for a real-time purpose. Limited space method (LSM) used here works with 3D real physical space (two translations and one rotation) and finds out a logical path (in the sense of the human solution faced with the same problem), rather than the optimal path (in the mathematical sense). Its main advantages are small model and short solution time. Although LSM is not as universal as the C-space, it has good potentiality for engineering applications.

(Fig. 9, Ref. 13 – original in English)

Authors

collision detection
motion planning
obstacle avoidance
limited space method

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