

akademikos niko musxel isvil is
120 wl isTavisadmi miZRvni i
andria razmaZis maTematikis institutis
samecni ero konferencia

2010 wl is 29 noemberi - 3 dekemberi

moxsenebaTa Tezi sebi

გ. ბერიკელაშვილი, მ. მირიანაშვილი
სხვაობიანი სქემები ბენჟამინ-ბონა-მაჰონის განტოლებისათვის

ბენჟამინ-ბონა-მაჰონის (რეგულარიზებული გრძელი ტალღის) განტოლებისათვის აგებულია სამშრიან სხვაობიან სქემათა ოჯახი. მიღებულ ალგებრულ განტოლებათა სისტემა წრფივია ყოველ ახალ შრეზე უცნობი ფუნქციის მნიშვნელობათა მიმართ. შესწავლილია ამოხსნადობისა და კრებადობის საკითხები. ჩატარებულია რიცხვითი ექსპერიმენტები.

A. Gachechiladze, R. Gachechiladze

Boundary Contact Problems with Friction of Dynamics for Hemitropic Elastic Solids

Abstract

In the present paper we investigate the three-dimensional boundary-contact problem of dynamics for homogeneous hemitropic elastic medium with regard for friction. The problem is equivalently reduced to a special spatial variational equation. The corresponding regularized equation depending on the parameter is written out and the questions on the existence of its solution are studied by the Faedo-Galerkin method. Some a priori estimates for the solution of the regularized equation are established; the estimates allow us to make the passage to the limit with respect both to dimension and to parameter. The limiting function turns out to be a solution of the variational inequality. The questions of the uniqueness of a solution follow directly from the properties of full potential energy. Such kind of problems in the classical theory of elasticity have been investigated in the monograph [G. Duvaut and J.-L. Lions, Les in'{}equations en m'{}canique et en physique. (French) Travaux et Recherches Math'{}matiques, No. 21. Dunod, Paris, 1972].

Extension of functions from hypersurfaces with the boundary

R. Duduchava*

We extend m -tuples of functions from the Besov spaces on both face of a smooth hypersurface \mathcal{S} with the smooth boundary $\Gamma = \partial\mathcal{S} \neq \emptyset$ in \mathbb{R}^n into the ambient domain slit by the hypersurface $\mathbb{R}_\mathcal{S}^n := \mathbb{R}^n \setminus \overline{\mathcal{S}}$. These tuples satisfy a compatibility conditions on the boundary Γ . The traces are defined by arbitrary Dirichlet system of boundary operators and extension is performed by two different methods, one implicit and one explicit. Explicit extension is based on the solution to the Dirichlet BVP for the poly harmonic equation and permits the extension of distributions from the Besov space $\mathbb{B}_{p,p}^s(\mathcal{S})$ with a negative $s < 0$. Moreover, it allows to establish some additional features of the extended functions, which are useful in applications.

Coretractions have essential applications in boundary value problems for partial differential equations when, for example, it is necessary to reduce a BVP with non-homogeneous boundary conditions to a BVP with the homogeneous boundary conditions.

For a pair of Besov spaces we introduce the following shortcut $\mathbb{B}_{p,p}^s(\mathcal{S}) := \mathbb{B}_{p,p}^s(\mathcal{S}) \otimes \tilde{\mathbb{B}}_{p,p}^s(\mathcal{S})$ and denote $p_s := p$ if $s \neq 0, \pm 1, \dots$, $p_s < p$ if $s = 0, \pm 1, \dots$. The notation $[s]^- \in \mathbb{Z}$ is used for the largest positive or negative integer less than s , i.e., $s - 1 \leq [s]^- < s$.

Here is one of the principal results obtained in the present investigation,

THEOREM. *Let \mathcal{S} be a smooth hypersurface with the boundary, $\mathbf{A}(x, D)$ be a PDO of order $k \in \mathbb{N}_0$ and of normal type, $1 < p < \infty$ and $k \in \mathbb{N}_0$, $s > 0$, $k \leq s + 1$. Further let*

$$\vec{\mathbf{B}}^{(k)}(x, D) := \{\mathbf{B}_0(x, D), \dots, \mathbf{B}_{k-1}(x, D)\}^\top$$

be a Dirichlet system of boundary operators and $\{\varphi_j^\pm\}_{j=0}^{k-1}$ be vector functions such that

$$\Phi_j := (\varphi_j^+ + \varphi_j^-, \varphi_j^+ - \varphi_j^-) \in \mathbb{B}_{p,p}^{s-j}(\mathcal{S}), \quad \text{for all } j = 0, 1, \dots, k-1.$$

Then there exists a continuous linear operator

$$\mathcal{P}_\mathbf{A} : \bigotimes_{j=1}^{k-1} \mathbb{B}_{p,p}^{s-j}(\mathcal{S}) \rightarrow \mathbb{H}_{p_s, loc}^{s+1/p_s}(\mathbb{R}_\mathcal{S}^n)$$

which has the prescribed traces on the boundary

$$\gamma_{\mathcal{S}^\pm} \mathbf{B}_j \mathcal{P}_\mathbf{A} \Phi = \varphi_j^\pm, \quad j = 0, 1, \dots, k-1, \quad \mathbf{A} \mathcal{P}_\mathbf{A} \Phi \in \tilde{\mathbb{H}}_{p_s, loc}^{s-k+1/p_s}(\mathbb{R}_\mathcal{S}^n),$$

where $\Phi := \{\Phi_j\}_{j=0}^{k-1}$.

*The investigation was supported by the grant of the Georgian National Science Foundation GNSF/ST07/3-175

I aSa efremiZe

pol inomial uri matric funqciebis speqtral uri faqtorizaciis Sesaxeb

motani i iqneba pol inomial uri matric funqciebis spectral uri
faqtorizaciis Teorems martivi damtkiceba romelic eyrdnoba
el ementarul faqtebs kompl eqsuri cvl adis funqciaTa Teoriidan da
wrfivi al gebridan.

ganxil ul i iqneba rogoC erTeul ovani wrewiris, ise namdvil i RerZis
SemTxveva.

n. inasariZe

al gebrebis j varedini modul ebis cikli uri homol ogiebi

LOCALISATION AND COLOCALISATION OF TRIANGULATED CATEGORIES AND EQUIVARIANT KK-THEORY

HVEDRI INASSARIDZE, TAMAZ KANDELAKI, AND RALF MEYER

Let \mathcal{T} be a triangulated category and \mathcal{E} a thick subcategory, let \mathcal{C} be an Abelian category and $F: \mathcal{T} \rightarrow \mathcal{C}$ a homological functor. Its *right localisation* at \mathcal{E} is a universal functor $\mathbb{R}F: \mathcal{T} \rightarrow \mathcal{C}$ with a natural transformation $F \Rightarrow \mathbb{R}F$, such that $\mathbb{R}F$ vanishes on \mathcal{E} . Its *right colocalisation* is a universal functor $\mathbb{R}^\perp F: \mathcal{T} \rightarrow \mathcal{C}$ with a natural transformation $\mathbb{R}^\perp F \Rightarrow F$ such that $\mathbb{R}^\perp F$ extends $F|_{\mathcal{E}}$. If F is a homological functor to the category of Abelian groups, then $\mathbb{R}F$ and $\mathbb{R}^\perp F$ are homological functors again, and both fit into a long exact sequence

$$(1) \quad \cdots \rightarrow \mathbb{R}^\perp F_1(A) \rightarrow F_1(A) \rightarrow \mathbb{R}F_1(A) \\ \rightarrow \mathbb{R}^\perp F_0(A) \rightarrow F_0(A) \rightarrow \mathbb{R}F_0(A) \rightarrow \cdots,$$

which is functorial in A and F ; that is, a natural transformation of homological functors $F \Rightarrow F'$ and an arrow $A \rightarrow A'$ induces a chain map from (1) for $F_*(A)$ to (1) for $F'_*(A')$ in a functorial manner (see [1]).

Let R be a commutative unital ring, let S be a multiplicative subset, and let $S^{-1}R$ denote the localisation of R at S . Let \mathcal{T} be an R -linear triangulated category. The multiplicative set S defines localisation of \mathcal{T} , which is isomorphic to $\mathcal{T}(A, B) \otimes_R S^{-1}R$. The structure of the corresponding colocalisation is studied in [2]. We study localisation and colocalisation of equivariant KK -theory at any multiplicatively closed subset of \mathbb{Z} . The colocalisation also produces an S -torsion theory $KK_*^G(A, B; S^{-1}\mathbb{Z}/\mathbb{Z})$ that fits into a natural long exact sequence like (1). When $S = \mathbb{Z} \setminus \{0\}$ and $S^{-1}\mathbb{Z} = \mathbb{Q}$, this includes the *rational* and *torsion* KK -theories. The S -rational and S -torsion theories inherit basic properties like homotopy invariance, C^* -stability, excision and Bott periodicity from KK^G . All this is contained in the statement that they are bifunctors on KK^G that are homological in the first and cohomological in the second variable. Since the S -rational theory is again a triangulated category, we get an associative product

$$KK_n^G(A, B; S^{-1}\mathbb{Z}) \otimes_{S^{-1}\mathbb{Z}} KK_m^G(B, C; S^{-1}\mathbb{Z}) \rightarrow KK_{n+m}^G(A, C; S^{-1}\mathbb{Z}).$$

The S -torsion theory is not a category because it lacks identity morphisms.

REFERENCES

- [1] Hvedri Inassaridze, Tamaz Kandelaki, Ralf Meyer, *Localisation and Colocalisation of Triangulated categories at thick subcategories*, (2009-12-10) oai:arXiv.org:0912.2088;
- [2] Hvedri Inassaridze, Tamaz Kandelaki, Ralf Meyer, *Localisation and Colocalisation of KK -theory at sets of primes*, (2010-03-01) oai:arXiv.org:1003.0278

This research was supported by the Volkswagen Foundation (Georgian–German Non-Commutative Partnership). The third author was supported by the German Research Foundation (Deutsche Forschungsgemeinschaft (DFG)) through the Institutional Strategy of the University of Göttingen.

d. kapanaZe

ტალლის დიფრაქციის ამოცანების შესახებ დირხლე, ნეიმანისა და იმპედანსის სასაზღვრო პირობებით

ნაშრომში შესწავლილია 270 გრადუსიანი ბრტყელი კუთხოვანი არის საზღვარზე ტალლის დიფრაქციის სხვადასხვა სასაზღვრო ამოცანა ბესელის პოტენციალთა სივრცეებში.

დამტკიცებულია ამონახსნის არსებობისა და ერთადერთობის თეორემები.

i. ki RuraZe

aral okal uri amocanebi maRal i rigis singul arul i Cveul ebrivi diferencial uri gantol ebebisaTvis

v. koki l aSvil i

singul arul i integral ebi banaxis arastandardul sivrceebSi

ukanasknel aTwl eul Si naTel i gaxda, rom kl asikur funqciur sivrceebis aRar Zal uZT mTel i rigi probl emebis gadaWra, roml ebiC Cndebian arawrfiv kerZowarmoebul ebian diferencial ur gantol ebebSi, arawrfivi drekadobis TeoriaSi, ukumSvad siTxeTa dinebis meqanikaSi, maTematikuri fizikis mTel i rigi amocanebis variaciul i meTodebiT kvl evisas. aman ganapiroba banaxis arastandardul i sivrceebis SemoReba da intensiuri Seswavl a. amis magal iTebia: banaxis funqciuri sivrceebi arastandardul i zrdadobis rigiT, e. w. grand l ebegis sivrceebi da sxva. es ukanasknel i SemoRebul iqna k. sbordonesa da T. ivaniecis mier iakobianis integredadobis minimal uri pirobebis dasadgenad. aRmoCnda, rom swored es sivrceebia kargad morgებul i zogierTi arawrfivi diferencial uri gantol ebebis amonaxsnebis regul arobis dasadgenad.

moxsenebaSi moyvanil i iqneba ganzogadebul grand l ebegis wonian sivrceebSi singul arul da maqsimal ur operatorTa SemosazRvrul obis aucil ebel i da sakmarisi pirobebi. ganxil ul i iqneba rogorc erTganzomil ebiani SemTxvevebi, aseve namravl -sivrceebze gansazRvrul i singul arul i integral ebi da potencial ebi, Zl ieri maqsimal uri funqciebi da sxva. mocemul i iqneba araerTgvarovan zomian metrikul sivrceebze gansazRvrul i singul arul i integral ebiT, sxvadasxva maqsimal uri funqciebiT da potencial ebiT l ebegis azriT j amebad funqciaTa L^1 sivrცის anasaxi simravლ eebis ufრო faqizi daxasiaTeba, vidre amas iZl eva, magal iTad, a. kol mogorovis Teorema hil bertის gardaqmnebi sTvis.

v koki aSvil i, v. paataSvil i

dirixl es amocana cvl admaCvenebl ian smirnovis kl asis
harmoniul i funqciebisaTvis

dirixl es sasazRvro amocana Seiswavl eba cvl admaCvenebl ian
smirnovis kl asis harmoniul i funqciebisaTvis nebismier uban-uban gl uvi
wiriT SemosazRvrul cal adbmul areSi.

imisda mixedviT, Tu rogoria saZiebel funqciaTa kl asis
ganmsazRvrel i funqciis mniSvnel obebi sazRvris kuTxis wertil ebSi,
amocana SeiZl eba aRmoCndes cal saxad an mraVal saxad amoxsnadi, anda
sul ac araamoxsnadi. am ukanasknel SemTxvevaSi moZebnil ia pirobebi
mocemul i sasazRvro funqciis mimarT (aucil ebel i da sakmarisi),
romel Ta Sesrul eba uzrunvel yofs amocanis amoxsnadobas.

yvel a im SemTxvevaSi roca amoxsnebi arsebobs, isini agebul ia
cxadi saxiT.

m. mania, r. TevzaZe

სარგებლიანობის მაქსიმიზაციის ამოცანა და დაკავშირებული შექცეული
სტოქასტური დიფერენციალური განტოლებები

Testing the Concept of Quark-Hadron Duality with the ALEPH Decay Data

B.A. Magradze

^a Andrea Razmadze Mathematical Institute

Abstract

We propose a modified procedure for extracting the numerical value for the strong coupling constant α_s from the τ lepton hadronic decay rate into non-strange particles in the vector channel. We employ the concept of the quark-hadron duality specifically, introducing a boundary energy squared $s_p > 0$, the onset of the perturbative QCD continuum in Minkowski space. To approximate the hadronic spectral function in the region $s > s_p$, we use Analytic Perturbation Theory (APT) up to the fifth order. A new feature of our procedure is that it enables us to extract from the data simultaneously the QCD scale parameter $\Lambda_{\overline{\text{MS}}}$ and the boundary energy squared s_p . We carefully determine the experimental errors on these parameters which come from the errors on the invariant mass squared distribution. For the $\overline{\text{MS}}$ scheme coupling constant, we obtain $\alpha_s(m_\tau^2) = 0.3204 \pm 0.0159_{exp.}$. We show that our numerical analysis is much more stable against higher-order corrections than the standard one. Additionally, we recalculate the “experimental” Adler function in the infrared region using final ALEPH results. The uncertainty on this function is also determined.

s. sanebl iZe

LC_∞-al gebris struqtura homotopiis j gufebze

sivrceTa garkveul i kl asisaTvis agebul ia maRal i rigis operaciebi homotopiis j gufebze, roml ebic kanonikurad SeTanxmebul ia standartul l is al gebris struqturasTan, daMMmocemul ia misi gamoyeneba am sivrceTa homotopiuri kl asifikaciisaTvis.

naSromi nawil ia sesf-is mier mxardaWeril i proeqtisa **GNSF/ST08/3–398**.

S. tetunaSvil i furies mwkrivebis ganSI adoba Sej amebadobis zogierTi meTodiT

1926 wels kol mogorovis mier iqna agebuli jamebadi funqcia, romlis furies trigonometriuli mwkrivi yovel wertil Si SemosazRvrel ad ganSI adia. igive debulebis samarti anoba furie- uol sis mwkrivebisatvis daadgina Sipma 1969 wels, xolo zogadi erTobliv SemosazRvruli orTonormirebuli sistemebisatvis ki analogiuri Teorema daamtkica bočkariovma 1975 wels. (ix.[1], [2] da [3]).

Cvens mier Semotanilia Sejamebadobis zogierTi axali meTodi, romlebic kerZod moicaven Cezarosa darisis Sejamebadobis $(C, \{\alpha_n\})$ da $(R, \{\alpha_n\})$ meTodebs cvladi α_n macvneblit. Tu $\alpha_n = 0$ yovel n -Tvis, maSin orive es meTodi emTxveva krebadobas.

Cvens mier ganzogadebulia kol mogorovis, Sipis da bočkariovis zemoarNiSnuli Teoremebi rogorc $(C, \{\alpha_n\})$ aseve $(R, \{\alpha_n\})$ meTodisatvis, rodesac

$$0 \leq \alpha_n \leq \frac{c}{\ln n}, \quad \text{sadac } 0 \leq c < \ln 2 \quad \text{da } n > 1.$$

I literatura

1. **Kolmogorov, A. N.** Une serie de Fourier-Lebesgue divergente partout, *Comptes Rendus.* **183**(1926), 1327-1329.
2. **Shipp, F.** Über die Divergenz der Walsh-Fourierreihen, *Ann. Univ. Sci. Budapest. Sec. Math.*, (1969). Bd. **12**, 49-62.
3. **Bočkarev, S. V.** A Fourier series that diverges on a set of positive measure for an arbitrary bounded orthonormal system. (Russian) *Mat. Sb. (N.S.)*, **98(140)**(1975), №3(11), 436-449.

**ორწერტილოვანი სასაზღვრო ამოცანები
ორგანზომილებიანი სინგულარულკოეფიციენტებიანი
წრფივი სისტემებისათვის**

ნინო ფარცვანია
ანდრია რაზმაძის მათემატიკის ინსტიტუტი
ელ-ფოსტა: ninopa@rmi.ge

2000 Mathematics Subject Classification. 34B05.

წრფივი დიფერენციალური სისტემებისათვის

$$u'_i = p_{i1}(t)u_1 + p_{i2}(t)u_2 + p_{i0}(t) \quad (i = 1, 2)$$

კოეფიციენტებით $p_{ik} \in L_{loc}([a, b])$ ($i = 1, 2; k = 0, 1, 2$), რომელთაც გააჩნიათ არაინტეგრებადი სინგულარობები a და b წერტილებში, ნაპოვნია ორწერტილოვანი სასაზღვრო ამოცანების

$$u_1(a) = 0, \quad u_1(b) = 0$$

და

$$u_1(a) = 0, \quad u_2(b) = 0$$

ცალსახად ამოხსნადობის ახალი ოპტიმალური საკმარისი პირობები.

დაფინანსებულია შოთა რუსთაველის ეროვნული სამეცნიერო ფონდის მიერ (პროექტი # GNSF/ST09_175_3-101).

T. qadei Svil i

mgrex i el ementebi hopotopiur G-al gebrebSi

kl asikuri mgrex i el ementebi $da = a \cdot a$ (e. brauni) da maTi gardaqmnebi $a' = g \cdot a \cdot g^{-1} + dg \cdot g^{-1}$ (n. berikaSvil i) mniSvnel ovan rol s asrul eben rogorc maTematikaSi (fibraciaTa homol ogoos Teoria, diferencial uri geometria), aseve fizikaSi (yal iburi Teoria).

Cven vixil avT mgrex el ementeb s araasociaturi \cup_1 -gamravl ebis mimarT. aRmoCnda, rom, Tu mgrex i el ementeb s ganmsazRvrel i tol oba $da = a \cup_1 a$ iwereba mxol od \cup_1 -gamravl ebis terminebSi, gardaqmnis formul a

$$a' = a + dg + g \cdot g + g\{a\} + a'\{g\} + a'\{g, g\} + \dots$$

moiTxovs \cup_1 -Tan dakavSirebul mraVal adgil ian al gebrul opraciaTa ierarqias, e.w. breis operacieb s $a\{b_1, \dots, b_k\}$, $a\{b\} = a \cup_1 b$, roml ebic hqmnian homotopiur G-al gebras.

vaCvenebT, aseTi mgrex i el ementebi erT konteqstSi aqceven or kl asikur koncefcias – gerstenhaberis deformacieb s da staSefis A_∞ -al gebrebs.

naSromi nawil ia sesf-is mier mxardaWeril i proeqtisa **GNSF/ST08/3-398**.

INTEGRATION AND DIFFERENTIATION OF DOUBLE FOURIER SERIES

OMAR DZAGNIDZE

ABSTRACT. It is proved that the termwise integration of any double Fourier trigonometric series over a variable rectangle $[0, x] \times [0, y] \subset \mathbb{R}^2$ gives a uniformly converging double series which is a Fourier series for an integral over $[0, x] \times [0, y]$ of that very function for which the double Fourier series has been constructed. A series sum $\sum_{m,n=1}^{\infty} b_{mn}/mn$ is found, where b_{mn} is the Fourier coefficient at the product $\sin mx \sin ny$. The technique of constructing the Fourier series of functions F'_x , F'_y , F''_{xy} and the case of uniform and absolute convergence of a Fourier series are indicated for an absolutely continuous function F . The characteristic property of Fourier coefficients tendency to zero for an absolutely continuous function is described.

a. xaraziSvil i

diskretul i geometriul i struqturibi da maTTan
asociirebul i al goriTmebi.

moxsenebaSi ganxil ul i iqneba kombinatorul i da gamoTvl iTi geometriis
zogierTi tipiuri amocana.

aRweril i iqneba am amocanebTan dakavSirebul i geometriul i
al goriTmebi da Sefasebul i iqneba maTi sirTul e.

ს. ხარიბეგაშვილი

კომის მახასიათებელი ამოცანის გლობალური ამოხსნადობის შესახებ
მეორე რიგის არაწრფივ ჰიპერბოლურ სისტემათა ერთი კლასისათვის

განხილულია კომის მახასიათებელი ამოცანა მომავლის კონუსში მეორე რიგის
არაწრფივ ჰიპერბოლურ სისტემათა ერთი კლასისათვის. დამტკიცებულია ამ
ამოცანის გლობალური ამონახსნის არსებობა და ერთადერთობა.

g. ximSi aSvil i

eqstremal uri amocanebi konfiguraciul sivrceebze

e. xmal aZe

araabel uri I aibnicis homol ogiebis Sesaxeb

g. j orj aZe

sivrcismagvari minimal uri zedapirebi Ads x S sirceebSi

g. j orj aZe

nawil akis dinamikis koordinatul i warmodgena statikur
sivrce-droSi

o. j oxaZe

koSis amocana damxSobi arawrfivi wevris Semcvel i tal Ris
gantol ebisaTvis).

o. Wkadua

areze da mis sazRvarze gansazRvrul i I okal izebul i
integral ur gantol ebaTa meTodi meore rigis
cvl adkoeficientebiani kerZowarmoebul iani diferencial uri
gantol ebebisaTvis