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Chekli yuduzsimon grafda berilgan kasr hosilali Eyri tenglamasi uchun Koshi masalasining qo'yilishi,B_3 nuqtadagi holati nolga teng bo`lsa yechimning mavjudligi va yagonalagi.

Mashrapov Quvonchbek Qaxramon o`g`li
Toshkent tumani 1-sonli texnikum matematika fani o`qituvchisi

Abstrakt Cheklangan grafdagi vaqt-kasrli eyri tenglamasi uchun Koshi masalaining qo`yilishi va chegara shartlari orqali yechimning potensiallar ususli orqali yagonaligi isboti ko`rilgan.

Kalit so'zlar: Eyri tenglamasi, ibvp, , fundamental yechimlar, nuqtasida Kirxgof qoidasi

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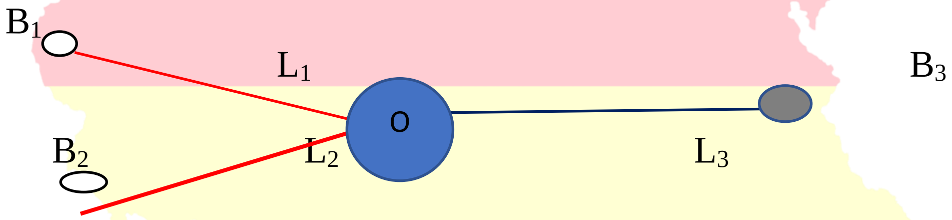
Kirish

Ushbu maqolada biz chekli yulduz grafigidagi dastlabki chegara muammosini ko'rib chiqamiz potentsial usuldan foydalangan holda topiladi Ikkita chekli kesma va bitta yarim to'g'ri chiziqni graf uchi deb nomlanuvchi bir nuqtada birlashtirildan hosil bo`lgan sodda yulduzsimon grafni qaraymiz.

Asosiy qism

Γ grafning bog`lamalarini , $\Omega = \Gamma^+ \cup \Gamma^-$ grafida k ta kiruvchi va m ta chiquvchi qirralar mavjud. Kiruvchi qirralarda Γ^- koordinatalarni L_j (0, L_j) oraliqda, j = 1, 2 sifatida belgilaymiz, chiquvchi qirralarda esa Γ^+ koordinatalarni 0 dan L_j gacha (L_j > 0, j = k + 1, k + m) deb qabul qilamiz. Grafning qirralarini B_j bilan belgilaymiz, bu yerda j = 1, k + m ().(k=$\overline{1,2}$ m=1)



2.4.1 rasm

Faraz qilaylik, $f=(f_1,f_2,f_3)^T$), $u^- = (u1,\ u2)^T$, $u^+ = u_3$ va $u = \begin{pmatrix} u^- \\ u^+ \end{pmatrix}$

Grafning har bir qirrasi uchun Eyri tenglamasining vaqt bo‘yicha kasr hosilasini quyidagi ko‘rinishda ko‘rib chiqamiz:

$$D_{0t}^{\alpha}u(x,t)-\frac{\partial^3}{\partial^3 x}u(x,t)=f_j(x,t)\quad 0<t<T, x\in B_j \qquad (2.4.1)$$

Boshlang‘ich shartlar:

$u(x,0)=u_0(x), x\in \bar{B}_j, j=\overline{1,3}$ (2.4.2)

bu yerda $u_0=(u_0^1,u_0^2,u_0^3)^T$

Grafning tutashgan nuqtalarida quyidagi shartlarni bajarsin:

$Au(0,t)=0, 0<t<T$ (2.4.3)

$u_x^+(0,t)=Bu_x^-(0,t)$ (2.4.4)

Bu yerda $A=\begin{pmatrix} 0 & 0 & 0 \\ 1 & -a_2 & 0 \\ 1 & 0 & -a_3 \end{pmatrix}$ $B=(b_1,b_2)$

Uchlarning kesish tugun nuqtasida Kirxgof qoidasi shartlari bajarilishini talab qilamiz:

$$C^-=(\frac{1}{a_1},\frac{1}{a_2}), C^+=\frac{1}{a_3}, a_1=1, a_j\neq 0, \quad (2.4.5)$$

$$u_{j,0}(x)\in C(\overline{b_j})\, f_j(x,t)\in C^{0,1}(\overline{b_j}\times[0.T])$$

$$u(x,t)|_{\partial\Gamma}=\varphi(t), \frac{\partial}{\partial x}u^-(x,t)=\phi(t), 0<t<T, \quad (2.4.6)$$

bu yerda Va j=3 uchun $\varphi=(\varphi_1,\varphi_2,\varphi_3)^T$ va $\varphi^-=(\varphi_1,\varphi_2,)^T$.(2.4.3) da 3 ta (k+m) tenglama mavjud, ammo 2 ta (k+m-1) shart mavjud.

Teorema 1. Agar B^TB-I_k manfiy aniqlangan bo`lsa, $u_{j,0}(x)\in C(\overline{b_j})\, f_j(x,t)\in C^{0,1}(\overline{b_j}\times[0.T])$ funksiyalar va $\varphi(t)$ va $\phi(t)$ [0,T] oraliqda differesianlanuvchi bo`lsa,2.4.1-2.4.6 tengliklarni qanoatlantiruvchi yagona yechimga ega bo`ladi.

Biz potensiallar usuli yordamida 2.4.1 tenglamaning fundamental yechimlari A.Psxu shu ko`rinishida topilgan :

$$G_\alpha^{2\alpha/3}(x,t)=\begin{cases} \phi(-\alpha/3, 2\alpha/3, x/t^{\alpha/3}) & x<0 \\ -2\,\mathrm{Re}[e^{2\pi i/3}\phi(-\alpha/3, 2\alpha/3, e^{2\pi i/3}x/t^{\alpha/3})] & x>0 \end{cases} \quad (2.4.7)$$

Yuqoridagi tenglikdan foydalanib ikkichi fundamental yechimini quyidagi ko`rinishda yozishimiz mumkin:

$$V_\alpha^{2\alpha/3}(x,t)=\frac{1}{3t^{t-\alpha/3}}\mathrm{Im}[e^{2\pi i/3}\phi(-\alpha/3, 2\alpha/3, e^{2\pi i/3}x/t^{\alpha/3})] \quad (2.4.8)$$

Yuqoridagi fundamental yechimlardan foyladalanib biz 2.4.1 tenglamaning umumiy yechimlari shu ko`rinishida topishimiz mumkin:

$$u_j(x,t)=\int_0^t G_\alpha^{2\alpha/3}(x-L_j,t-\tau)\alpha_j(\tau)d\tau+\int_0^t V_\alpha^{2\alpha/3}(x-L_j,t-\tau)\beta_j(\tau)d\tau+\int_0^t G_\alpha^{2\alpha/3}(x-0,t-\tau)\gamma_j(\tau)d\tau+\int_0^t V_\alpha^{2\alpha/3}(x-0,t-\tau)\rho_j(\tau)d\tau+F_j(x,t) \quad j=\overline{1,k+m}$$

va bu yerda α_j,γ_j(j=$\overline{1,k+m}$),β_j(j=$\overline{1,k}$), ρ_j(j=$\overline{k,k+m}$) noma`lum funksiyalar uchun ), $\rho_j$(t)=0 ), (j=$\overline{1,k}$), ; ),$\beta_j$=0(j=$\overline{k=1,k+m}$), o`rinli.

Xulosa.Biz yechimni yagona mavjud ekanligini va bu yechim yagona ekanligi ko`rdik.Bu teorema 1 bog`liq ekanligini ,koeffitsiyentlariga bog`liq bo`lishinmi ham ko`rsatadi.

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