EMERGENT: JOURNAL OF EDUCATIONAL DISCOVERIES AND LIFELONG LEARNING (EJEDL)
ISSN: 2776-0995 Volume 3, Issue 10, Oct., 2022

EVALUATION AND COMPARATIVE ANALYSIS OF ROUTING ALGORITHMS FOR HOMOGENEOUS WIRELESS SENSOR NETWORKS

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Abstract

Evaluation and comparative analysis of routing algorithms for homogeneous wireless sensor networks is a complex scientific field. Currently, this scientific work is being carried out in several countries, various design methods are being developed and put into practice. Wireless sensor nodes (SNS) consume energy for transmission, message processing, and computation. The article discusses such issues.

Keywords: sensor, technology, node, energy, homogeneous, method.

GOMOGEN SIMSIZ SENSOR TARMOQLARI UCHUN MARSHRUTLASH ALGORITMLARINI BAHOLASH VA QIYOSIY TAHLIL QILISH

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Annotatsiya

Gomogen simsiz sensor tarmoqlari uchun marshrutlash algoritmlarini baholash va qiyosiy tahlil qilish murakkab ilmiy yo'nalish hisoblanadi. Hozirgi vaqtda ushbu ilmiy ishga bir nechta mamlakatlarda olib borilmoqda, har xil loyihalashtirish usullari ishlab chiqilmoqda va amaliyotga tadbiq etilmoqda. Simsiz sensorli tugunlar (SST) uzatish, xabarlarni qayta ishlash va hisoblash uchun energiya sarflaydi. Maqolada shu kabi masalalar muhokamasi olib boriladi.

Kalit so'zlar: sensor, texnologiya, tugun, energiya, gomogen, metod.

KIRISH

Gomogen simsiz sensor tarmoqlari uchun marshrutlash algoritmlarini baholash va qiyosiy tahlil qilish murakkab ilmiy yo'nalish hisoblanadi. Hozirgi vaqtda ushbu ilmiy ishga bir nechta mamlakatlarda olib borilmoqda, har xil loyihalashtirish usullari ishlab chiqilmoqda va amaliyotga tadbiq etilmoqda. Simsiz sensorli tugunlar (SST) uzatish, xabarlarni qayta ishlash va hisoblash uchun energiya sarflaydi.

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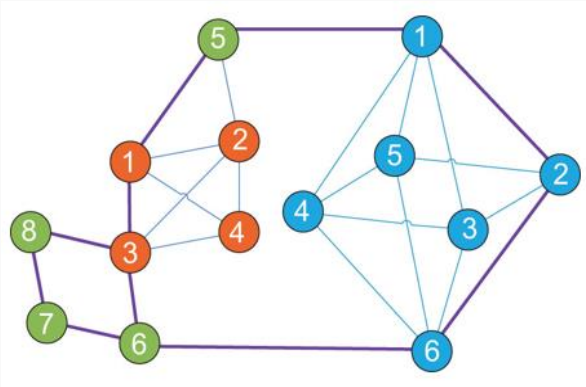
Sensor tugunining ishlash muddati batareykalarning ishlash muddatiga juda bog'liq bo'lib, ko'pincha an'anaviy batareykalar qo'llaniladi.

ASOSIY QISM

Gomogen simsiz sensor tarmoqlarda marshrutlash algoritmlarini baholashda matritsa misolida hisoblab ko'rishimiz mumkin.

Rasmning chap tomonida ko'rsatilgan, 8 ta tugun va 12 ta havolaga ega bo'lgan ya'ni ulangan va ulanmagan tarmoqni marshrutlash algoritmlarini baholashni ko'rib chiqamiz.



1-rasm. Getrogen va gomogen tarmoq.

C_1 ni asosi hisoblanadi { (1,2), (1,3), (1,4), (1,5), (2,3), (2,4) (2,5), (3,4), (3,6) , (3,8), (6,7), (7,8) }, va uning o'lchami shunday $m_1 = 12$. Ta'rifga ko'ra, tugun-bo'g'in matritsasi B_1 darajasiga ega bo'lgan quyidagicha bo'ladi $r_1 = 7$ ikkilik maydonni tekshirish orqali. Matritsa ko'rinishda quydagicha tasvirlanadi:

	(1,2)	(1,3)	(1,4)	(1,5)	(2,3)	(2,4)	(2,5)	(3,4)	(3,6)	(3,8)	(6,7)	(7,8)
1	1	1	1	1	0	0	0	0	0	0	0	0
2	1	0	0	0	1	1	1	0	0	0	0	0
3	0	1	0	0	1	0	0	1	1	1	0	0
4	0	0	1	0	0	1	0	1	0	0	0	0
5	0	0	0	1	0	0	1	0	0	0	0	0
6	0	0	0	0	0	0	0	0	1	0	1	0
7	0	0	0	0	0	0	0	0	0	0	1	1
8	0	0	0	0	0	0	0	0	0	1	0	1

Ushbu matritsada barcha qizil raqamlar "1" birgalikda (1,2), (1.3), (1,4), (1,5), (3, 6), (3,8), (6,7), bunda bog'lanishlar soni tugunlar soni minus 1 ga teng. Qora "1" soniga mos keladigan boshqa qatorlar bilan birgalikda ular chiziqli mustaqil sikllarni hosil qiladi, ya'ni, ustunlar (1,2,3), (1,2,4), (1,2,5), (1,3,4) va bo'shliq (3,6,7,8) soni sikllar ulanishlar hamda minus tugunlar soniga, keyin esa plus 1 ga teng. Ushbu tarmoqda eng kichik sikl (2,3,4) mavjud, chunki bu chiziqli bog'liq sikl hisoblanadi.

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$(\sigma_{12} + \sigma_{23} + \sigma_{31}) + (\sigma_{12} + \sigma_{24} + \sigma_{41}) + (\sigma_{13} + \sigma_{34} + \sigma_{41}) + (\sigma_{23} + \sigma_{34} + \sigma_{42}) = 0.$

C_2 asosi bo'yicha hisoblangan matritsa quydagicha tasvirlanadi:

	(1,2,3)	(1,2,4)	(1,3,4)	(2,3,4)	(1,2,5)
(1,2)	1	1	0	0	1
(1,3)	1	0	1	0	0
(1,4)	0	1	1	0	0
(1,5)	0	0	0	0	1
(2,3)	1	0	0	1	0
(2,4)	0	1	0	1	0
(2,5)	0	0	0	0	1
(3,4)	0	0	1	1	0

C_2 ni asosi hisoblanadi $\{(1,2,3), (1,2,4), (1,3,4), (2,3,4), (1,2,5)\}$, va uning o'lchami shunday $m_2 = 5$. Ta'rifga ko'ra, tugun-bo'g'in matritsasi B_2 darajasiga ega bo'lgan quyidagicha bo'ladi $r_2 = 4$ ikkilik maydonni tekshirish orqali.

$$\partial_2(\sigma_{123} + \sigma_{124} + \sigma_{134} + \sigma_{234}) = 0.$$

Simsiz sensor tarmoqlarda marshrutlash algoritmlarini baholash mavjud bo'lganlarning to'plami bo'lgan sensorli tarmoqlarni o'rnatishda juda ko'p qiyinchiliklar mavjud. Sensor tugunlari hech qanday infratuzilmaga ega bo'lmagan simsiz, datchiklar orqali muloqot qiladi. Qo'shimcha qiyinchilik sensorli tugunlarning cheklangan, odatda qayta tiklanmaydigan energiya ta'minoti bilan bog'liq. Tarmoqning ishlash muddatini maksimal darajada oshirish uchun protokollar energiya resurslarini samarali boshqarish maqsadida boshidan ishlab chiqilishi kerak.

Mesh tarmoq topologiyasi: To'r tarmog'i ma'lumotlarni bir tugunga tarmoqning radio uzatish diapazonida joylashgan boshqa tuguniga uzatish imkonini beradi. Bu ko'p tarmoqli aloqa deb ataladigan narsaga imkon beradi, ya'ni agar tugun radioaloqa doirasidan tashqarida bo'lgan boshqa tugunga xabar yubormoqchi bo'lsa, u xabarni kerakli tugunga yo'naltirish uchun oraliq tugundan foydalanishi mumkin. Ushbu tarmoq topologiyasi ortiqcha va miqyoslilik afzalliklariga ega. Agar individual tugun muvaffaqiyatsiz bo'lsa, masofaviy tugun hali ham o'z diapazonidagi istalgan boshqa tugun bilan bog'lana oladi, bu esa o'z navbatida xabarni kerakli joyga yo'naltirishi mumkin. Bundan tashqari, tarmoq diapazoni bitta tugunlar orasidagi diapazon bilan cheklanishi shart emas; u shunchaki tizimga qo'shimcha tugunlarni qo'shish orqali kengaytirilishi mumkin.

XULOSA VA MUNOZARA

Simsiz sensor tarmoqlaridan olingan ma'lumotlar odatda markaziy tayanch stantsiyasida raqamli ma'lumotlar ko'rinishida saqlanadi. Raqamli ko'rinishda saqlangan bu ma'lumotlarni ko'rishda bizga GNS (Graphical Network Simulator), NS-2 (Network Simulator-2) dastulari ancha yordam beradi, bu esa har qanday kishiga Internet brauzeri orqali simsiz sensor tarmog'ini real vaqt rejimida kuzatish yoki boshqarish imkonini beradi

Bundan tashqari simsiz sensor tarmoqlari tugunlaridan keladigan ma'lumotlar bilan ishlash uchun ma'lumotlarni ko'rish va baholashni osonlashtiradigan dasturlardan foydalaniladi. Ana shunday dasturlardan biri Mote View. Ushbu dastur real vaqt rejimida ma'lumotlarni ko'rish va ularni tahlil qilish, har xil grafikalarni tuzish, hamda turli bo'limlarda hisobotlarni chiqarish imkonini beradi.

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