

**SINGLE FITNESS FUNCTION ANALYSIS OF ENERGY-
CONSUMPTION AND RADIO BANDWIDTH MANAGEMENT IN
COVERAGE AREA PROBLEMS**

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ABSTRAK

Sensor Rangkaian wayarles (WSN) telah muncul sebagai alat yang berpotensi untuk memantau dunia fizikal, menggunakan sendiri menganjurkan rangkaian bateri sensor tanpa wayar yang boleh rasa, memproses dan berkomunikasi. Ia boleh digunakan dengan cepat dan murah, dengan itu membolehkan berskala besar, pemantauan atas permintaan dan menjejaki lebih pelbagai aplikasi. Nod sensor dalam apa-apa rangkaian biasanya telah terhad pemrosesan atas kapal dan keupayaan komunikasi tanpa wayar, dan dilengkapi dengan bateri dengan kuasa terhad dan dengan itu keperluan untuk menggunakan teknik-teknik penjimatan tenaga dalam usaha untuk memanjangkan jangka hayat rangkaian. Walau bagaimanapun, jika semua nod sensor secara serentak dikendalikan, data penderiaan berlebihan, pelanggaran komunikasi tanpa wayar dan gangguan sama akan menyebabkan tenaga banyak yang sia-sia. Bagaimanakah seseorang perlindungan semua kawasan sensing dengan nod aktif kurangnya supaya tidak bula mata wujud dan hubungan disimpan penting? Liputan menjadi masalah besar dalam rangkaian sensor skala besar di mana beratus-ratus dan beribu-ribu nod secara rawak dikerahkan. Masalah perlindungan adalah salah satu isu yang paling asas dalam rangkaian sensor tanpa wayar, yang secara langsung memberi kesan kepada keupayaan dan kecekapan rangkaian sensor. Secara umumnya, ia boleh dianggap sebagai penilaian Kualiti Perkhidmatan (QoS) dalam rangkaian sensor. Penyelesaian semasa adalah berdasarkan sebahagian besar pada penjadualan nod, idea utama iaitu untuk mencari bilangan optimum nod aktif di samping mengekalkan liputan dan sambungan. Masalah dalam mencari perlindungan maksimum dalam rangkaian sensor ditujukan di mana liputan ditakrifkan sebagai satu set nod yang benar-benar boleh meliputi kawasan yang dipantau dan penyelesaian berpusat kepada masalah ini adalah dicadangkan. Beberapa algoritma bertujuan untuk mencari penyelesaian yang rapat ke optimum berdasarkan kepada maklumat tempatan. Dalam karya ini, satu kaedah baru untuk mengawal parameter utama WSN (seperti penggunaan tenaga, bandwidth, kekuatan isyarat dan liputan) menggunakan fungsi kecergasan tunggal yang dicadangkan, yang dibangunkan dan diuji. Dalam usaha untuk menyiapkan kajian ini rangkaian menyerupai dibangunkan utama Microsoft visual C # dan beberapa percubaan dilakukan di simulator. Dalam kajian masa depan, lebih banyak kerja akan memberi tumpuan kepada penyelesaian yang.

ABSTRACT

The Wireless Sensor Network (WSN) has emerged as a promising tool for monitoring the physical world, utilizing self-organizing networks of battery-powered wireless sensors that can sense, process and communicate. It can be deployed rapidly and cheaply, thereby enabling large-scale, on-demand monitoring and tracking over a wide range of applications. Sensor nodes in such a network usually have limited on-board processing and wireless communication capabilities, and are equipped with batteries with limited power and thus the need to deploy energy saving techniques in order to prolong the network lifetime. However, if all the sensor nodes simultaneously operated, redundant sensing data, corresponding wireless communication collision and interference will cause much energy to be wasted. How does one cover all the sensing area with the least active nodes so that no blind-point exists and connectivity is kept significant? Coverage becomes a serious problem in large scale sensor networks where hundreds and thousands of nodes are randomly deployed. The coverage problem is one of the most fundamental issues in wireless sensor networks, which directly affects the capability and efficiency of the sensor network. Generally, it can be considered as the measure of Quality of Service (QoS) in a sensor network. Current solutions are based for the most part on node scheduling, the main idea of which is to find the optimal number of active nodes while maintaining coverage and connectivity. The problem in finding the maximal coverage in a sensor network is addressed in where coverage is defined as a set of nodes that can completely cover the monitored area, and a centralized solution to this problem is proposed. Several algorithms aim to find a close-to-optimal solution based on local information. In this work, a new method for controlling WSN main parameters (such as energy consumption, bandwidth, signal strength and coverage) using single fitness function proposed, developed and tested. In order to complete this research a network simulator is developed main Microsoft visual C# and a few experiments are done on the simulator. In future research, more and more work will be focused on distributed and localized solutions for practical deployment by simulation wireless sensor networks. In this simulation can be run either be reset with a new seed or with the previous seed for replay.

مخلص البحث

تطوير خوارزمية لمراقبة استهلاك الطاقة ونشر وحدة راديو عرض النطاق الترددي لياقة بدنية وظيفية لإدارة مشاكل منطقة التغطية وكأداة واعدة لرصد العالم المادي، وذلك باستخدام شبكات التنظيم قد برزت شبكة الاستشعار اللاسلكية الذاتي من أجهزة الاستشعار اللاسلكية التي تعمل بالبطارية ويمكن الشعور بها، وعملية التواصل يمكن نشرها بسرعة وبثمن بخس، وبالتالي تمكين من نطاق واسع، ورصد وتبع علي الطلب علي مجموعة واسعة من التطبيقات. وعقد الاستشعار في هذه الشبكة عادة ما يكون محدود بحسب امكانيات وقدرات التجهيز، والاتصالات اللاسلكية بجهازه ببطاريات طاقة محدودة، وبالتالي نحن بحاجة الي نشر تقنيات توفير الطاقة من أجل اطالة عمر الشبكة. ومع ذلك، اذا كانت كل عقود الاستشعار تعمل في وقت واحد، وسوف تكون بيانات الاستشعار زائدة عن الحاجة، تصادم الاتصالات اللاسلكية، وتدخل المتبادلة بسبب هدر الكثير من الطاقة وضياعها. باعتبارها غطاء واحد في منطقة الاستشعار بأقل تكلفة للعقد النشط بحيث لا توجد نقطة عمياء، وأخري ذات اتصال مهم؟ التغطية تصبح مشكلة خطيرة في شبكات الاستشعار واسعة النطاق التي تنتشر فيها المئات والالاف من العقد بشكل عشوائي مشكلة التغطية هي واحدة من اهم، القضايا الاساسية في شبكات الاستشعار اللاسلكية، مما يؤثر بشكل مباشر علي قدرة وكفاءة الشبكة وأجهزة الاستشعار عموما، لهذا يمكن اعتبار مقياس جودة الخدمة في شبكة الاستشعار، وتستند بحلول الحالية في معظمها علي جدولة عقدة، والفكرة الرئيسة منها هو العثور علي العدد الأمثل من العقد النشط مع الحفاظ علي التغطية والاتصال، يتم تناول المشكلة في العثور علي التغطية القصوي في شبكة الاستشعار، من حيث يتم تعريف غطاء علي أنها مجموعة من العقد التي يمكن أن تغطي كامل منطقة المراقبة، ويقترح حل لهذه المشكلة المركزية، تهدف لعدة خوارزميات لايجاد حل قريب يمثل استنادا الي المعلومات المحلية، في هذا العمل سوف نقوم، بقوة الاشارة باستخدام وظيفة اللياقة البدنية بتطوير خوارزمية يمكنها التحكم في استهلاك الطاقة، واحدة للتغلب علي مشاكل منطقة التغطية واستهلاك لياقة بدنية وظيفية لشبكة الاستشعار اللاسلكية.

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LIST OF ABBREVIATIONS

WSN -	Wireless sensor networks
QOS -	Quality of service
BW-	Bandwidth
S-MAC-	Sensor –Medium Access Control
PEAS-	Probing Environment and Adaptive Sleeping
GAF-	Geographical Adaptive Fidelity
OGDC-	Optimal Geographical Density Control
CCP-	Coverage Configuration Protocol
SPAN-	Self-Powered Ad-hoc Network
ECCA-	Energy-efficient Coverage Control Algorithm
MOGA-	Multi-Objective Genetic Algorithms
VFA-	Virtual Force Algorithm
MAC-	Medium Access Control
NSGA-II-	non-dominated sorting genetic algorithm
DCCP-	Dynamic Coverage and Connectivity Problem
MOFS-	Multi-objective free search
RF-	radio frequency
NAV-	Network Allocation Vector
PAMAS-	Power Aware Multi-Access Signalling
LPL-	Low Power Listening
ARQ-	Automatic Repeat Request
FEC-	Forward Error Correction
BAMAC-	Battery Aware MAC protocols
RAS-	Remote Access Switch
PSM-	Power Save Mode
WLAN-	Wireless Local Area Network