Development of methods and models of designing the wireless sensor network and their applications

M Sarzhan

International Information Technologies University, Manas Str./Zhandosov Str., 34 A /8A 050040 Almaty, Kazakhstan

**Corresponding author's e-mail: magzhanmekebai@gmail.com*

Abstract

The article is about wireless sensor network (WSN), that is a distributed system for collecting, processing and transmitting data. Each sensor consists of a sensor that collects information (temperature, humidity, the degree of radiation or chemical contamination, etc.), a microprocessor, a transceiver and a power source in the form of a rechargeable battery. Despite the fact, that one sensor can be continuously active for a short period of time the WSN can, if it is properly organized, operate autonomously for a long period. In this connection, the main actual task is to maximize the length of the network operation period, which is called the lifetime of the WSN [1],

Keywords: wireless sensor network, collecting data, applications of network

1 Introduction

Wireless sensor networks have many applications. One of the most important applications is the collection of information when data is collected by sensors and then transmitted to the base station for further analysis. In the WSN, each sensor is equipped with a battery and uses wireless communication. Tracking of wildlife [2], monitoring of the environment [3-4], monitoring of volcanic activity [5], water monitoring [6], monitoring of civil construction, and detection of forest fires are only some examples of such applications. The lifetime of the sensor is largely determined by the capacity of the battery, and the lifetime of the entire network depends on the operating time of each sensor.

Therefore, to reduce costs, it is necessary to solve the problems of energy-efficient functioning of the WSN. First of all, the sensors must cover the area, the information about which must be collected.

2 The aim

Aim is the development of an algorithmic apparatus for optimizing the structure and functioning of a WSN, which gives them maximum efficiency and efficiency.

3 Methods of research

In the development of algorithms will be used t combinatorial analysis, discrete optimization, computational geometry, as well as linear, integer, stochastic and semidefinite programming. To assess the quality of algorithms will be used methods of a priori and probabilistic analysis, as well as numerical modeling.

4 Conclusions

The task of building an energy efficient communication tree is the task of routing. However, in practice, the minimum island tree is used as its solution, which is a 2-approximate solution. This means that to ensure the connectivity of the network can be spent 2 times more energy than required, but this is unacceptable. We have developed a new hybrid genetic algorithm that builds a solution close (by functional) to the optimal one. Further development of this approach is seen in the use of the VNS method [7], which will allow using the local search with alternating neighborhoods at the stage of mutation of the solution. An analysis of the problem of minimizing the number of identical sectors participating in the coverage of the strip is carried out. This allows, to minimize the costs associated with monitoring such long objects as roads, pipelines, boundaries, perimeters of buildings, etc.

5 Practical significance

The obtained results will allow to design energy-efficient WSN, which will result in more effective use of them. Currently, WSN are used in many areas of human activity, which is due to both economic considerations and security considerations in the case of networks in hard-to-reach or life-threatening and human-health places.

References

[1] Tubaishat M, Madris S 2003 Sensor networks: an Overview *IEEE Potentials* **22** 20-3
[2] Tolle G, Polaste J, Szewczyk E, Guller D, Turner N, Tu K, Burgess S, Dawson T, Buonadonna P, Gay D, Hong W 2005 A Amcroscope in the Redwoods *ACM SenSys*
[3] Selavo L, Wood A, Cao Q, Sookor T, Liu H, Srivasan A, Wu Y, King W, Stancovic J, Young D, Porter J 2007 LUSTER: Wireless Sensor Network for Environmental Research *ACM SenSys*
[4] Barrenetxes G, Ingelrest F, Schaefer G, Vetterli M 2008 SensorScope: Oute-of-the-Box Environmental Monitoring *ACM/IEEE IPSN*
[5] Ewrner Allen G, Lorinez K, Johnson J, Lees J, Welsh M 2006 Fidelity and Yield in a Volcano Monitoring Sensor network *USENIX OSDI*
[6] Song W-Z, Huang R, Xu M, Ma A, Shorazi B, LaHusen R 2009 Air-dropped Sensor network for Real-time High-fidelity Volcano Monitoring *ACM MobiSys*
[7] Hansen P, Mladenovic N 2001 Variable neighborhood search: Principles and applications *Eur. J. of OR* **130** 449-67