5. Decrease in the route length and movement time in the chord directions.

6. It is ensured the formation of micro-districts with regular and irregular structure.

7. Typical elements can be used in the design of micro-districts on the free areas of the old town.

8. In contrast to networks with radial structure there is no overflow of the micro-district center by cars.

9. On the basis of typical elements the formation of pedestrian zones in the central part of the micro-district is ensured.

10. No artificial car concentration characteristic to trunk roads: this reduces pollution and noise [2].

11. The selected element size provides an approach to public transport within pedestrian connectivity.

12. The opportunities for the formation of a distributed public transport system enlarge.

Conclusions

Considered characteristic features of transport networks in some cities of Western Ukraine and the proposed measures for their improvement can be useful when planning networks in other cities. A new approach to the development of the route network provides the solution of the transport problem at the stage of computer-aided design, and not in the process of the dynamic control of chaotic transport flows [3]. A systematic approach and formalization of the project tasks implementation using the regular typical elements provides the improved results of the transport networks design.

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DESIGNING MULTI-SENSORY SYSTEM FOR MONITORING GAS

ПРОЕКТУВАННЯ МУЛЬТИСЕНСОРНОЇ МЕРЕЖІ МОНІТОРИНГУ ГАЗІВ

This article is devoted to the design of a system to detect gases. The paper describes a system that is based on the controller STM32F4 and includes a series of sensors MQ. System requirements were formulated, the software was developed.

Key words: Gas analyzer, sensor, microcontroller, multisensory system.

Здійснено проектування системи для виявлення газів. Система побудована на базі контролера STM32F4 та включає сенсори серії MQ. Сформульовано вимоги до системи та розроблено програмне забезпечення.

Ключові слова: газоаналізатор, сенсор, мікроконтролер, мультисенсорна система.

Statement of the problem

In nature, the gas is pure and composed of various mixtures. The accumulation of free gas produced in the lithosphere. They are important for the industry. The most important thing that we must remember

about gas is that it can be not only necessary for use in industry, but also be a serious threat to human health and life. [2] Gas analyzers help to deal safely with gas. They determine the qualitative and quantitative composition of gas mixtures. [1]

Analyzer is necessary to chemically hazardous occupations, when determining leaks in refrigeration equipment and gas, leaks and vacuum equipment for explosive and fire industries for the determination of combustible gases. [5] In diving, gas analyzers are used to determine the composition of the gas mixture in the balloons for diving. Analyzer is also used in basements, wells and pits before the start fire`s works. [3]

In Ukraine widely developed chemical and mining industry, where workers are often faced with the problem of pollution and the need for operational definitions and finding toxic chemicals in a specific environment, so the design multisensory system for monitoring gases is important.

Analysis of recent research and publications

Many countries have initiated research of gas sensors in recent years. Gas sensors are devices that can be called “artificial nose” because they have the ability to detect very low concentrations of gases. Today, there are devices that exceeded the sensitivity generally recognized masterpiece of nature – dog nose [7].

A number of leading scientists in Japan, USA, Germany, Britain, France, Russia and Ukraine working on solving complex technical problems in designing of individual measurement devices and information-measuring systems (IMS) for environmental monitoring. British firms EEV Chemical Sensor Systems, Bloodhound Sensor Aroma-Scan, German Lenard, Swedish Nordic Sensor Technologies and French Alpha MOS, US firms – Serrano Sensors, Electronic Sensors Technologies, Hewlett-Packard and Micro sensor Systems start work in this area first.

Scientists NAS of Ukraine, National Technical University of Ukraine “KPI” National University “Lviv Polytechnic”, Chernivtsi National University of J. Fedkovich working on problems developing methods and detection in air chemicals.

With the development of industry and the interest of scientists and researchers to the topic of chemical sensors began to emerge books and publications on this topic and industry that are available for a wide range of readers and interested.

The article “Chemical sensors: classification, principle work area of application”, in co-authorship three authors Egorov A. A., Egorov M. A, Tsareva Y.Y., fundamentally describes and presents brief overview of chemical sensors. The article is presented their classification, describes the work of some sensors and their applications. The authors emphasize not only on theoretical grounds threads chemical sensors, but also on the practical appropriateness and relevance. Particular attention is given to the electrochemical, optical and biosensors. The fundamental phenomena that underlying the action of optical chemical sensors discussed there. The paper describes the principle of integral – optical chemical sensors absorption type. The potential application of integral – optical sensors, for example, in the chemical industry, microelectronic industry, ecology and medicine were accented [4].

Formulating purposes of article

The aim is to designing multisensory system for monitoring gases based on STM32F407 microcontroller and using cross-sensitivity.

Description the object of design

The object of design is multisensory system for monitoring gases based on microcontroller STM32F4. The system should include a set of sensors that will respond to carbon dioxide, carbon monoxide, cigarette smoke, liquefied gas, vapors of alcohol, methane, propane, isobutene, hydrogen. Since these sensors have cross-sensitivity, it is necessary to develop a system in a way that there was unequivocal identification of chemical substances.

The subject of research is the identification availability and concentration of chemical poisons.

As a result, production activity various chemicals released into the air, which causes changes in the composition of the gas mixture. [6] This leads to pollution “internal environment” human by chemicals that

enter from the air. All this testifies to the necessity complex solution to reduce the impact pollutants on the human body.

Today we know more than 7 million chemicals, of which 60 thousand are widely used in various fields. From 500 to 1,000 new chemical compounds and mixtures appear annually in the international market. Therefore, recently the impact of various chemicals on workers significantly increased.

Requirements for multisensory systems

According to the research object system works with chemicals, in this case determines carbon, carbon monoxide, cigarette smoke, liquefied gas, vapors of alcohol, methane, propane, butane, hydrogen, natural gas, cooking gas.

The designed system must perform the following tasks:

- promptly identify gases in the environment, determine their concentration;
- the data output to PC that are possible to analyze the environment;
- unique identification of detected gas;
- have high accuracy measurements;
- be able to calibrate multisensory system;
- the likelihood of potentially add functionality multisensory system;
- the ability to work and interact with other systems and to work in different conditions.

The picture 1 shows the view of multisensory system for operative detection of chemicals.

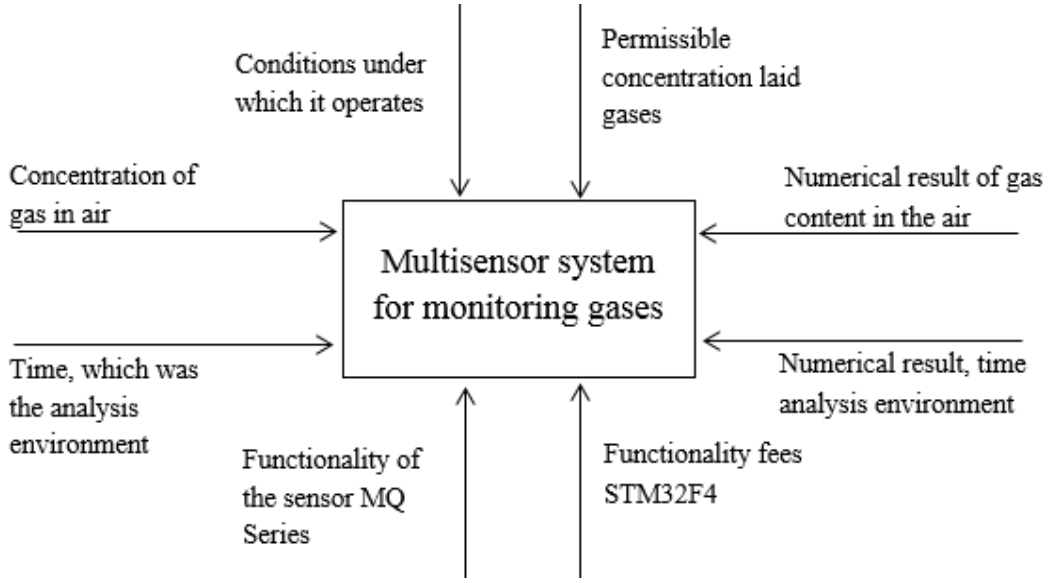

Fig. 1. View multisensory system for monitoring gases

Fig. 2. Multisensory system for monitoring gases

Input data for the solution of the problem is the concentration gas in air. The system will be based on the following steps:

- Setting of all parameters.
- Processing of signals that are fed from the gas sensor to ADC.
- Convert the signal from the ADC value in mV.
- Presentation of data.

Special computing devices (microcontrollers) are used for processing signals in real time. Implies the following settings: initialize the timer, initialize the ADC and set the necessary parameters to configure the analog inputs. After completing the settings and checking their correctness power must be supplied to the microcontroller and process the signals that come from sensors. The data is transferred to the PC where the program determines that the gas contained in the environment and what is his concentration (Fig. 2).

The algorithm of work

In accordance with the tasks before us, multisensory system must operate according the next algorithm.

You must first turn on the multisensory system, giving on it power through cable USB. At this moment, all the settings on the motherboard MK enabled automatically for the possibility further work on the analysis of the investigated medium. Multisensory system is ready for operation after receive power 5 V. To improve the accuracy and fidelity of research, manufacturers of gas sensors MQ Series advise that before analysis environment gas sensor stayed for at least overnight in an environment that will be analyzed.

To prepare the PC to work with multisensory system on your PC you need to install the software driver board and a program that reads data from the board and represents them graphically. The program interface that will read data from the board should be intuitive for the initial user.

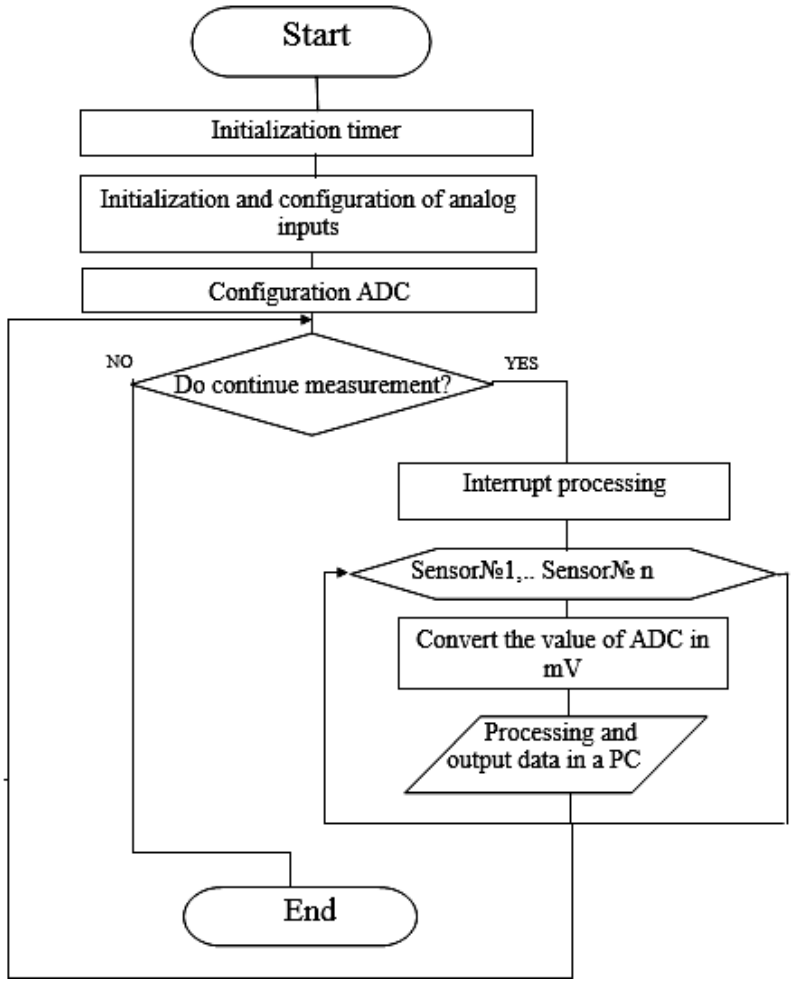

Fig. 3 Block diagram of the algorithm of the GA

Algorithm of work multisensory system is shown in Fig. 3.

If necessary set of sensors can be changed. You can add more sensors to the system, but it requires editing code. Since sensors have cross-sensitivity, we can uniquely identify the gas that was detected.

Conclusions

This paper describes the designing multisensory system for monitoring gases based on STM32F407 microcontroller and using cross-sensitivity sensors, that can not only detect the available gas in the environment, but also uniquely identify it. In this paper the algorithm of the system, which allows you to change the set of sensors is presented.

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FUZZY MODEL FOR RECOMMENDER SYSTEMS

НЕЧІТКА МОДЕЛЬ ДЛЯ РЕКОМЕНДАЦІЙНОЇ СИСИЕМИ

The paper analyzes the current state of development and application of recommendation systems, models and methods of construction of recommendation systems. It is shown that the most widely used method came into collaborative filtering. The method of fuzzy clustering is developed, which improves the accuracy of predicting ratings of products.

Key words: Recommender system, data mining, collaborative filtering, fuzzy clustering.

Проаналізовано поточний стан розробки та застосування рекомендаційних систем, моделей і методів побудови рекомендаційних систем. Показано, що найбільш широко використовується метод колаборативної фільтрації фільтрації. Розроблено метод нечіткої кластеризації, який підвищує точність прогнозування рейтингів продуктів.

Ключові слова: Рекомендаційні системи, інтелектуальний аналіз даних, колаборативна фільтрація, нечітка кластеризація.

Introduction

Recommendation system – a system working with a certain type of information, a filter system that recommend information items that can cause a user's interests. The typical recommendation system makes recommendations to users as input, aggregates and sends them to the appropriate recipients in the form of recommendations. Recommendation system compares the data collected from users and create a list of items recommended to the user. They are an alternative search algorithm because it helps users to find items and information that they would not find themselves.