THE PROGRAM SCRIPT FOR PROCESSING HETEROGENEOUS DATA MULTISENSOR SYSTEM

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Introduction

Based on the Arduino platform, the multisensory system was developed to monitor changes in temperature, humidity, light and combustible gas, load data into an existing database and check the current state of the environment.

It is often required, without reading detailed information from a connected set of sensors, simply to estimate the current state of the system and the dynamics of its state change over a certain period. To solve this problem, a special script was developed for simplified processing of heterogeneous data of a multisensory system.

Software script development

A distinctive feature of the script is a built-in primary data processing system, which includes a graphical representation, correlation and regression analysis in real time. Usually, special software modules and complex mathematical calculations are written for data processing from multisensory systems, depending on the specific practical problem [4], [6], [16], [9]. In our case, the user, not possessing special knowledge, can get the results of processing immediately in real time. In this case, the determining factor was the minimum cost, and ease of implementation.

The following sensors were used as sensors of the multisensory system: MQ2 (uses lower conductivity of tin dioxide as a gas-sensitive material, determines the content of methane, propane, natural gas, gas and other combustible gases), DHT11 (consists of a humidity sensor and temperature sensor components), PhotoPin (digital light intensity sensor).

To obtain data from the sensors, a special program script was written in the Arduino environment for transmitting data, part of which is shown in Figure 1.

The registration of a new connected sensor begins with the identification by the sensor driver, then information is collected, data is normalized in accordance with the algorithm and then transferred to the database of the multisensory system.

```
#include <dht11.h>
#include <string.h>
DHT11 DHT11;
#define DHT11PIN 34  // Подключение библиотек для считывания данных DHT11 с порта 34
#define photocellPin 0  // Подключение библиотек для считывания данных с фоторезистора
#define mq2Pin 1  // Подключение библиотек для считывания данных с датчика газа MQ-2
//---------------------------------Считывание данных MQ-2_NEW-------------------------------------
#include <TroykaMQ.h>// библиотека для работы с датчиками MQ (Troyka-модуль)
#define PIN_MQ2  A0 //имя для пина, к которому подключен датчик
MQ2 mq2(PIN_MQ2);// создаём объект для работы с датчиком и передаём ему номер пина
//---------------------------------Считывание данных с PIR-----------------------------------
#define pirPin 36  //PIR соединение

#define uint8 unsigned char
#define uint16 unsigned int
#define uint32 unsigned long

```

Fig. 1. Part of a software script in the Arduino environment for reading data from MS

The main parts of such a database are tables, sections and records. The tables are divided into sections, and each section consists of a set of records [5], [7]. Sections of the same table can be physically stored both on the computer and on the SQL server, so data is grouped so that data can be read from one section.

The interface description includes descriptions of resource classes, classes of relations between them, and classes of operations on resources [8], [9]. In total, there are several main resource classes:

- entry point, that is, from where the user must start navigating through interface resources;
- the MS collection, in which all sensors connected to the software system are listed;
- MC, which describes the sensor, its metadata and lists the processes implemented;
- process that is implemented in the MC;
- collection of output data, for example, MQ2 measurements;
- collection of command execution results.

Descriptions of some of the resources of an application programming interface are generated based on the results of SQL queries executed by the database. The following describes these requests for each of the resources.

The description of the sensor collection is generated using the corresponding query. Next, the sensor data is unloaded in the form of a table, the number of sensors (columns) in the table changes in accordance with the number of connected sensors [1], [2].

The software system is adapted for use in various subject areas where it is necessary to provide both local and remote data collection from the MS and control sensors. For example, monitoring of temperature and humidity in medical institutions, monitoring, security systems in sensitive facilities.

The adaptation method includes several stages:

- development or loading of an existing driver for each sensor model used in a given subject area;
- creation of descriptions and templates for modeling MC;
- creation of a file to configure the connection to the required sensors.

The sensor driver is a dynamically loaded and configured software module for MS. The driver must be developed in the C # programming language or in the language corresponding to the Arduino software system.

For the driver to interact with the software system, the following operations should be used: registration of sensor driver; registration of a new sensor; updating information (metadata) of the sensor; results.

Conclusion

This paper presents a software script for transmitting and processing data from a multisensory system. Various data processing methods were used, including matrix correlation calculations, correlation analysis, and the principal component method. To verify the results of the program, a series of tests was carried out in

various conditions and the results of the multisensory system were analyzed. This development will be useful not only in the tasks of environmental monitoring, but also for the development of new multisensory systems.

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