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DEVELOPMENT OF A DATABASE FOR THE SUBSYSTEM RESEARCH PYROELECTRIC SENSORS

In this article subject area using pyroelectric sensors and motion detectors on their basis are examined. The necessity of examining the characteristics of the pyroelectric sensors. Infware and software subsystems for research pyroelectric sensors are developed.

Key words: passive motion detectors, pyroelectric sensors, development of the infware, development of the software, subsystem for research pyroelectric sensors.

Розглянуто предметну область використання піроелектричних сенсорів та детекторів руху на їх основі. Показано необхідність дослідження характеристик піроелектричних сенсорів. Розроблено інформаційне та програмне забезпечення для підсистеми дослідження піроелектричних сенсорів.

Ключові слова: пасивні детектори руху, піроелектричні сенсори, розробка інформаційного забезпечення, розробка програмного забезпечення, підсистема для дослідження піроелектричних сенсорів.

Introduction

With the rapid development of information technology *has* a lot of software products that allow you to raise to a qualitatively new level of scientific research in various fields of science and technology [1-7]. Such software should primarily include: Axiom, Derive, Macsyma, Maple, MatLab, MathCAD, Mathematica, LabVIEW, and many others. Among all the variety of existing software none so fully that would ensure the needs of the scientist or researcher. In particular this applies to highly specialized research. These products contain a powerful mathematical apparatus that allows for extremely complex calculations but does not include databases, taking into account all the necessary features peculiar to specific research [8]. One of the research is research of pyroelectric sensors [9,10]. Therefore, the development of subsystems to conduct such research in view of all the subtleties of a scientific experiment is the actual problems.

Description of subject area

Today in any object where material values established security systems. Whether it's a bank, museum, warehouse, dwelling, or even educational laboratory. An integral part of modern security systems are passive infrared motion detectors [1], and also used during engineering development and implementation of the companies involved in the development project "Smart House". However, these detectors have several disadvantages. The main ones are: high frequency of false anxiety arising from radiation detectors sunlight shot convection air flow, vibration, or presence in the area of detecting other living facilities, and lack of signal anxiety in those cases when the temperature of an object is equal to background temperature zone detection. The reason for this behavior detector should be sought primarily in the principle of its sensing element - a pyroelectric sensor Fig.1.

Fig. 1. Pyroelectric sensor and passive infrared motion detector designed based on it

The aim of research is to determine the pyroelectric sensor according to the parameters of electrical output analog signal from the thermal pattern changes in the area of detection. As the researcher is primarily interested in the parameters of the signal (Fig. 2.) which will result from the emergence in the area of detecting living facility it is necessary to take into account data such as the distance to the object, its temperature, weight, geometry and more. Useful the output signal will be formed on the background noise parameters which should also be considered as background parameters: the width of the zone detection, length, height, temperature, relative humidity, pressure, etc. An example of the output electrical signal parameters that will be investigated is its amplitude, shape, energy, and temporal characteristics of frequency spectrum, and so on. One of the samples of the signal from the pyroelectric sensor is shown in Fig. 2.
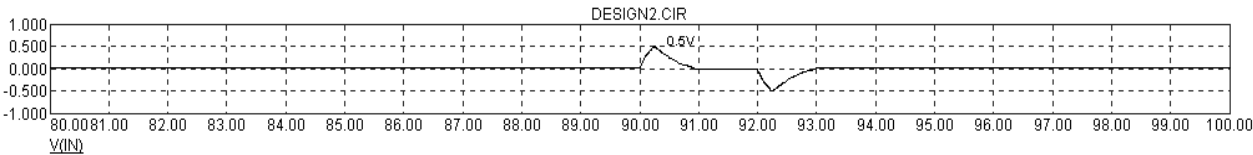
Fig. 2. Useful signal from the pyroelectric sensor

Designed subsystem is designed primarily to study the characteristics of pyroelectric sensors under real operating conditions, determine their characteristics and weaknesses with a view to further improving and developing new methods of detecting signals from objects detection.

Infware

To solve this problem was developed following conceptual database model Fig. 3.

Fig. 3. Conceptual model database subsystem for research pyroelectric sensors

The analysis of the domain was developed infologic model of database subsystem for research pyroelectric sensors. It could reflect given subject area as a set of information objects and their structural relationships. When datalogic modeling was used obtained infologic model and describes the properties of the concepts of the s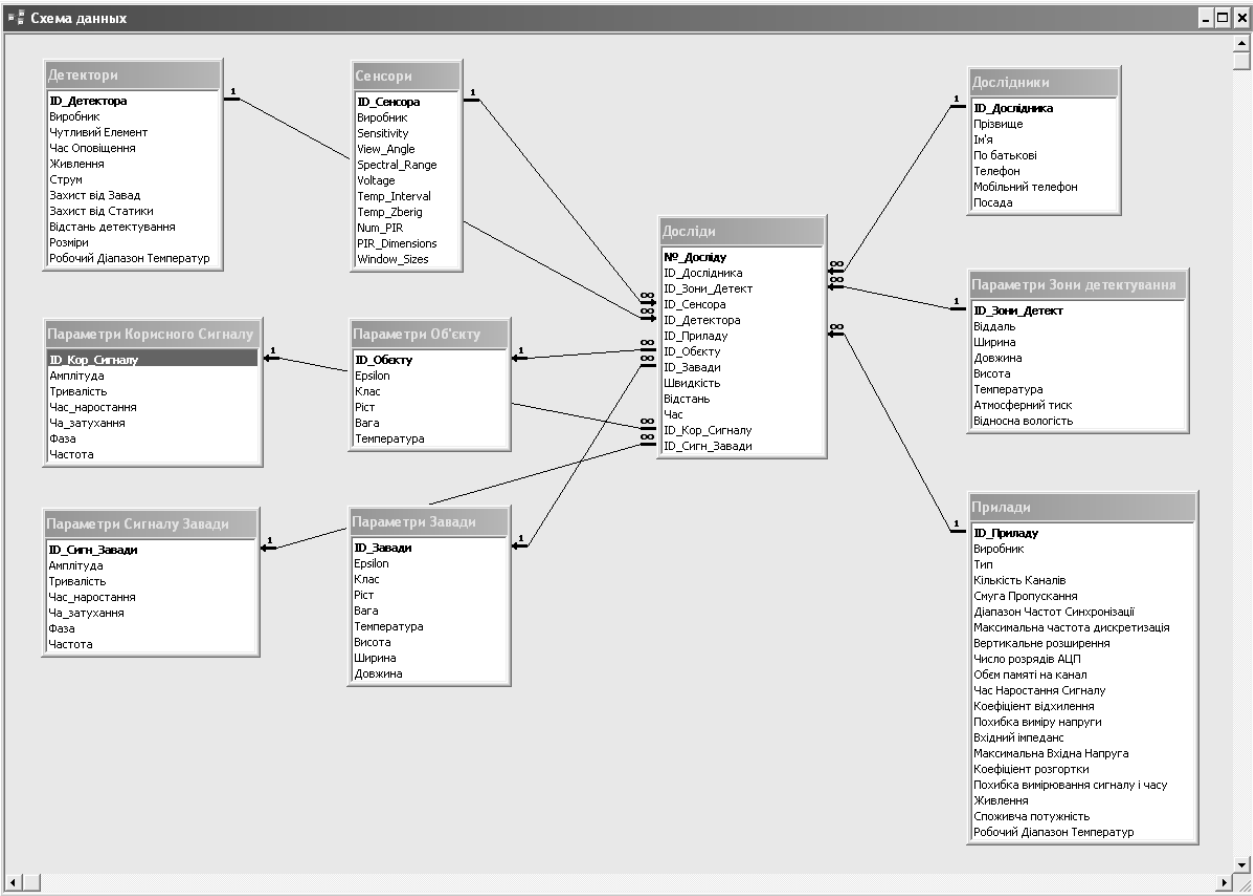ubject area that researched, their relationship and the restrictions imposed on the data. Considered features a data storage component model on a physical level in the database that is used for its software implementation. Datalogic model database subsystem for research pyroelectric sensor is shown in Fig. 4.
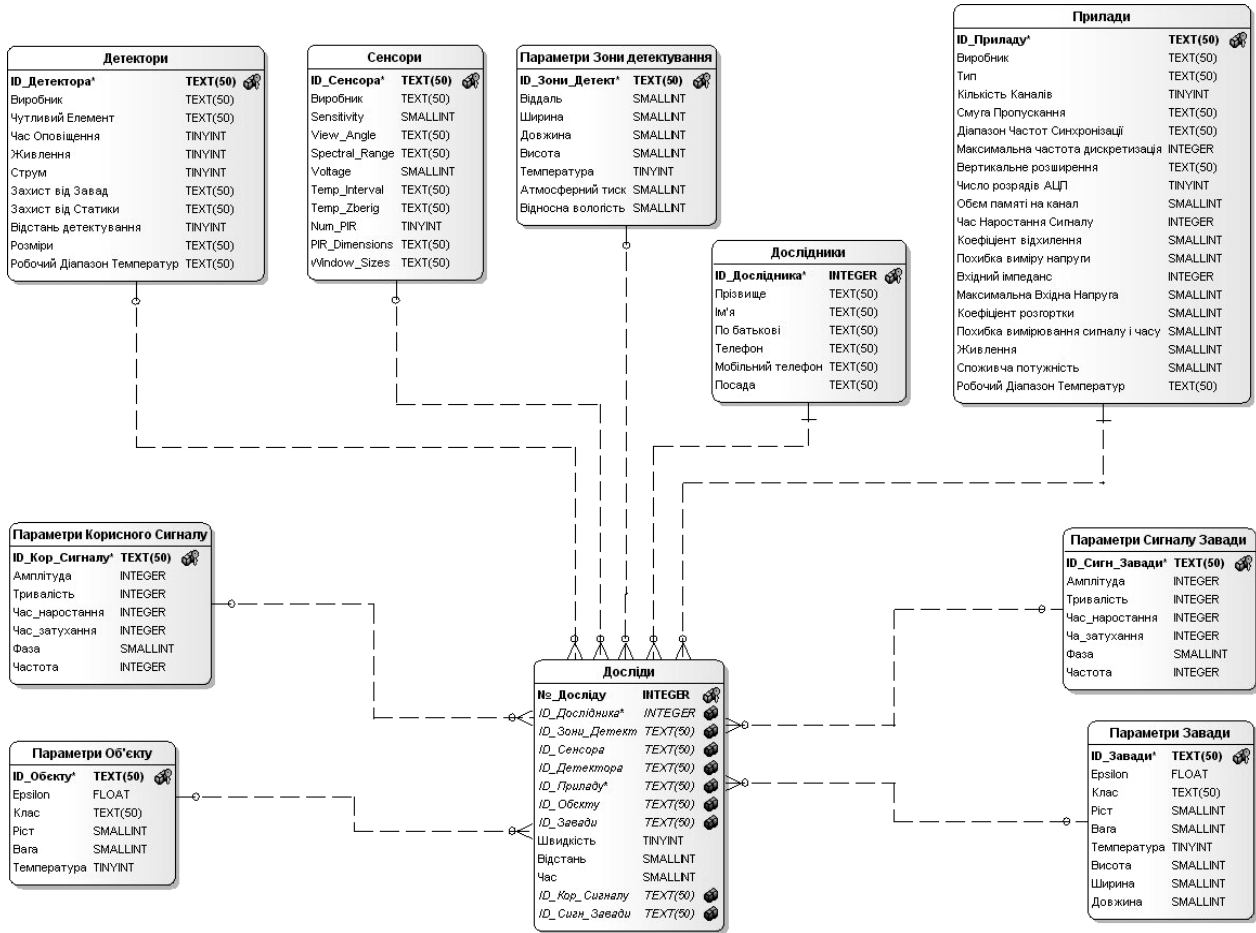
Детектори

ID_Детектора*	TEXT(50)
Виробник	TEXT(50)
Чутливий Елемент	TEXT(50)
Час Оповіщення	TINYINT
Живлення	TINYINT
Струм	TINYINT
Захист від Завад	TEXT(50)
Захист від Статики	TEXT(50)
Відстань детектування	TINYINT
Розміри	TEXT(50)
Робочий Діапазон Температур	TEXT(50)

Сенсори

ID_Сенсора*	TEXT(50)
Виробник	TEXT(50)
Sensitivity	SMALLINT
View_Angle	TEXT(50)
Spectral_Range	TEXT(50)
Voltage	SMALLINT
Temp_Interval	TEXT(50)
Temp_Zberig	TEXT(50)
Num_PIR	TINYINT
PIR_Dimensions	TEXT(50)
Window_Sizes	TEXT(50)

Параметри Зони детектування

ID_Зони_Детект*	SMALLINT
Віддаль	SMALLINT
Ширина	SMALLINT
Довжина	SMALLINT
Висота	SMALLINT
Температура	TINYINT
Атмосферний тиск	SMALLINT
Відносна вологість	SMALLINT

Прилади

ID_Приладу*	TEXT(50)
Виробник	TEXT(50)
Тип	TEXT(50)
Кількість Каналів	TINYINT
Смуга Пропускання	TEXT(50)
Діапазон Частот Синхронізації	TEXT(50)
Максимальна частота дискретизація	INTEGER
Вертикальне розширення	TEXT(50)
Число розрядів АЦП	TINYINT
Обєм памяті на канал	SMALLINT
Час Наростання Сигналу	INTEGER
Коефіцієнт відхилення	SMALLINT
Похибка виміру напруги	SMALLINT
Вхідний імпеданс	INTEGER
Максимальна Вхідна Напруга	SMALLINT
Коефіцієнт розгортки	SMALLINT
Похибка вимірювання сигналу і часу	SMALLINT
Живлення	SMALLINT
Споживча потужність	SMALLINT
Робочий Діапазон Температур	TEXT(50)

Дослідники

ID_Дослідника*	INTEGER
Прізвище	TEXT(50)
Ім'я	TEXT(50)
По батькові	TEXT(50)
Телефон	TEXT(50)
Мобільний телефон	TEXT(50)
Посада	TEXT(50)

Параметри Корисного Сигналу

ID_Кор_Сигналу*	TEXT(50)
Амплітуда	INTEGER
Тривалість	INTEGER
Час_наростання	INTEGER
Час_затухання	INTEGER
Фаза	SMALLINT
Частота	INTEGER

Параметри Об'єкту

ID_Обєкту*	TEXT(50)
Epsilon	FLOAT
Клас	TEXT(50)
Ріст	SMALLINT
Вага	SMALLINT
Температура	TINYINT

Досліди

№_Досліду	INTEGER
ID_Дослідника*	INTEGER
ID_Зони_Детект	TEXT(50)
ID_Сенсора	TEXT(50)
ID_Детектора	TEXT(50)
ID_Приладу*	TEXT(50)
ID_Обєкту	TEXT(50)
ID_Завади	TEXT(50)
Швидкість	TINYINT
Відстань	SMALLINT
Час	SMALLINT
ID_Кор_Сигналу	TEXT(50)
ID_Сигн_Завади	TEXT(50)

Параметри Сигналу Завади

ID_Сигн_Завади*	TEXT(50)
Амплітуда	INTEGER
Тривалість	INTEGER
Час_наростання	INTEGER
Ча_затухання	INTEGER
Фаза	SMALLINT
Частота	INTEGER

Параметри Завади

ID_Завади*	TEXT(50)
Epsilon	FLOAT
Клас	TEXT(50)
Ріст	SMALLINT
Вага	SMALLINT
Температура	TINYINT
Висота	SMALLINT
Ширина	SMALLINT
Довжина	SMALLINT

Fig. 4. Datalogic model database subsystem for research pyroelectric sensors

Accumulated during the experiments data is stored in tables. Examples of such tables can serve as a table: "Sensors" (Fig. 5).

Edit entity : Сенсори

General | Attributes | Indexes | Table constraints | Note | To do

Key	Attribute name	Data type	Length	Precision	PK	Not null
(PK)	ID_Сенсора	TEXT	50	0	☑	☑
	Виробник	TEXT	50	0	☐	☐
	Sensitivity	SMALLINT	0	0	☐	☐
	View_Angle	TEXT	50	0	☐	☐
	Spectral_Range	TEXT	50	0	☐	☐
	Voltage	SMALLINT	0	0	☐	☐
	Temp_Interval	TEXT	50	0	☐	☐
	Temp_Zberig	TEXT	50	0	☐	☐
	Num_PIR	TINYINT	0	0	☐	☐
	PIR_Dimensions	TEXT	50	0	☐	☐
	Window_Sizes	TEXT	50	0	☐	☐

Fig. 5. The table structure "Sensors"

Software

To organize the interface and interaction researcher developed a database have developed special forms. An example of one of these forms can be seen in Fig. 6. An important feature of the developed forms is to control the accuracy of data entry, which significantly reduced the number of errors that occur at the stage of data entry.

Fig. 6. The form of "sensors"

Calling required forms or select the desired command by using the menu on the main window. Example of a call form "Devices" is shown in Fig. 7.

Fig. 7. Calling from menu form "Devices"

As a result of scientific experiments gradually formed and filled with useful reference database signals and signal noise. This framework can be used to develop intelligent detectors in solving tasks of object detection of passive motion detectors. Therefore, this program provides the ability to export data to external files for their further use, eg for firmware Flash memory in intelligent motion detection.
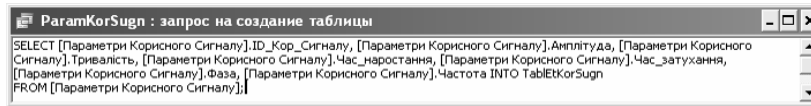
Example SQL - Query to create a database reference useful signals are shown in Fig. 8.

Fig. 8. SQL - query to create a database reference signal

After that generated a database reference signals can be stored in external files Fig. 9.
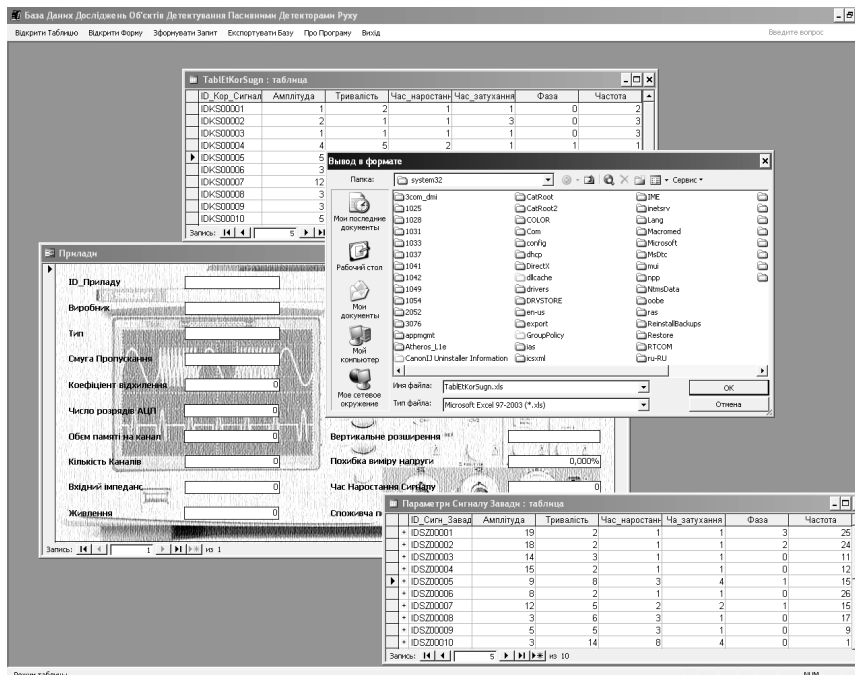

Fig. 9. Keeping a database reference signals in external files

Conclusions

The question of rational saving received data in scientific experiments at research pyroelectric sensors to further their optimal treatment. Defined data structures and formats of their physical representation in the database. Proposed block diagram of the database for the research of pyroelectric sensors. The results of the research subject developed her infological and datalogical model. In developing datalogical database model took into account the features of the experimental data storage on a physical level in the database. Developed and implemented data entry forms, structure tables for data storage database research. There are exports formed database reference signals in external files for data exchange with other software. Developed and implemented infware and software for research pyroelectric sensors.

1. http://www .chartwellyorke.com/derive/derivefeatures.html. 2. http ://www.macsyma.com/. 3. http:// www.maplesoft.com/. 4. ht tp://www.mathworks.com/. 5. ht tp://www.ptc.com/products/mathcad/. 6. ht tp:// www.ni.com/labview/. 7. http://www.statsoft.com/textbook/experimental-design/. 8 Лобур М.В., Головацький Р.І. КМОН інтегрований інфрачервоний детектор руху // Вісник Нац. ун-ту"Львівська політехніка" №548, "Комп'ютерні системи проектування. Теорія і практика". 9. Лобур М.В., Головацький Р.І. Методи адаптації чутливості пасивних інфрачервоних детекторів руху до об'єктів спостереження // Вісник Вісник Нац. ун-ту"Львівська політехніка" №512, " Комп'ютерні системи проектування. Теорія і практика". 10. Lobur M.V., Golovatsky R.I. Methods of sensitivity management of passive infrared detectors of movement. CADSM 2005, Lviv – Polyana, UKRAINE. P. 276.