

Кадмий	0,01	Пикриновая кислота	0,5
Капролактан	1	Пропилен	0,5
Кобальт	1	Сероуглерод	1
Мель	0,1	Скипидар	0,2
Никель	0,1	Тиофос	0,003
Тринитротолуол	0,5	Толуол	0,5
Хлор активный	0	Фенол (карболовая кислота)	0,001
Цинк	1	Хлорбензол	0,1
		Хлорофос	0,05
В. По органолептическому лимитирующему показателю вредности		Хром:	
		трехвалентный	0,5
		шестивалентный	0,1
Бензин	0,1	Четыреххлористый углерод	5
Гексахлоран	0,02		

Казахстан теряет значительные объемы водных ресурсов как в результате неэффективного использования воды, так и загрязнения водных ресурсов. Загрязнение водных объектов в результате недостаточной и неэффективной очистки хозяйственно-бытовых стоков населенных мест, отсутствие управления и должного контроля за сбросом стоков промышленных предприятий, бытовых и токсических промышленных отходов, приводит к тому, что проблема повышения эффективности водохозяйственной отрасли Казахстана заключается не столько в дефиците водных ресурсов, а сколько в проблеме эффективного управления использованием и охраной водных ресурсов, должного внимания к отрасли со стороны властных структур государства всех уровней.

UDC 004.38 + 004.9  
GRNTI 50.43.31

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## APPLICATIONS OF COMPUTER SYSTEMS BASED ON THE ARDUINO MICROPROCESSOR SYSTEM IN CHEMICAL LABORATORY

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### ANNOTATION

Features laboratories for carrying out chemical experiments are high demands on the fire, explosion and protection from intrusion. In addition, the educational and research laboratories may be significant changes in the teaching process. Thus, a system that is easy to adapt to a changing environment.

Application processors based on Arduino offers great opportunities to create customized application development.

Arduino Uno module programming is done using the Arduino IDE software and firmware in it Codebender module. The system is flexible, so it can be incorporated into any other alarm system. As well, if necessary, extra equipment or what sensors, remote warning systems, etc.

Invented device is aimed at a wide range of consumers, as it can be embedded in security and fire alarm systems.

## АННОТАЦИЯ

Особенностями лабораторий для проведения химических опытов, являются высокие требования к пожаро-, взрывобезопасности и охране от проникновения посторонних лиц. Кроме того, в учебных и исследовательских лабораториях возможны существенные перестановки в ходе учебного или исследовательского процесса. Таким образом, необходима система, которую легко адаптировать к изменениям окружающей среды.

Применение процессоров на базе **Arduino** открывает широкие возможности для создания адаптированных прикладных разработок.

Программирование модуля Arduino Uno осуществлялось с помощью программы Arduino IDE и встроеного в неё модуля Codebender. Данная система достаточно гибкая, поэтому её можно встраивать в любые другие системы охранных сигнализаций. Так же, при необходимости, возможна дополнительная комплектация какими либо датчиками, системами удаленного оповещения и т.д.

Разработанное устройство нацелено на широкий круг потребителей, так как может встраиваться в системы охранной и пожарной сигнализации.

**Keywords:** alarm, the Arduino, laboratory, prevention, protection, system, sensors

**Ключевые слова:** сигнализация, Arduino, лаборатория, предупреждение, охрана, система, датчики

Educational and research laboratories in which to conduct experiments related to chemicals, are high-risk facilities. In this case problems may arise both during their stay in humans and in their absence. In this connection the alarm installation, which would respond to harmful changes. Given that the situation during the operation of the laboratories can vary significantly, a system which allows easy enough to make the necessary changes in it. Thus, the system should be, with its programming and reprogramming, and adding to it additional elements and thus having a sufficient degree of resistance to cracking. The most promising is the use of products in this regard. The Arduino, which includes not only the programmable modules, but also sets them compatible with a variety of sensors that allow to take the necessary evidence.

Arduino modules are special hardware platforms on which to create the various electronic devices, including wireless alarm system [1]. Devices of this type have simple structure and the possibility to program their operation algorithm [2-5]. Due to this, created with the Arduino alarm can maximally adjust to the object.

Features of laboratories for chemical experiments are high demands on the fire, explosion and protection from intrusion. [6]

Thus, we can formulate the requirements to be met by alarm:

- notification of hacking or penetration (using a siren sound);
- support of external systems such as sound alarm, warning light;
- stand-alone operation without external power.
- the possibility of warning about leaks fluid;
- the possibility of a gas leak alarm;
- connectivity indicator of hazardous substances sensors.

Considering that the Arduino - an open electronic platform, which includes the so-called starting

developer kits (starter kit) and open source software intended for fast creation of interactive electronic devices [7].

Of used currently modules Arduino: Arduino Uno, Arduino Leonardo, Arduino Ethernet based on the ATmega328, Arduino Mega 2560, Arduino Mini, Arduino Micro, Arduino Due, LilyPad Arduino, Arduino Pro, Arduino Yún [1-5,7,8], most preferably Arduino Uno, having sufficient capacity to solve the problem and attractive price.

When designing alarm that meets the requirements, were used:

- Arduino module;
- a set of functional sensors;
- a source of autonomous power supply;
- external actuators.

When triggered, one of the connected sensor is transmitted to the signal processor Arduino module. Using the downloaded software user, the microprocessor performs its processing on a particular algorithm. As a result of this command can be configured to actuate an external actuating device.

If necessary, to allow the mandrel alarm owner Laboratory, which is protected, to the Arduino module via an expansion card, you can connect a special GSM module. It is installed SIM-card of one of the cellular providers.

The following components are used to create a security-warning alert system based on MEA Arduino:

- board Arduino Uno;
- high contrast LCD display 16 × 2;
- keyboard 4 × 4;
- 10 ~ 20 ohm potentiometer;
- 3 reed switch sensors;
- March 2-pin screw terminals;
- HC-SR04 ultrasonic sensor.

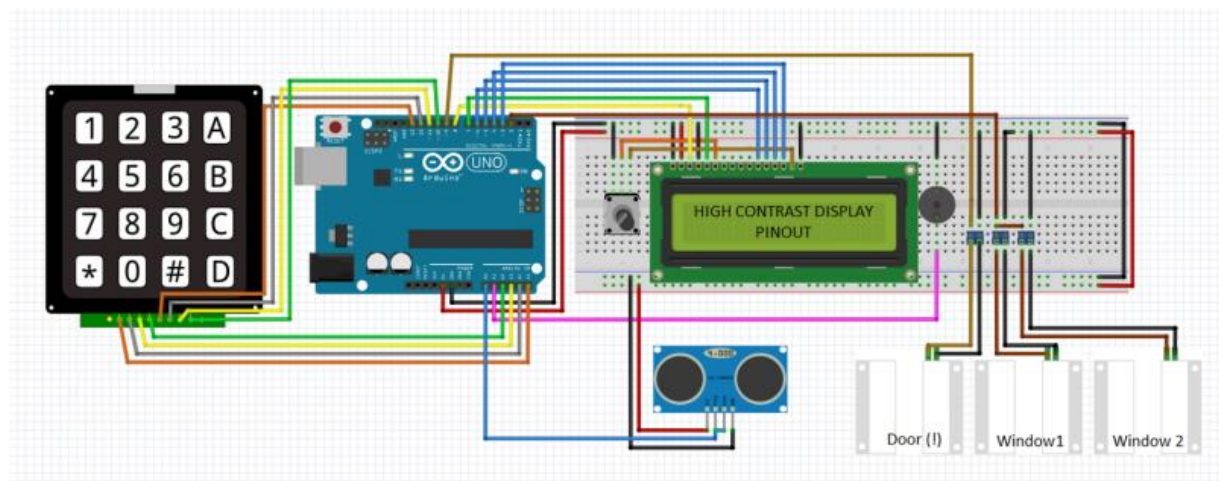


Fig. 1 - General signaling scheme on the basis of MPS Arduino

Sample code (door sensor):

```
// Door is opened, unlock the system!
void unlockPassword () {
    int count = 21; // 20 sec for alarm!
    retry: // label for goto, retry in case of wrong password
    tempPassword = ""; // reset temp password (typing ...)
    lcd.clear (); // clear lcd
    i = 6; // variable to put * while typing pass
    unsigned long previousMillis = 0;
    const long interval = 1000;
    boolean buzzerState = false; // variable to help us make a beep NewTone
    while (! checkPassword) { // While waiting for correct password do ...
        unsigned long currentMillis = millis ();
        if (currentMillis - previousMillis >= interval) {
            previousMillis = currentMillis; // play beep NewTone every 1 sec
            if (! buzzerState) {
                NewTone (buzzer, 700);
                buzzerState = true;
            }
            else {
                noNewTone (buzzer);
                buzzerState = false;
            }
        }
        if (count > 0) { // Screen counter 20sec
            count--;
        }
        else {
            alarmFunction (); // Times is up, ALARM!
            break;
        }
    }
    keypressed = myKeypad.getKey ();
    lcd.setCursor (0,0);
    lcd.print ("ALARM IN:");
    // For screen counter - 20sec
    if (count >= 10) {
        lcd.setCursor (14,0);
        lcd.print (count); // print countdown timer at lcd
    }
    else { // catch '0' below 10 (eg 09)
        lcd.setCursor (14,0);
        lcd.print ("");
        lcd.print (count);
    }
    lcd.setCursor (0,1);
}
```



Connecting sensor leaking fluid (water). The sensor has 3 outputs - +, -, S. plus and minus output is connected in accordance with the breadboard similar inputs, the analog output S is connected to an analog input A0 Arduino board.

Connect the motion sensor. Movement detector HC-SR501 has 3 outputs - GND, Power +, Output. Outputs Power + and GND are connected to the + and - breadboard and Output D9 output to input board Arduino UNO (Figure 2.).

Connecting gas sensor. Gas sensor MQ-2 has four output - VCC, GND, D0, A0. VCC and GND is connected to the + and - breadboard. Yield D0 and A0 are respectively discrete and analog output sensor. This scheme was used only analog output A0 A5 which connects to the analog input board Arduino UNO

Connecting the relay module. relay module has 4 outputs - VCC, GND, IN2, IN1. VCC and GND are connected to the breadboard. IN1 IN2 and outputs connected to the binary inputs D5 and D6, respectively. Module 2 has an additional input under 220V device. This is to ensure that when any of the sensors, Arduino sending the relay signal to switch illumination or fan to ventilate the room. Connecting GSM Shield Neoway M590 M590 module has 8 outputs - + 5V, GND, I, T, R, V, K, G. outputs + 5V and GND are connected to corresponding inputs on Arduino board. The outputs T and R are communication channels Tx and Rx, where Tx-receiver, and Rx-source. They are connected to the discrete inputs D2 and D3, respectively. To turn on the output of the module K must be connected to the output of G, and therefore worth a jumper between them.

Connection of the sensor door opening door opening sensor is connected to one output + breadboard, and a second output connected to the digital input boards D10 Arduino. For proper operation of the sensor, the output D10 must be short-circuited through 10K resistor to GND. Connecting buzzer MH-FMD buzzer has 3 outputs - VCC, GND, I / O. VCC and GND are connected to respective tracks on the breadboard. Output I / O is connected to a logic input on D8 Arduino.

УДК 697.95

This system can operate as a burglar alarm (protective regimen), and a warning mode (operating in the laboratory to prevent leakage and so on)

To arm the alarm is armed is a button "A" on the numeric keypad. After pressing system gives 10 seconds to leave the premises. After 10 seconds, a protection mode is enabled and the penetration into the territory of the laboratory involved beep. In order to disarm the alarm mode you must enter the correct password and press "\*" on the keypad. It is also has a function to change the password by clicking the button «B». In the present fire-alarm reed sensor 3 is used and ultrasound 1 that would track the movement. When you open the door, entered have 20 seconds to enter the correct password before the system will give a loud signal.

Conclusion: These developments burglar-alarm on the Arduino-based ICS can be used as a basis for the development of burglar alarm systems. Computer system burglar-alarm can be used in various industries, and in contrast to other similar systems, its cost is much smaller. So it could easily be integrated into other alarm system and changed for the needs of the user.

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### ВЫБОР СХЕМЫ КЛИМАТИЗАЦИИ ВЫСОТНЫХ ЗДАНИЙ ПРИ КАПИТАЛЬНОМ РЕМОНТЕ НА ПРИМЕРЕ АДМИНИСТРАТИВНОГО ЗДАНИЯ В Г. МОСКВА

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#### АННОТАЦИЯ

Статья посвящена вопросам выбора оптимального способа климатизации высотных зданий построенных в России в 60-70-е годы, которые в настоящее время находятся в состоянии износа и