

ДИАЛОГ КУЛЬТУР

МАТЕРИАЛЫ XV МЕЖДУНАРОДНОЙ НАУЧНО-ПРАКТИЧЕСКОЙ КОНФЕРЕНЦИИ НА АНГЛИЙСКОМ ЯЗЫКЕ

**Научное издание
Часть II**



**Санкт-Петербург
2022**

Министерство науки и высшего образования Российской Федерации
ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ
«Санкт-Петербургский государственный университет
промышленных технологий и дизайна»
Высшая школа технологии и энергетики

МАТЕРИАЛЫ

XV Международной научно-практической конференции на английском языке «ДИАЛОГ КУЛЬТУР»

Научное издание
2022 • Часть II

*Под общей редакцией заведующей кафедрой иностранных языков,
кандидата филологических наук, доцента
В. В. Кирилловой*

Санкт-Петербург
2022

УДК 62+54+502.001

ББК 31+35+20.1

Д 44

Редакционная коллегия:

кандидат филологических наук, доцент, зав. кафедрой иностранных языков
В. В. Кириллова (Санкт-Петербургский государственный университет промышленных технологий и дизайна, Высшая школа технологии и энергетики);
доктор технических наук, профессор, директор Мегафакультета биотехнологий и низкотемпературных систем
И. В. Баранов (Национальный исследовательский университет ИТМО);
доктор технических наук, профессор Мегафакультета наук о жизни
Е. И. Верболоз (Национальный исследовательский университет ИТМО)

Ответственные редакторы:

старший преподаватель кафедры иностранных языков
Е. Н. Лашина (Санкт-Петербургский государственный университет промышленных технологий и дизайна, Высшая школа технологии и энергетики);
старший преподаватель кафедры теплосиловых установок и тепловых двигателей
М. С. Липатов (Санкт-Петербургский государственный университет промышленных технологий и дизайна, Высшая школа технологии и энергетики)

Д 44 Материалы XV Международной научно-практической конференции на английском языке «Диалог культур». В 3 ч. / Минобрнауки РФ; ФГБОУ ВО «С.-Петерб. гос. ун-т промышленных технологий и дизайна»; сост. Е. Н. Лашина, М. С. Липатов; под общ. ред. В. В. Кирилловой. — СПб.: ВШТЭ СПбГУПТД, 2022. — Ч. II. — 226 с.

ISBN 978-5-91646-302-6

В настоящем сборнике представлены материалы XV Международной научно-практической конференции на английском языке «Диалог культур». В сборнике собраны материалы из областей машиностроения, экологии, химических технологий, автоматизации, информационных технологий.

Сборник предназначен для широкого круга читателей, интересующихся научными исследованиями и разработками докторов, профессоров, доцентов, преподавателей, аспирантов, магистрантов и студентов учебных заведений, а также всех тех, кто проявляет интерес к рассматриваемой проблематике с целью использования в научной деятельности и учебной работе.

Материалы представлены в авторской редакции. Ответственность за аутентичность и точность цитат, имен, названий и иных сведений, а также за соблюдение законов об интеллектуальной собственности несут авторы публикуемых статей. Организаторы конференции не несут ответственность перед авторами и/или третьими лицами за возможный ущерб, вызванный публикацией статьи.

Материалы конференции размещены в научной электронной библиотеке elibrary.ru и зарегистрированы в наукометрической базе РИНЦ (Российский индекс научного цитирования).

УДК 62+54+502.001

ББК 31+35+20.1

ISBN 978-5-91646-302-6

© ВШТЭ СПбГУПТД, 2022

© Коллектив авторов, 2022

Ministry of Science and Higher Education of the Russian Federation
FEDERAL STATE BUDGETARY EDUCATIONAL INSTITUTION OF HIGHER EDUCATION
**“Saint Petersburg State University of Industrial Technologies and Design”
Higher School of Technology and Energy**

PROCEEDINGS
**of the XV International Scientific and Practical
Conference in English
“DIALOGUE OF CULTURES”**

Scientific publication
2022 • Part II

*Under the general editorship of Head of the Department of Foreign
Languages, PhD in Philology, Associate Professor
V. V. Kirillova*

Saint Petersburg
2022

UDC 62+54+502.001

BBK 31+35+20.1

D 44

Editorial board:

PhD in Philology, Associate Professor, Head of the Department of Foreign Languages
V. V. Kirillova (Saint Petersburg State University of Industrial Technologies and Design,
Higher School of Technology and Energy);

Doctor of Technical Sciences, Professor, Director of the Mega-Faculty of Biotechnology and Low-
Temperature Systems

I. V. Baranov (ITMO University);

Doctor of Technical Sciences, Professor of the Mega-Faculty of Life Sciences

E. I. Verboloz (ITMO University)

Responsible editors:

Senior Lecturer of the Department of Foreign Languages

E. N. Lashina (Saint Petersburg State University of Industrial Technologies and Design,
Higher School of Technology and Energy);

Senior Lecturer of the Department of Heat Power Installations and Heat Engines

M. S. Lipatov (Saint Petersburg State University of Industrial Technologies and Design,
Higher School of Technology and Energy)

D 44 Proceedings of the XV International Scientific and Practical Conference in English “Dialogue of cultures”. In 3 parts. / Ministry of Education and Science of the Russian Federation; FSBEI HE “Saint Petersburg State University of Industrial Technologies and Design”; compilers *E. N. Lashina, M. S. Lipatov*; under the general editorship of *V. V. Kirillova*. SPb.: HSTE SPbGUITD, 2022. Part II, 226 p.

ISBN 978-5-91646-302-6

This collection presents the proceedings of the XV International Scientific and Practical Conference in English “Dialogue of cultures”. The collection contains materials from the fields of mechanical engineering, ecology, chemical technology, automation, information technology.

The collection is intended for a wide range of readers interested in research and development, doctors, professors, associate professors, lecturers, PhD students, master students and students of educational institutions, as well as all those who are interested in the issues under consideration for use in scientific activities and educational work.

The proceedings are presented in the author’s edition. Authors of published articles are responsible for the authenticity and accuracy of citations, names, titles and other information, as well as for compliance with intellectual property laws. The conference organizers are not liable to the authors and/or third parties for possible damage caused by the publication of the article.

The proceedings of the conference are posted in the Scientific Electronic Library elibrary.ru and are registered in the Scientometric Database of the RSCI (Russian Science Citation Index).

UDC 62+54+502.001

BBK31+35+20.1

ISBN 978-5-91646-302-6

© HSTE SPbGUITD, 2022

© Team of authors, 2022

“SMART HOME” SYSTEM BASED ON THE ARDUINO MICROCONTROLLER

Student **Gaffanova Angelina Ramisovna**,
Student **Ishalin Alexandr Veniaminovich**,
PhD in Technology, Associate Professor **Nizamiev Marat Firdenatovich**,
Kazan State Power Engineering University,
Kazan, Russian Federation

Abstract. Today, everyone is striving for home automation. In the apartment many of us have a robot vacuum cleaner, dishwasher, security cameras, etc. But the Smart Home system will expand automation capabilities and ensure safety and comfort. The system will monitor temperature changes, safety systems, gas and water leaks, lighting, and notify of ignition.

Keywords: arduino, sensor, signal, temperature, humidity, transmitter, receiver, security, microcontroller.

СИСТЕМА «УМНЫЙ ДОМ» НА БАЗЕ МИКРОКОНТРОЛЛЕРА ARDUINO

студент **Гаффанова Ангелина Рамисовна**,
студент **Ишалин Александр Вениаминович**,
канд. техн. наук, доцент **Низамиев Марат Фирденатович**,
Казанский государственный энергетический университет,
г. Казань, Российская Федерация

Аннотация. Сегодня все стремятся к домашней автоматизации. У многих из нас в квартире есть робот-пылесос, посудомоечная машина, камеры наблюдения и т. д. Но система «Умный дом» расширит возможности автоматизации и обеспечит безопасность и комфорт. Система будет следить за изменениями температуры, системами безопасности, утечками газа и воды, освещением и оповещать о возгорании.

Ключевые слова: Ардуино, датчик, сигнал, температура, влажность, передатчик, приемник, безопасность, микроконтроллер.

For the implementation of the Smart Home system in Figure 1, a model of a residential apartment with an area of 31.5 m² was chosen, consisting of: kitchen, living room, bedroom, bathroom, hallway and loggia.



Figure 1. Two-room apartment layout

Each room has a specific sensor to ensure comfort and safety in the apartment.

In the kitchen, it is important to monitor the proper operation of appliances and prevent gas and water leaks, as in most cases it leads to emergencies. Almost everyone has gas stoves installed, so it is important to install a gas sensor to ensure safety. Its principle of operation is that when the rated value of gas in the air (GOST R 54961-2012) increases, it triggers an alarm light signal, signaling a gas leak [1]. It is also necessary to install a fire alarm, which will catch the infrared radiation inherent in the fire. Such sensors can send a signal to a smartphone and the appropriate security services.

The bathroom has the need to monitor humidity and air temperature. With the help of temperature and humidity sensors, you can observe the temperature in the room we need. The principle of operation of the sensors is that when the temperature and humidity rise above or below the nominal value (GOST 30494-2011), the ventilation system is activated [2].

Table 1 – Room temperature and humidity reading rate

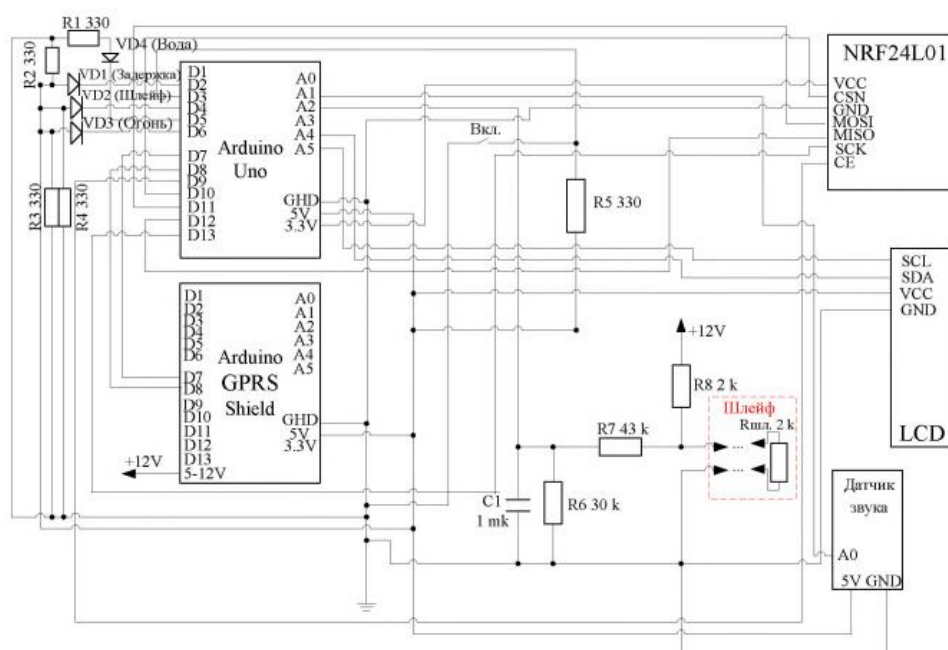
Temperature, °C	Humidity, %
18-26	45-60

If the temperature readings do not exceed this value, but the humidity is more than normal, then the ventilation still begins to work.

All sensors work around the clock, but if suddenly one of the sensors works, then an emergency notification comes to the owner's smartphone, and the LCD display also reflects the temperature and humidity indicators in the room.

The security system is implemented in the form of three operating modes. The transition to the first mode of operation is carried out by pressing a button or loud sound, which will catch the sound sensor. If within 5 seconds the landlord disappeared from the field of view of the sensor, then the signal system goes to the second mode of operation, where any movement in the room will be

The Smart Home system consists of two units: a transmitter and a receiver. Also, the Smart Home system transmits sensor readings via a radio channel. For this, a combination of a microcontroller and a NRF24L01 radio module is used. One is used on the receiver side and the other is used on the transmitter side. The transmitter unit consists of a MEGA microcontroller, a DHT-11 temperature and humidity sensor, a HC-SR501 motion sensor, a liquid sensor, a combustible gas sensor MQ5 and a fire sensor module. All sensors supply data to the Arduino MEGA analog inputs, except for the DHT-11 temperature and humidity sensor, as it transmits data to the digital output. After that, the data is packed into an array and sent to the NRF24L01 radio module via the SPI interface (outputs: SCK, MOSI, MISO and SS) [3].



There is an alarm loop in the receiver unit. Alarm loops are a chain of sensors connected in series and in parallel. Multiple sensors can be connected to one.

Several sensors can be connected to one loop, both normally closed (NC) and normally open (NO) [4].

Let's take a look at the scheme of the alarm loop operation. The button “On” is used to turn on the alarm. A short press on the “On” button, while applying a logic zero level to the input D3 of Arduino Uno, the rest of the time there is a logic one level on the input D3 due to the resistor R5, leads to starting the timer for 5 seconds (this is signaled by the blinking of the LED VD1). This time is necessary in order to have time to leave the protected premises without triggering the alarm system. The visual control of the loop is performed by the red LED VD2, the LED VD2 starts blinking for the duration of the timer, but there is no sign for alarm messages. The alarm unit controls the resistance of the loop. If the resistance is less than the lower or more than the upper threshold, the unit alarms.

The resistance of the loop defined by the terminating resistor is considered normal. If the thief closes the wires of the loop or breaks them, then the alarm will go off.

Table 2 – Nominal value of loop resistance

Upper Threshold	Lower Threshold
5900 Ohm	540 Ohm

Loop resistance in the range 540-5900 ohms is considered normal, but if the value exceeds the specified loop resistance limits, an alarm will be triggered.

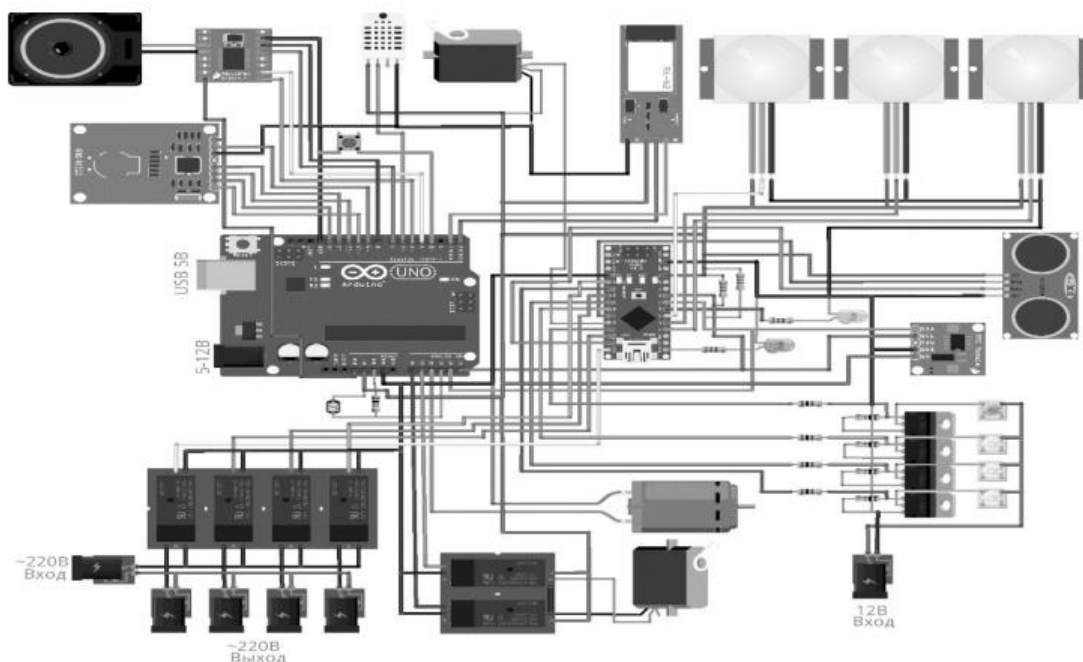


Figure 3. Arduino Module Connection Diagram

The Smart Home system with the help of an Arduino microcontroller (Figure 3) can control all systems by itself, it is only important to program with the help of the C++ program to your liking. All functions of the system will help to make your life comfortable and safe, and most importantly economical.

References:

1. *GOST R 54961-2012. Sistemy gazoraspredelitel'nyye. Seti gazopotrebleniya. Obshchiye trebovaniya k ekspluatatsii. Ekspluatatsionnaya dokumentatsiya* [GOST P 54961-2012. Gas distribution systems. Gas consumption networks. General requirements for operation. Operational documentation] (in Russian).
2. *GOST R 30494-2011. Zdaniya zhilye i obshchestvennyye. Parametry mikroklimata v pomeshcheniyakh* [GOST 30494-2011. Buildings residential and public. The parameters of the microclimate in the premises] (in Russian).
3. Arduino dlya nachinayushchikh [Arduino for beginners]. URL: <https://clck.ru/NY6j2> (Accessed: 10.03.2022).
4. Rabochiy proyekt Arduino. Okhrannaya signalizatsiya [Working project ARDUINO. Security alarm system]. URL: <https://clck.ru/dZ96x> (Accessed: 10.03.2022).

Список литературы:

1. ГОСТ Р 54961-2012. Системы газораспределительные. Сети газопотребления. Общие требования к эксплуатации. Эксплуатационная документация. – М.: Стандартинформ, 2014. – Текст: непосредственный.
2. ГОСТ 30494-2011. Здания жилые и общественные. Параметры микроклимата в помещениях. – М.: Стандартинформ, 2013. – Текст: непосредственный.
3. Arduino для начинающих: [сайт]. – URL: <https://clck.ru/NY6j2> (дата обращения: 10.03.2022). – Текст: электронный.
4. Рабочий проект Ардуино. Охранная сигнализация: [сайт]. – URL: <https://clck.ru/dZ96x> (дата обращения: 10.03.2022). – Текст: электронный.

© Гаффанова А. Р., Ишалин А. В., Низамиев М. Ф., 2022