



THEME: ARDUINO PLATFORM: ADVANTAGES AND CHARACTERISTICS

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Abstract:

The article is of interest to novice developers of electronic devices. The Arduino family of boards are considered, which can be used to implement electronic designs for controlling automated systems. The article presents a comparative analysis of the characteristics and capabilities of the Arduino family of boards, the prospects for their use are revealed. The disadvantages and advantages of using each type of Arduino family boards are indicated.

Keywords: Configuration, the control algorithm, memory, board, electronic device, programmable microcontroller, the robot.

Arduino is an electronic designer and a convenient platform for the rapid development of electronic devices. Due to the convenience and simplicity of the programming language, as well as the open architecture and program code, these platforms are popular all over the world.

Arduino as a microcontroller can be represented in the form of a computer, which consists of a processor, permanent and RAM. The processor is used to perform arithmetic and logical operations, the user program is stored in permanent memory, and the RAM is used to store intermediate data.

The device is programmed via USB, and no programmers are used. Arduino-based devices can receive information about the environment through various sensors and can also control various actuators. The microcontroller on the board is programmed using the Arduino programming language, which is based on the Wiring language. In turn, the Arduino development tool is based on the Process environment. Arduino-based device designs can work both independently and interact with software.

The boards can be assembled independently or purchased assembled; the software is available for free download. Let's conduct a comparative review of the most popular versions of Arduino platforms.

When considering the platforms, we will proceed and build on the capabilities of the flagship DIY platform Arduino Uno, since the boards of this family gave an incredible impetus to the development of hobby electronics all over the world. Various manufacturers that produce modules, sensors, etc. first check compatibility with Arduino Uno, and then with all other devices. Arduino Uno has a 16 MHz processor, 32 GB of permanent and 2 GB of RAM, 20 I/O ports, 6 analog inputs, 6 PWM channels. There are a huge number of video tutorials and ready-made libraries that will help you learn the Arduino C++ language.

The Arduino Leonardo board is very similar to the Arduino Uno, but with a different microcontroller. She is in the same class but has some positive differences. It has many analog inputs for sensors, pulse width modulation (PWM) channels, hardware interrupt pins, separate independent serial interfaces for USB. Such a board can be programmed with a keyboard or mouse (HID device) for a computer, while creating your own input device. Sometimes there is incompatibility with some other expansion boards due to the difference in the location of the Arduino Uno board when it is connected.

An alternative to this board may be Iskra Neo. It is the same as the Arduino Leonardo, but it is made in Russia and is noticeably cheaper than the original.

The Arduino Mini microcontroller is a copy of the Arduino Uno, but in a different form factor. Compact, but because of the form factor, it is impossible to install Arduino expansion boards without tricks. There is no USB port on the board, so you need to flash through a separate USB-Serial adapter. An alternative may be the Russian Iskra mini.

Another board is the Arduino micro. It is the same Leonardo, but in a different form factor. Due to its compactness, it has the same problems as the Arduino Mini.

The Arduino mega is similar to the Arduino Uno, but based on a more powerful microcontroller of the same architecture. An excellent choice when expanding the capabilities of an existing system in case the Arduino Uno board has stopped coping with the volume of tasks assigned. It has many times more memory: 256 KB of permanent and 8 KB of RAM. There are many times more ports: 60 of them are 16 analog and 15 with PWM. The dimensions are slightly longer than the basic Arduino Uno.

Arduino Due is one of the most productive boards from Arduino on the Cortex-M3 microcontroller. The form factor is similar to the Arduino Mega. It has an 84 MHz processor and 512 KB of memory. 66 I/O pins, of which 12 can be analog inputs, 12 support PWM and all 66 can be configured as hardware interrupts. The built-in CAN bus controller allows you to create a network from Due or interact with automotive electronics. Two channels of analog-to-digital converter (DAC) allow synthesizing stereo sound with a resolution of 4.88 Hz. However, since the nominal voltage for the board is 3.3 V, and not the traditional 5 V, it is necessary to ensure that the selected peripherals support operation with this level or install voltage level converters.

Arduino Yun is a unique hybrid of Arduino Leonardo and an OpenWRT Linux microcomputer. The board is equipped with Ethernet and WiFi, with which to communicate with the device and even flash the platform remotely. The power of Linux allows you to work with multimedia, and its network capabilities can be easily integrated with social networks and other web services. Since OpenWRT is a stripped-down Linux, not every Linux software can be installed on a microcomputer. Only Bash and Python can be used as programming languages out of the box.

For clarity of the difference in parameters and convenience of choosing the model of Arduino platforms, the main technical parameters of the most popular boards are collected in the table below:

Table-1
The main technical parameters of the Arduino line of boards

Characteristic	Mega	Uno	Nano	Mini
Microcontroller	ATmega2560	ATmega328p	Atmel ATmega168 or ATmega328	ATmega168
Operating voltage V	5	5	5	5
Input voltage (recommended) V	7-12	7-12	1-12	7-9
Input voltage (limit) V	6-20	6-20	6-20	-
Digital Inputs/Outputs	54 (14 can to be used as a PWM output)	14 (6 can be used as a PWM output)	14 (6 can serve as PWM outputs)	14 (6 as PWM outputs)
Analog inputs	16	6	8	8 (4 have)
Direct current through input/output mA	40	40	40	40
Direct current for 3.3V mA output	50	50	-	-
Flash Memory KB	128 (4 uses bootloader)	32 (0.5 uses bootloader)	16/32 ATmega168/ ATmega328) (2 uses bootloader)	16 (2 per bootloader)
RAM KB	8	2	1 (ATmega168) 2 (ATmega328)	1
Non-volatile memory	4 KB	1 KB	512 b (ATmega168) 1 Kb (ATmega328)	512 B
Clock frequency MHz	16	16	16	16

CONCLUSION. Summing up the comparison, we can say that the choice of an Arduino board depends on the scope of its application, whether it is flashing an LED, turning on a fan at a certain temperature or creating your own robot, it all depends on the goal being pursued. Arduino Uno is well suited for training beginners since Ait is convenient to connect various external devices to it. Arduino Mini and Arduino micro, due to their small size, are well suited for ready-made devices. It should be noted that Arduino boards can be used not only for the development of devices used in various fields of human activity, but also in the process of training engineering and computer specialists at the university.

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