

Modern concepts and expediency of usage an Arduino

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Abstract: *In this article submits familiarity with the hardware computing platform for amateur design. The structure of the platform and a special environment for the development of programs designed for this platform are considered.*

Key words: *Arduino, informational technologies, shield.*

1.Introduction

Arduino – electronic platform with open source code, which basics on simplicity of hardware and software usage. Arduino's motherboards has processors and memory that are capable of processing data from different sensors – light sensors, displays or messages (Twitter) – and transform them into output – activate engine, turn on LED, publish something in the Internet. There are also a lot of contacts on motherboard, to which you can connect all sorts of components: lamps, sensors, engines, kettles, routers, magnetic door locks and in general everything that works from electricity.

You can download the program into processor Arduino which will manage all those devices according to the preset algorithm. This way you can create an infinite number of unique gadgets, made by your own hands and on your own plan [1,2].

During many years Arduino was the brain of thousands projects, from everyday subjects to complex scientific instruments. The global community of developers - students, amateurs, artists, programmers and professionals – gathered around this open source platform, their contributions supplemented the incredible amount of available knowledge that can greatly help beginners and experts.

2. Formulation of the problem

The purpose of the article is to familiarize with the platform Arduino and the programming environment Arduino IDE, as well as with its potential and the feasibility of using it in household and scientific-technical devices.

3. Results

Arduino was created at Interaction Design Institute Ivrea as a simple tool for the rapid development of prototypes designed for students without special knowledge in electronics and programming. As soon as it reached the wider community, the Arduino board began to change to adapt to the new needs by differentiating the offer from simple 8-bit boards to products for iOS applications, media, 3D printing and embedded environments. All Arduino boards are completely open sources, giving users the opportunity to build their own and ultimately adapt them to their specific needs. The software is also open source, and it grows thanks to contributions from users around the world [2,3,4].

Arduino has gained its ferocious popularity thanks to its simplicity and benevolence. This platform is easy to use, for the development of elementary programs the user will need a small amount of time.

The programs for Arduino are written in the C ++ programming language, supplemented by simple and clear functions for managing input / output on the contacts.

For the convenience of working with Arduino there is a free official programming environment "Arduino IDE", running on Windows, Mac OS and Linux. With the help of it, downloading a new program to Arduino takes place quickly, provided that you connect the board to your computer via USB. Although it may also work through Visual Studio, Eclipse, another IDE or command line.

Complete devices can be collected using a custom breadboard and jumpers that adds versatility and portability to the platform.

Arduino's Integrated Development Environment is a multi-platform Java application that includes code editor, compiler, and firmware transfer module. The development environment is based on the Processing language and is designed for programming by beginners who are not familiar with software development. The programming language is similar to the Wiring language. Strictly speaking, it's C ++, supplemented by some libraries. Applications are processed using a preprocessor, and then compiled using AVR-GCC [3,4].

Arduino programs are written in the programming language C or C ++. The Arduino development environment comes with a program library called "Wiring", which originates from the

Wiring project, which makes many standard I / O operations much easier. Users need to define only two functions in order to create a program that will work on the principle of cyclic execution:

- Setup (): the function is executed only once at the start of the program and allows you to set the initial parameters;

- loop (): the function is executed periodically until the board is switched off.

A typical simple program for a microcontroller that sends a command to flash a light diode in the Arduino environment will look like this:

```
#define LED_PIN 13
void setup () {
  pinMode (LED_PIN, OUTPUT); // Enable pin 13 for digital output
}
void loop () {
  digitalWrite (LED_PIN, HIGH); // Include LED
  delay (1000); // Wait one second (1000 milliseconds)
  digitalWrite (LED_PIN, LOW); // Disable LED
  delay (1000); // Wait one second
}
```

In the example of the program, the constructive feature of most Arduino boards, which have a built-in LED with a load resistor, connected between the 13th contact and the ground, is convenient for many simple tests.

Hardware part. The Arduino board consists of the Atmel AVR microcontroller, as well as the binding elements for programming and integration with other devices. On many boards there is a linear voltage regulator + 5V or + 3.3V. The tapping is carried out at a frequency of 16 or 8 MHz by a quartz resonator. The microcontroller has a boot loader written, so an external programmer is not required [3,4].

At the conceptual level, all boards are programmed via RS-232 (serial connection), but the implementation of this method varies from version to version. Newer boards are programmed via USB, which is possible thanks to the chip of the USB-to-Serial FTDI FT232R Converter. In the version of the Arduino Uno platform, the Atmega8 controller in the SMD case is used as the converter. This solution allows you to program the converter so that the platform is immediately recognized as a mouse, joystick or other device by the choice of the developer with all the necessary additional control signals. In some variants, such as the Arduino Mini or the unofficial Boarduino, for programming, you need to connect a separate USB-to-Serial card or cable to the controller.

Arduino boards allow you to use a large number of microcontroller outputs as input / output contacts in external circuits. For example, Decimila has 14 digital inputs / outputs available, 6 of

which can generate PWM (Pulse Width Modulation) signal, and 6 analog inputs. These signals are available on the board through pads or pin connectors. There are also many different external expansion cards called "shields" that connect to the Arduino card via plug-in connectors.

Expansion devices. Arduino and Arduino-compatible boards are designed in such a way that they can be expanded as needed by adding new components ("shields") to the device. These extension boards are connected to the Arduino using their pin connectors mounted on them. There are a number of unified boards that allow for a constructively rigid connection of the processor board and expansion boards in a stack through the pin rods. In addition, boards with reduced (for example, Nano, Lilypad) and special (for robotics tasks) form factors are issued.

Third-party manufacturers produce a large range of all kinds of sensors and actuators that are more or less compatible with each other and with Arduino processor boards, for example: gyroscopes, compasses, manometers, hygrometers, thermometers, relay modules, indicators, keyboards, etc. [1, 2.3].

The third-party manufacturers also produce sets of electromechanical elements that are designed to work together with Arduino boards (usually through special "driver" cards) - motors, electromagnets, etc. The developer chooses the method of installing and protecting the processor motherboards and expansion components independently.

The principle of sandwich

Another great feature of Arduino is the availability of expansion cards, so-called shields or simply "shields." This is an additional fee that resembles a sandwich over Arduino to give it new opportunities. For example, there are Ethernet Shield extension cards, for managing motor shields, for coordinates and time from GPS satellites (GPS module) and many more.

4. Summary

So, having analyzed various sources, one can conclude that Arduino – an effective tool for the development of programmed electronic devices, which, unlike personal computers, are focused on close interaction with the surrounding world. Arduino – it is an open, programmed platform for working with various physical objects and represents itself simple board with a microcontroller, as well as a special development environment for writing microcontroller software.

Arduino can be used to develop interactive systems run by various sensors and switches. Such systems, in turn, can manage the work of various indicators, engines and other devices. Arduino projects can be either independent or interact with software running on a personal computer (for example, Flash, Processing, MaxMSP). Any Arduino card can be assembled manually or you can buy a finished device. The development environment for programming such a card has an open source and is free. All of the above properties and features contribute to the feasibility of using Arduino in today's conditions of software development environment.

Література

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