# ROBOTS CONTROL TECHNOLOGY USING THE ROBOTREK PLATFORM

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**Abstract.** Analyzing the trends in the development of robotics today, one can imagine a future in which robots will become indispensable assistants in people's daily lives. Perhaps humanity is on the verge of a new era when personal computers will leave the desk and allow us to see, hear, touch and even manipulate objects from a distance. The technology of controlling the movement of robots was analyzed by installing sensors and motion mechanisms used to control robots using the Robotrek platform.

**Key words:** *Robotrek, Tracduino, Embedded systems, robotic devices, Program.*

Program control is the simplest control system used to control manipulators in industrial facilities. Such robots do not have a sensory part, all actions are strictly fixed and regularly repeated. Adaptive control robots are equipped with a sensory part. The signals sent by the sensors are analyzed and, depending on the results, a decision is made on the next action, the transition to the next stage of action, etc. Intelligent control. The intelligent control method is based on artificial intelligence methods. An example of such a robot is a remotely controlled mine clearance machine. Arduino is a small board with its own processor (microcontroller) and memory. There are many types of Arduino, for example: arduino uno, arduino mega, etc. Arduino is very useful for young people interested in robotics and electronics, because on this device you can create small and large programs, algorithms, and perform various devices, robots and other interesting operations. In other words, Arduino is a device that combines software and hardware components.

In 2020, the Development and RoboTrack groups of companies introduced a new multifunctional controller, the Tracduino Pro.

The Trackduino Pro multifunctional controller is an electronic device with the ability to reprogram several times in two programming environments (Phyton and C++).

The Tracduino Pro platform is based on the STM32 microcontroller, a 32-bit controller that has found wide application in industry. The choice of a specific STM microcontroller model was made taking into account the availability of a high-performance 32-bit microcontroller based on the Cortex-M4F core with a floating-point DSP computing system.

Fig 1. Tracduino board

Tracduino Pro is a modern multifunctional microcontroller platform based on the STM32F407VGT6 microcontroller. Due to the high speed of operation and optimized data exchange with memory, it became possible to use the MicroPython language as the main programming language of the platform.

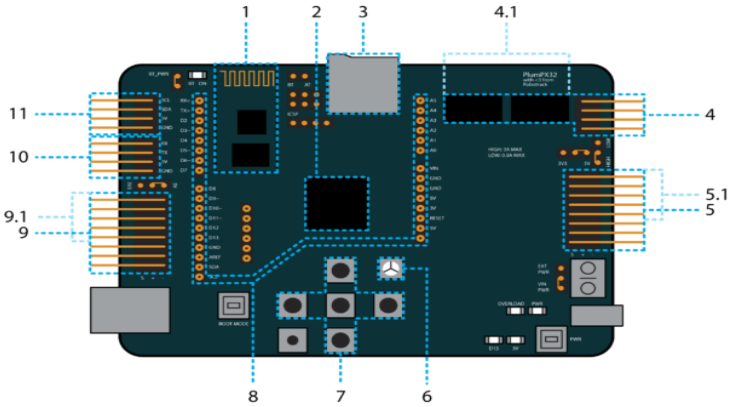


Fig 2. Tracduino Features

This language facilitates the development of prototypes of mobile robots and robotic devices, and also has a low entry barrier, which positively affects the possibility of teaching robotics using high-level languages.

The ability to program in MicroPython for the Trackduino Pro platform allows users to create more complex and productive programs and robotic devices, unlike a visual development environment.

1. Built-in Bluetooth module;
2. Microcontroller STM32F407VGT6;
3. microSD memory card slot;
4. 4x DC motor ports;

4.1. 2x drivers for 2 DC motors;
5. 8x output ports;
5.1. 5x output ports with PWM support;
6. Built-in tri-color LED;
7. 5x built-in control buttons;
8. Arduino Uno interface;
9. 8x input ports;
9.1 5x input ports with PWM support;
10. 2x output USART ports;
11. 2x output I2C ports.
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The platform can be effectively used as a standalone device (for running resource-undemanding machine learning models), for machine learning tasks, and in general as a microcomputer controller with video data processing services using machine learning.

The control board is enclosed in a case with inaccessible ports that may be needed only by "advanced" users (screw terminal block for external power supply, Arduino interface, jumpers for switching the supply voltage of the IN and OUT ports to 3V and 5V, jumper for configuring Bluetooth, etc.). To access these elements, the case cover must be removed.

Power requirements:
- USB - 5 volts exactly
- External power - 6-17 volts.

External power can be:
- A 9-volt battery pack (3 sections) using six AA batteries or a battery;
- Lithium-ion batteries with a total voltage of no more than 17 volts;
- A constant power supply with a voltage of 6 to 17 volts and a current of at least 500 mA (1-3A when using several motors and servomotors).

When using power supplies that are not capable of delivering high currents (for example, alkaline batteries or nickel-metal hydride batteries or weak power supplies), it should be taken into account that large loads can lead to a decrease in the supply voltage. , as a result, to restart the controller, for example

- sudden stops and blocking of the motors;
- sharp changes in the direction of the motors before stopping;
- connecting a large number of servomotors;
- using servomotors to lift excessive weight.

Features of the Trackduino Pro version for Python programming language

The Trackduino Pro platform firmware for Python programming consists of a built-in MicroPython interpreter.

MicroPython is an implementation of the Python 3 programming language, which includes the core set of the Python standard library and is optimized for running on microcontrollers.

The MicroPython version for Trackduino Pro is based on the MicroPython for PyBoard firmware. You can read the documentation for this on the official website.

To program the platform in Python, you need to install the driver. After the driver is successfully installed and the platform is connected to the computer in the correct mode, the platform will appear on the computer as a removable device called PYBFLASH.

TRACKDUINO Pro API for MicroPython is a software loaded onto the platform that allows you to easily program the platform to use the hardware and software components of the Robotrack. The add-on package includes the following components:

● The boot.py script, which describes the behavior of the platform immediately after boot. By default, the main task of this script is to run the main script;

The main.py script, which describes the logic of the robot controlled by the platform;

● The pybcdc.ini configuration file, which contains platform settings information for use on a Windows computer.

Trackduino module, which includes

● The actuator module is a set of driver modules for the Robotrack actuators;

● The sensor module is a set of driver modules for the robot-track sensors;

● The common.py file is a set of common functions and classes that are used in other modules and simplify platform programming;

● The pins.py file is a set of definitions for the pins available on the platform, providing simple named access to the required pins.

Conclusion

The Trackduino controller has a number of built-in devices that allow you to run programs and develop algorithms on the controller without connecting external devices. The built-in programmable buttons and tri-color LED are especially useful for debugging programs.

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