RoboMaster 2019 Robotics Winter/Summer Camp Learning Tracks

Reference

The organizing committee has summarized and compiled the following learning tracks for middle/high school students who wish to improve their knowledge in the robotics field through self-study. Interested students can use this as a reference:

1. Mechanical Structure Design Track

Master any 3D modeling software (such as SolidWorks, Maya, UG, 3Dmax, Pro/E, CATIA, etc., SolidWorks is recommended) to understand basic processing techniques, such as machine engraving, 3D printing, etc. Preference will be given to students with hands-on experience. Next, you should have experience of assembling and implementing a mechanism or item that can perform a specific function. If you encounter any problems in the process, think and solve the problem independently and ensure system functionality.

2. Embedded Systems Track

Students must understand embedded systems. Embedded systems students are mainly responsible for writing robot system framework programs, low-level drivers, peripheral interaction modules, etc., and they must also be able to read circuit schematics. Therefore, the following skills are required for junior/high school students:

(1) Programming language capability. The programming language used by high school students in the winter and summer camps is C. Therefore, it is recommended that students can systematically learn a programming language, master its grammatical structure, write specifications, develop good coding habits and use some code management platforms to record their own code.

(2) Development capability for embedded system development platforms. After mastering the basics of a programming language, students should be able to use it on a development platform. Of course, the first two points here can be done in parallel. The development platform adopted by the high school students in the winter and summer camps is STM32. We will provide the code framework, and campers will only need to write the code they need on the framework. Therefore, in terms of the development platform, students are advised to buy their favorite learning boards on Taobao or directly weld their own. There are many online tutorials available. After discovering that many students have been using the Arduino controller for development, our suggestion here is that it is very good for beginners, but if you want gain deeper knowledge, you must understand the low level development process.

(3) Simple robot making capability. With the first two points, we believe that you have mastered the basic skills of robot development, and can make your own intelligent robot. Add the appropriate sensors to your own board and control the actuator to move according to the planned circuit. These are good projects for improving your personal abilities.

3. Algorithm Track:

Your theoretical algorithm knowledge must be solid. Do not shy away from mathematics, do

not acquire biases, do not aim too high, and learn to analyze the complexity of the algorithm you have learned. Be familiar with a programming language (C/C++ recommended), and implement common algorithms. For actual problems, you must think about establishing a model analysis. In practice, it is only when you apply the methods you have learned and draw inferences from different areas of knowledge can the problems be solved. For example, the path planning problem mentioned in the resume may be quickly realized by the familiar wide search and deep search. However, with the number of grids given by the question, which method requires less time can be analyzed. Therefore, you should deeply explore the Dijkstra algorithm and the A* algorithm to gain more in-depth knowledge. Meanwhile, think about how the specific implementation of their data structure is achieved so as to practice your practical application of the language. When the robot is actually running, its movement is not perfect. Therefore, in practice, we encounter many problems that do not conform to the ideal model. It is very important to combine the theory with practice.

The above descriptions are for reference only. Students can learn according to their actual situations.