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Abstract

C language is one of the oldest programming languages (it's approaching its 50th birthday). It helped us build the foundation of the software world as we know it today, including almost all operating systems. However, even though it is a fundamental part of the technology landscape, some people still complain that C language is no longer competent for this job ... So, is C language already almost there? The answer is absolute, no. The C language is simply like a poplar tree in the programming language world; it will never disappear (but after hundreds of millions of years, we don't know...)

Introduction

The most apparent reason why C language hasn't died is that it is indispensable for so much software we use today. We're not just talking about standard legacy systems; C is inside the operating system and allows us to interact with software and machines. With the rapid development of the Internet of Things and embedded computing, this will only make the C language more critical. Although it is old, it is hidden everywhere in the infrastructure of our existing software that people can not simply discard it. So, how vital is the C language? Even if it doesn't necessarily have a wide range of use cases, it gives developers and engineers insight into how code works at different levels of the software stack, which means that the C language will always be a language that needs attention.

Methodology

Next, we start with the Internet of Things to talk about system layer design flow and design requirements in each step. The standard IoT system can be roughly divided into four levels: perception recognition layer, network construction layer, management service layer, and comprehensive application layer.

1) Perceptual recognition layer:

The perceptual recognition layer is located at the bottom of the four-layer model of the Internet of Things and is the basis of all upper-layer structures. At this level, thousands of various sensors or readers are placed on physical objects, such as oxygen sensors, pressure sensors, light intensity sensors, sound sensors, and so on, to form a specific size sensor network. Through these sensors, it is possible to sense the environmental information around this physical object. Now bar code technology, voice recognition technology, RFID (radio frequency identification technology) and so on are gradually emerging. At this time, it feels like the object is a bit like a creature, and can feel it. When the upper layer feedbacks the command, the physical object can complete the specific control through the single-chip microcomputer, simple or complex machinery. At this time, it looks like a creature and can sense and respond. After detecting the information, how to send it to be used? This requires building layers through the network.

2) Network construction layer:

The network is one of the most important infrastructures of the Internet of Things. The network construction layer connects the perception and recognition layer and the management service layer in the four-layer model of the Internet of Things. It has the role of a link. It is responsible for transmitting awareness information and commands to the lower layer. In short, it is

transmitting data. At this level, a variety of network forms such as the Internet, wireless broadband networks, low-speed wireless networks, and mobile communication networks are used to deliver massive amounts of information.

3) Management service layer:

This level is mainly the killing ground of program apes and siege lions. When a large amount of information generated by the perception and recognition layer is transmitted to the management service layer through the network layer, if it cannot be effectively integrated and utilized, it is equivalent to returning to Baoshan and returning to the air, looking at the "sea of data" and sighing. The management service layer mainly solves how to store data (database and mass storage technology), how to retrieve (search engine), how to use (data mining and machine learning), how not to be abused (data security and privacy protection) and other issues. In short, this level is the effective integration and utilization of the collected information, and this level is often the essence of the Internet of Things.

4) Comprehensive application layer:

The rich connotation of the Internet of Things has led to richer extension applications. The traditional Internet has undergone a data-centric to a people-centric transformation. Typical applications include file transfer, email, the World Wide Web, e-commerce, video on demand, online games, and social networks. The Internet of Things applications are based on "things" or the physical world. As the center, it covers the advanced vocabulary that we often hear now, such as item tracking, environmental perception, intelligent logistics, intelligent transportation, smart grid, and so on. In a

nutshell, the application of the Internet of Things is currently in a period of rapid growth, which is characterized by diversification, scale, and industrialization. This so-called intelligence is actually based on the information collected by the perceptual recognition layer, transmitted by the network construction layer, and managed by the management service layer, and then fed back specific information to the underlying objects to complete the specified commands.

Discussion

Similar to the IoT system design level, driverless software systems are usually divided into three layers: perception, planning, and control. To some extent, unmanned vehicles can be regarded as a "manned robot" under this layered system. Among them, perception includes environmental perception and positioning. In recent years, breakthroughs in deep learning have made image-based. The perception technology of deep learning and deep learning has played an increasingly important role in environmental perception. With the help of artificial intelligence, we are no longer limited to sensing obstacles, but gradually become understanding what obstacles are, understanding scenarios, and it can even predict the behavior of target obstacles. For instance, the actual perception of unmanned vehicles, we usually need to fuse various measurements such as lidar, camera, and millimeter wave radar. The fusion algorithms such as Kalman filtering, extended Kalman filtering, and lidar involved. Those are also some examples of current existing design techniques for these new technology trends.

There are many positioning methods for unmanned vehicles and robots. At present, the mainstream method is a method using

GPS + inertial navigation system fusion, and the second method is based on Lidar point cloud scanning and matching. The planning module is also divided into three layers: task planning (also (Referred to as path planning), behavior planning and action planning, control modules for unmanned vehicles. We often use model-based control methods for prediction. Although unmanned vehicles are understood as robots, and robotic thinking systems are used to handle unmanned vehicle systems, it is currently There is a consensus in the industry, but there are also some cases where purely artificial intelligence or intelligent agents are used to complete unmanned driving. Among them, end-to-end unmanned driving based on deep learning and driving agents based on reinforcement learning is the current research hotspots.

Results

Taking driverless technology as an example, let's talk about the challenges brought by the results of system design.

Technical dilemma:

Technical issues are a major problem encountered in driverless cars. No matter what level of driverless driving, perception is an indispensable step. Only by sensing the surrounding environment of the vehicle during its driving can we make corresponding path planning and driving behavior decisions. At present, the sensors used for sensing have their own advantages and disadvantages, and it is difficult to find a sensor device that can adapt to various environments. For example, the lidar's ability to penetrate rain and fog is limited, and the reflectivity of black cars is limited; the millimeter-wave radar is not sensitive to the reflection of animal bodies; the sensing distance and frequency of the ultrasonic radar are

limited; the camera itself is imaged by visible light. In rainy and foggy days and nights, its sensitivity will decrease. In addition, how to improve the visual ability of the car is also a difficulty faced by driverless cars. Driverless cars not only need to identify other vehicles in the surroundings, but also must be able to detect the surrounding lanes, A series of related factors such as pedestrians and traffic signs. When in harsh environments such as rain and snow, driverless cars may not be able to accurately identify relevant factors in the surrounding environment, making it difficult to make judgments and decisions. In addition, complex road conditions are another problem that driverless cars need to consider and solve. Road conditions in different countries, and even in different cities in a country, there may be a certain degree of difference in road conditions in different regions, with better technology. Means to cope with different road conditions and solve corresponding problems is one of the tasks faced by driverless cars in the future.

Cognitive Dilemma:

As a new technology and new product, self-driving cars, in the process of gradually forming a new market, the degree of government, market and consumer awareness are very important. Consumers' understanding and acceptance of driverless cars is an unavoidable issue. According to a survey by relevant US research institutions, 75% of drivers are cautious about self-driving cars, and some of them are even skeptical. For consumers, the issue of driverless safety is their biggest concern, and some negative news may make them prohibitive. In recent years, with the major auto companies such as Tesla, Uber, Ford, and other driverless car accidents have occurred, resulting in driver casualties, the issue of driverless car safety has caused more and more extensive

discussion. At the same time, the government's awareness of driverlessness is also very important. At present, more than 20 states in the United States have allowed self-driving cars to conduct actual road tests. However, the state governments in the United States have relatively loose supervision of self-driving car road tests, which has also led to accidents to a certain extent. Therefore, a deep understanding of driverless cars still requires a long period of accumulation.

Ethical and legal dilemmas:

Regarding driverlessness, there are many ethical and legal dilemmas that remain unresolved. When a road accident occurs, the judgment made by a driverless car should give priority to protecting the owner, or to sacrifice himself and the owner in order to protect the school bus full of children; when the driverless car accident occurs, it is the owner Responsible or car manufacturer? Laws in related fields are not yet mature. These ethical dilemmas and legal dilemmas have infinitely prolonged the process of mass adoption of drone cars. In general, although driverless cars are currently facing many difficulties and problems in terms of technology, cognition, cost, laws and regulations, and industrialization has also encountered bottlenecks, in essence, driverless cars are built on the safety of traditional cars On the basis of the gradual upgrading of technology and intelligent technology, it has a high guarantee for the safety and traffic efficiency of the transportation system, and to a certain extent represents the development direction of future intelligent driving. Therefore, its prospects are optimistic for many enterprises.

Conclusion

C language never seems to be out of date. It is very close to the hardware, highly portable, and resource deterministic. It is ideal for low-level development of operating system kernels and embedded software. Its versatility, efficiency and good performance make it the best choice for high-complexity data processing software (such as a database or 3D animation).

Many programming languages today use the C language for their intended use, and it does not necessarily mean that they use the C language in all areas. When performance is a priority, C is still unparalleled. System layer build-up in IoT / Robotics / Autonomous Car and other system design, system compilation is inseparable from C language. The C language has been irreplaceable by human technology from the past to the present, and it is still the future for many areas of software development.

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