

A Research on 3D Terrain Simulation in Embedded Operating Systems

Du Ying

Surveying and Mapping Institute, Information and Engineering University, Zhengzhou, 450052,
China (e-mail: zzdy2003@sina.com)

Wu Yu-guo

Zhengzhou Teachers' College, Zhengzhou, 450052, China (e-mail: hellomf@163.com)

Mo Fan

Surveying and Mapping Institute, Information and Engineering University, Zhengzhou, 450052,
China (e-mail: hellomf@163.com)

As we all know, it is quite difficult to implement 3D terrain simulation, just because this technology is related to many advanced subjects, such as Computer Graphics, Scientific Computing Visualization, Virtual Reality, etc.

In addition, expensive hardware devices with high performance are always required during the whole simulation. It is just these factors that have prevented 3D terrain simulation from developing in embedded operating systems (such as VxWorks), which are not as popular as desktop operating systems (such as Windows and Unix).

However, embedded operating systems are the only choice in many special fields, such as aviation industries. Moreover, embedded hardware devices, instead of personal computers and workstations, are introduced into these fields, which behave not as well as those in desktop operating systems.

All these have resulted in the difficulties in implementing 3D terrain simulation in embedded operating systems. The reason may be summarized as following:

First, embedded operating systems are not as convenient as desktop operating systems, and developers should take many complex questions into consideration, such as real-time, response time, throughout, quick startup, error processing, automatic recovery, etc.

Second, two kinds of computers are needed during the development, which are named "Target" and "Host". This, different from the one-computer-model in desktop operating systems, is called "Cross Development".

The reason is that developers have to design their own boards to implement some special functions, and at the same time, softwares cannot be developed on those boards and an assistant computer should be used to help developing. This computer, may be a PC or a workstation, is just what we called "Host", and the board is what we called "Target".

This paper discusses how to implement 3D terrain simulation in embedded systems. Considering the specialties and complexities of embedded operating systems, the emphasis is only laid on part of key points, including how to deal with quick response of embedded operating systems, how to make the most of limited memory, and how to design a friendly human-computer interface for interactions.

The whole research is based on VxWorks, a high performance real-time embedded operating system. And the Integrated Development Environment (IDE) is Tornado, an integrated environment for software cross-development. It provides an efficient way to develop real-time and embedded applications with minimal intrusion on the target system. As a result, a prototype system

is designed and implemented to test what has been discussed in this paper, and recently, this system has been put into practice in an aviation corporation and behaves high performance.