Prototype Implementation of the Direct3D-on-OpenGL Library

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Abstract. In this paper, we aimed to provide Direct3D graphics features on Linux-based systems, which are actively used for various portable game platforms and mobile phone devices. Direct3D is used as one of the most important middle-ware for game and graphics applications developed on Microsoft Windows operating systems. However, this graphics library is not commonly available for other operating systems. We present a prototype library to provide Direct3D functionalities on Linux-based systems, using the OpenGL graphics library. In typical Linux-based systems, only the X window system and OpenGL graphics library are available. There are lots of needs to port Direct3D-based applications on these systems, and our Direct3D-on-OpenGL library would be a good starting point. Selecting a set of widely-used Direct3D data structures and functions, we implemented selected Direct3D functionalities and finally acquired a prototype implementation. Our implementation currently covers 3D transformations, light and material processing, texture mapping, simple animation features and more. We showed its feasibility through successfully executing a set of Direct3D demonstration programs on our implementation.

Keywords: DirectX, OpenGL, Implementation, black-box testing.

1 Introduction

In this paper, we present a prototype implementation of Direct3D graphics functionalities on Linux-based systems. Notice that the Linux-based systems are now used for various portable game platforms and mobile phone devices[1,2,3]. In contrast, Currently, Direct3D is used as one of the most important library for graphics output, mainly for applications developed on Microsoft Windows operating systems[4]. In contrast, this graphics library is not commonly available for other operating systems. Thus, we are hard to use it on other operating systems, at least at this time.

As the first step to provide an easy way of porting Direct3D-based game applications to other operating systems, we designed and implemented a graphics
library which provides Direct3D graphics API functions on Linux-based systems. Since this library can be used to directly port the graphics and game applications originally developed for PC desktops in a straight-forward manner, we expect it to be a cost-effective way of porting these programs.

As shown in Figure 1, our final goal is to get the same graphics output for both of the desktop Direct3D application programs and the new implementation of our Direct3D-on-OpenGL architecture, which corresponds to the right side of the figure.

2 Related Works

Typical Linux-based systems, or especially for embedded Linux-based systems, they usually provide OpenGL (or its equivalent) for 3D graphics output. OpenGL is one of the most widely-used 3D graphics libraries, and continuously improved to reflect the current state of the art[5].

As an example, OpenGL ES is newly released for handheld devices including mobile phones[6]. OpenGL ES shows a good example of re-constructing a general purpose desktop 3D graphics library for small embedded systems[7]. We also take a similar way, to get a selected set of original Direct3D functions.