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Design and Realize of the Graphics Platform for LED Lamps' Layout Based on GDI+ and Dual-Buffer

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Abstract

Based on the GDI+ class library and dual-buffer technology of .NET framework, the software for LED lamps' layout is developed. On the basis of determining the scheme of layout platform, the metafile class library model by Composite design-set and the process of calling the LED pixels metafile symbol interface are designed firstly. The design method of realizing the LED pixels metafile visual editing on the drawn LED logical pixel based on GDI+ is analyzed. The dual-buffer technology is used to solve the problem of flicker when fast refreshing. The testing results show that the platform can meet the basic function requirements of engineering application, and realize partial adjust on the process of LED lamps layout without distortion.

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Keywords: Led Lamp; Layout; GDI+; Dual-buffer

1. Introduction

Urban landscape lighting is an important means to beautify the living environment and show the splendors of the city. As the fourth generation product in lighting industry, LED has the characteristics of long life, high luminous efficiency, light colour purity, stability, security, no radiation, low power consumption and shock resistance, which gradually replaces the traditional light source in the landscape lighting and other lighting area^[1,2]. The expansion of the LED lamps scale, improvement of landscape design complexity and the integrated requirement of the complex building surface and the LED lamps, lead to the arbitrary spatial relationship of the LED lamps, which makes the uneven distribution of LED

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lamps and LED pixels. When making the layout of LED lamps on computer screen, the non-proportion amplification of the LED pixels spacing causes the deformation effect of the actual layout result. So the platform design for LED lamps layout becomes one of the key problems in the heterogeneous LED decorative lights control system^[3].

The software for LED lamps' layout should realize two basic functions: ①to describe the position of each LED lamp in the layout plane, the LED pixel physical coordinates must correspond to the logical coordinates on the computer screen. ②to control all the LED lamps properly and achieve data transmission and display, the control logic mapping between controller and LED lamps must be realized. The representative software platforms for the LED lamps' layout are: LED Manager, Easy Player and LED Player, which have largely achieved the functions above. Led Manager achieves the LED pixel layout by filling the data table one pixel by one pixel, in which a pixel needs to fill in four parameters (physical and logical coordinates). When dealing with a large project, the complex operation process causes a great many of work^[4]. Easy Player supports directed graphic operation, but does not support the partial adjust of the layout documents^[5]. Led Player is not open to consumers, which directly provides the layout file if it is the general layout of video wall, when the project is needed to change, the user can do nothing^[6]. Combined GDI+ class library with dual-buffer technology, which is powerful in developing general graphical under the .NET framework of Windows platform, this paper has designed a software platform for LED lamps' layout, which supports animation editing effect and partial adjust on the process of LED lamps layout.

2. The key technology of graphics platform design for LED lamps' layout

The graphics platform for LED lamps' layout is designed to be used in the control of heterogeneous LED decorative lights system. The platform has the following features: mapping position and control logic relationship of LED lamps; achieving graphical operation; supporting auto and manual layout together; realizing partial adjust on the process of LED lamps layout without distortion. The technical architecture of layout platform is shown in Fig. 1.

When the LED master-slave logic controller receives a request from client application side, it sets its own parameters according to the request and transfers the request to the LED pixel drawing logic model, which calls the GDI+ metafile class library through the interface function and sends the resulting data to View based on dual-buffer technology, then feeds back to the client application side through pages. The key technologies involved in the design will be described below.

2.1 Design of GDI+ metafile class library

GDI+ is the upgraded version of GDI. It optimizes the performance of GDI and offers more excellent features^[7]. The circle, line and other metafiles needed in the design of the platform can be achieved by applying GDI+ to pack different metafile class. To reduce the developing difficulties, the Composite designed-set is used to construct the class library model using metafile as the object. The structure of the model is shown in Fig. 2.

When building a metafile-objected model, the metafile is the Component, simple metafile (Point, Straight line) is the leaf, the complex one (graph) is the Composite. By abstracting the class as well as using the multi-state characteristics of class, interactions between the metafiles class are achieved. The unified external interface of graphs (point, line, surface) is designed and the graphs are packaged as dynamic link library.

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