Colors Are Changing

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Why Change?

Both BellSouth and IBM Rochester have reported dissatisfaction with the way ATK handles colors. IBM Rochester is especially concerned that ATK applications allocate too many colors. Both IBM and BellSouth are concerned with the horrible default appearance of images.

Why Does ATK Have These Problems?

One of the major reasons that ATK applications consume so many colors is that once a process has used a color that color will remain allocated until the process exits. Images look so horrible because on a typical display (8-bit pseudocolor) ATK uses only 5 evenly spaced intensity levels for each of the red, green and blue components. This limit is in place so that displaying images in ATK won't consume all available colors.

Goals

Our goal in implementing these changes is that ATK applications should look the best they can, while not interfering with the appearance or function of other applications.

What are the Constraints?

The X Window System provides several ways of organizing the colors an X server can provide.

Static Gray

A fixed set of gray levels are provided. Typically these are monochrome displays with only 2 gray levels. (i.e. black&white)

StaticColor

A fixed set of colors are provided. They may be arranged so as to provide a 'good' coverage of the color spectrum.

TrueColor

A linear range of intensities is allowed for each of the red, green and blue components. The precision available for each component may be different. (For example a fairly common organization on PC displays is 32 reds, 64 blues, and 32 greens.)

GrayScale

A fixed maximum number of gray levels can be used simultaneously. The number of gray levels available might be larger than the number which can be used simultaneously.

PseudoColor
A fixed maximum number of colors can be used simultaneously. The number of colors available is usually larger than the number which can be used simultaneously. The most common display type is 8-bit pseudocolor. These displays can show 256 distinct colors simultaneously, out of palettes ranging from 262144 to 16777216 colors(depending on the particular hardware).

DirectColor
A fixed maximum number of intensity levels for each of the red, green and blue components can be used simultaneously. The number of intensity levels available may be larger than the number which can be used simultaneously. This mode is usually made available as an option on displays which use the TrueColor organization normally.

StaticGray, StaticColor and TrueColor are easy to use, whatever colors are needed are simply allocated. The hardware will show the closest color it supports.

GrayScale, PseudoColor and DirectColor are more complicated since they provide a variable resource which may be exhausted. Some strategy must be used to avoid exhausting the available colors, gray levels, or component intensities. Further, the strategy should optimize the appearance of the application or image to be as close as possible to the intended appearance.

What is the Standard Solution?

The standard way to address this issue is to use a standard colormap, or a standard graymap. A standard colormap or graymap has a selection of colors generally representing an even spacing over the available colors or gray levels. These colors are chosen and allocated at the time the map is set up and cannot be altered except by installing a new standard map. The major drawbacks to this method are that the coverage is generally quite sparse in order to cover the entire range colors available, and some of the colors allocated for the map may never be needed. Further, due to technical issues in how the standard maps are created they should always be installed as soon as possible after the X server starts. It is therefore inadvisable for an application to install a standard map. One example of how sparse a color map can be is the default standard colormap for an 8-bit pseudocolor display with 256 intensities available per red, green, blue component. This standard colormap offers only 5 intensities for each component, thus using 125 out of the 256 available color cells.

What Will We Do?

1. Colors will be deallocated when not in use.
2. When a color cube is needed RGB_DEFAULT_MAP will be used if it is defined and the user has not indicated otherwise.
3. In the absence of RGB_DEFAULT_MAP or if the user so indicates then the largest color cube possible will be used subject to any user imposed limit.
4. ATK applications will redraw automatically if the mapping from a color specification to an actual color must be changed.
5. Allow only needed colors from the color cube will be allocated.

What Might We Do?

6. We may provide a quota for exact colors, allocating from a color cube if the quota is exceeded.
7. The color cube may be automatically reduced in size if the color resources are exhausted.
8. We may work to reduce the 'technicolor' flashing effect when a private colormap is used.