CPSC 1070
Lab Project
Oct. 21 and Oct. 23, 2019

Introduction

This is a two day project to be completed in lab by Wednesday. If you have not finished by the end of lab on Wednesday, the TA will grade you on what you have completed.

Your task this week is to write an EZ Draw program, using images of your own choosing, that displays a background and presents an object or character moving across that background. You can do this by starting with the `helloworld` program distributed with the new version of EZ Draw, and modifying it so that it uses your images, making one of them the background image, and another the one that moves across the background.

Make a working directory

To begin, make a directory named `image-tasks` and move into this directory. Copy EZ Draw's new `helloworld.c` program and its `Makefile` to this directory. Then, make sure that the new versions of `ezdraw.h` and `libezdraw.a` are in a directory named `ezdraw` at the top of your directory hierarchy. And, finally, edit the `Makefile` to make the lines with `IDIR` and `LDIR` both end in `= ~/` instead of `= ../`

Then, collect a few images that you think you might want to use, and place them in this directory. You can get them from the internet, by using the browser to find images you like. If you right-click on an image you will get a menu that will allow you to download the image. Another way to get images is to send them to yourself via email from your phone. Move all images into your `image-tasks` directory, and, if necessary, change their names so they describe the image contents.

The convert tool

In order to load an image in EZ Draw, it must be in BMP format, with a file suffix `.bmp`. However, most images from the web or from a phone are stored in JPEG format. They will have a file suffix of `.jpg` or `.jpeg`. Fortunately, it is easy to convert images from one format to another.

The standard linux distribution in the School of Computing has a system called *Image Magick* installed. One of the programs that it supports is named `convert`. This command will convert an image from JPEG to BMP format:

```
convert myimage.jpg myimage.bmp
```

Convert can do more than this, however. You can use it to resize an image to some scale of its original size like this:

```
convert myimage.jpg –resize 50% myimage.bmp
```

Or you can specify a specific width and height like this:

```
convert myimage.jpg –resize 640x480 myimage.bmp
```

Note, that this resize command will keep the image proportions (known as the image's aspect ratio) the same as the original image. If the size you give does not match the proportions of your original image, convert picks the maximum dimension (640 in the example) and scales the other dimension to match the images proportions.

You can also use `convert` to cut out a rectangle from the input image, which is handy if you want to crop the image. For example, to cut out a 100x100 square whose upper lefthand corner is at row 10, column 50, you would enter the command like this:

```
convert –crop 100x100+10+50 myimage.jpg myimage.bmp
```

The Gimp

Another great tool for working on images in the Linux environment is *Gimp*. Yes, that is the official name. You can run it under linux with the command

```
gimp
```

Even a short introduction to Gimp would be too long to include here, but its website provides full documentation. Here are some very useful things you can do with it. Using its File menu, you can Open an existing image or create a New image of a size you specify. There are lots of tools for manipulating an image in the Tools menu, that you will enjoy exploring. In addition, you can paint or draw on an image using the tools accessed by icons on the lefthand side of the window, or start with a blank image and use it as a canvas for drawing or painting.

One thing you might want to do for this assignment is to add an alpha channel to an image, and then use the eraser tool to erase parts of the image you do not want to show. You can add an alpha channel using the Layer menu, Transparency -> Add Alpha Channel. Once you add an alpha channel, wherever you erase the alpha value will be set to 0, making the image transparent. Gimp indicates this by displaying a grey checkerboard pattern wherever the image is transparent.

After working on an image in Gimp, you can save it using Save from the File menu, but this saves to a special image format called XCF that is proprietary to Gimp. Instead, you probably want to use the File menu's Export As option that allows you to save the image in whatever file format you specify. If you have added an alpha channel to your image, you need to save to a format that supports this, like PNG or BMP.

Constructing your program

Once you have collected your images and understand the tools, modify the `helloworld` program in three steps.

1. Modify the program to load one of your images instead of `girl.bmp`. Use your image's width and height to set the window size, and use it as the background, instead of a solid color background. Compile this and make sure that it works.

2. Modify the program again to load a second image that you will use as the moving object in the next step. Just draw this image over the background in a fixed location, compile this and make sure that it works.

3. Finally, modify the program again, so that on a mouse click the object starts moving from the left side of the screen to the right, so it looks like it is traveling across the background.

Once you have this working, check out with the TA. If not everything is working, show the TA the last working version of your program.