CHAPTER 4

EXPERIMENT

4.1 Material

4.1.1 Paper

- Plain laser paper 100 gsm

4.1.2 Ink

- Process Toner for Canon Color Laser Copier 1120.
- Process Toner for Canon Bubble jet BJC 8500.
- Hewlett Packard c6614d.

4.2 Apparatus

4.2.1 Spectrophotometer

- GRETAG SPM50.

4.2.2 Digital Color Printer

- Canon Bubble jet BJC 8500
- Hewlett Packard DeskJet 640c

4.2.3 CRT Monitor

4.2.4 Personal Computer

- Pentium 166 MHz or faster.

4.2.5 Software

- Java 2 SDK Standard Edition Version 1.3.0
- Editor 6.0
- Adobe PhotoShop version 6.0
- Microsoft Excel 97.

4.3 Procedure

4.3.1 Equipment setup

Personal Computer has already been installed Java 2 SDK Standard Edition Version 1.3.0 and Editor 6.0. And it has properly connected to spectrophotometer.

4.3.2 LUT data creation of CRT monitor.

The CRT monitor must be adjusted the white point into D65. The LUT data, which is the relationship between Digital count RGB and chromaticity x, y, and L is measured by spectrophotometer.

The measured color samples were displayed on monitor and were divided into two major type; the maximum colors and the gray scale colors. The maximum colors were the maximum red, green, and blue respectively. The gray scale colors were divided into 16 colors from 0 to 240 and white (255).

These LUT data are the input data, which were saved into Mymonitor.txt file as shown in Appendix D. The input data has to be compared with the reference values (CIE chromaticities for ITU-R BT.709 reference primaries and CIE standard illuminant D65).

However, the input data depend on the typical CRT monitor, which were measured. Therefore, the acceptable input data has to be the closest value with the reference value as soon as possible.

4.3.3 Monitor profile creation.

The monitor profile was created by using the input data from Mymonitor.txt file. These data were calculated by through the process of Forward model. The transformation matrix and GOG model were created in Forward model, which was described in chapter 3. The next, the inverse transformation matrix and inverse GOG model were created from the transformation matrix and GOG model respectively. Finally, the monitor profile is a combination of Forward model, Backward model, and monitor gamut. And the obtained output data is XYZ tristimulus values.

The monitor profile can transform input data (RGB) into output data (XYZ) and output data into input data. Finally, the obtained monitor profile are measured the efficacy by analysis the CIELAB color differences.

4.3.4 Color Perception Program Developing.

The XYZ tristimulus values were transformed into L*a*b*, L*C*h°, and xyz by developing Java program. A L*C*h° coordinate values were represented in all color perception equations and were calculated into the color perception values. These color perception values can describe the human color emotion.

In addition, the color perception program was designed in sRGB system. If this program had not read the Mymonitor.txt file, it would have been transformed by through sRGB profile. Therefore, the monitor profiles in this program have two types such as the monitor profile, which were created from Mymonitor.txt file and sRGB profile, which were described in 2.1.4.2.

The characteristic of program consists of five parts; color perception values, color space values, color frame, color sample, and color saving.

In part of color perception values, a color sample was defined the color perception values by calculating the twelve color perception equations.

In part of color space values, a color sample was defined the color space values in L*C*h°, L*a*b*, XYZ, RGB color space, and xyz chromaticity coordinates. For XYZ and RGB

values were calculated through the monitor profile. $L^* a^* b^*$ coordinates were calculated by equations (2.4) and (2.5). $L^* C^* h^\circ$ were calculated by equations (2.6). And the xyz chromaticity were obtained as follows:

$$x = \frac{X}{X+Y+Z} \tag{4.1}$$

$$y = \frac{Y}{X+Y+Z} \tag{4.2}$$

$$z = \frac{Z}{X+Y+Z} = 1-x-y \tag{4.3}$$

In part of color frames, this program displayed the color frame in $L^*C^*h^\circ$ and $L^*a^*b^*$ color spaces. The users can select the color samples from both of these color frames.

In part of color sample, a selected color sample was displayed in a sample frame for the clear viewing.

In part of color saving, If the users save a color sample, a color sample will be recorded the color perception values and color space values in Panel.txt file and a color sample will be displayed in the grid frame.

The program developed using created monitor profile was represented in Appendix A. Shown in Appendix B is the program developed using sRGB monitor profile. And shown in Appendix C is the main program.