CHAPTER 1

INTRODUCTION

The judgement of color becomes an important role in the industrial life, whereby color can give the information and use to identify object such as stop when traffic lights turn to red and move on when they change to green. Furthermore, fruits can be classified, which is ripe, by using color and the manufacturers also judge the quality of materials and products by their color (*1,2*). Not only the production of color materials concerns to many industries and technologies such as paper, textiles, ceramic, printing, paints and plastics, but also the explanation of color phenomenon involve in several fields of science like chemistry, physic, physiology, psychophysics and psychology. Thus, it is necessary to select color carefully for the production because every color is always having its own meaning. The meaning of color is implied in different things for different people and in different fields because many definitions of color arise from several specific interests of people who deal with it. Color for an artist means pigments. Color for the physiologist means a response of the nervous system. Color for the psychologist means perception, which exists within the mind. Color for the physicist means an attribute of radiant energy. And color for the man in the street means a property of objects or light sources. Therefore, color means all of these things at one and the same time. However, all these meanings of color make sense for those persons who use them. Beside all these meanings, the most important point is that there will be no color without light and color will not be interpreted without brain (*3*).

Basically, the components of color are divided into three parts. They are light sources, objects under illumination and observers. Light is the energy radiated from light sources in form of the electromagnetic spectrum of various wavelengths. The perception of color is produced when radiant energy from light sources enters to the eyes, either directly or modified by some object, which reflects it. The light passes through the lens of the eyes to the retina where light stimulates special photoreceptor cells, which are rods and cones. At these cells, light is converted into electrical signals and then generates nerve impulses transmitting to the brain and, again, converted into mental impressions. As a result, color is the sensation that produced on the eyes by radiation from the light, which is reflected and modified by the object and is interpreted in the brain (*4, 5*). It makes the act of seeing is a perceptual process and take place in the brain. That means the color perception was produced by the reproduction of the object depends upon the physical composition of the light, upon the physiological state of adaptation of the eyes when viewing it and also upon any psychological effects that may have on the observers (*6*). The above mention shows that not only color is related to physic and physiology but also related to psychology. However, the mechanism of human color perception system is very complicate and difficult to analyze, particularly the mechanism relates to the nervous system that is not well understood. Since physicists study the color perception in term of light from a scientific point of view, while psychologists investigate the color from a perceptual and psychological points of view. Thus, the relationship between physical and perceptual color parameters is investigated in this research through practical and psychological studies. This research focuses on building the bridge over the gap between color science and color sense, and between theorists and pragmatists.

There are many attempts to approach this gap. For example the neural network method, the statistical method which use SPSS program and the contours ellipse

method. Being of interest in this study, the contours ellipse method is an easy describe the color perception value by using CP-ISO lines, which correlate the colorimetric values to the color perception values. In order to link these relationship, the quantitative visual scales of color perception in terms of the colorimetric values are necessary (*7*). As an expression of human color perception, words play an important role not only in the communication of the color perception but also in the development of the quantitative visual scales in visual assessment. The result of visual assessment and the colorimetric values contributes to the empirical equations known as the color perception equations. This research investigates the color perception equations by using the opponent word pairs and relevant the colorimetric values, CIE L^*, C^*, h color space, whereby the color perception model is obtained.

1.1 Objectives

One goal of this dissertation is to elucidate the relation between the opponent word pairs of the color perception and the colorimetric values. Another objective is to clarify the quantitative assessment of the color perception in CIE L^*, C^*, h color space for Thai observers.

To obtain the color perception model, the color perception equations are acquired by using the opponent word pairs with corresponding the colorimetric values that express the color perception of Thai observers.

1.2 Scope of the Research

The dissertation covers the study on the effects of the visual assessment on CIE L^*, C^*, h plane; the distribution of the visual assessment on hue angle which effects

the visual results; the derivation of the visual assessment and the colorimetric values to establish the color perception equations; and the colorimetric characteristics of the color perception in term of ISO-lines, the color perception lines, in CIE L^*, C^*, h and CIE L^*, a^*, b^* diagrams. In addition, the color perception maps, representing the relation between two opponent word pairs are included.

1.3 Content of the Thesis

Chapter 2 deals with the overview of the theoretical considerations and literature reviews. Chapter 3 gives the description on materials under study and the experimental procedures and apparatuses. Chapter 4 contains the results and discussion on the visual assessment, the color perception equations, the color perception values on CIE L^*, C^*, h and CIE L^*, a^*, b^* diagram, the color perception maps and the correlation coefficients. Finally, the results are concluded in Chapter 5 along with some possible suggestions. This research shows that it is possible to predict the color perception values by using the color perception equation. Furthermore, the twelve opponent word pairs could be divided in to three groups. The first group was described mainly by chroma. They were "Light-Dark", "Distinct-Vague", "Vivid-Sombre", "Dynamic-Passive", "Striking-Subdued", "Transparent-Turbid" and "Gaudy-Pain". The second group was directly proportional to lightness. They are "Soft-Hard", "Deep-Pale", "Heavy-Light" and "Strong-Weak". The third group consists of "Warm-Cool" alone which was dominated influence by hue.