A Study on the Expression of Emotions using Lights in Apparel Types

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***Abstract*— When types of communication between people are observed, one can see that communication not only consist of words but also, contextual communication consist of facial expressions and body gestures. In this study, elements that need to be considered when using light in clothes in order to express the thoughts and various emotions of the wearer and surrounding people and to design contextual interaction rather than simply for visual effects, are examined. Clothes and light are central visual elements therefore, the relationship between perception of objects through sight and emotions are examined, elements of visual language of cloths and light are examined through documentary record, elements of visual language such as shape, color, and texture of light and clothes that influence each other are classified as well as unique elements of visual elements of light such as blink speed and blink pattern, and terms that are related to the psychological effects of these elements are extracted. Based on this, using the 8 most representative human emotions which includes happiness, excitement, anger, hatred, sadness, shock, fear, and shame as standards of design, interaction design elements using clothes and light for expression of each emotion are organized in a matrix.**

***Index Terms*— User Interfaces – Interaction Styles, Natural Language, User-centered design.**

I. Introduction

Wearable computer, the core field of the next generation PC Technology, is closely linked to not only to computer technology but also to machine, physics, apparel, material, design, sensibility engineering, and psychology, and it [1] significantly influences the users reception of technology from the aspect of stability, comfort, fashion, and design in addition to system performance or technical aspects from direct wear of various functions.[2] Therefore, for advancement of wearable computers, in addition to behavioral and psychological understanding of the user and technical for functional approach of apparel, approach in clothes design and psychological effects of clothing are also needed.

When communicational behaviors of people are observed, they do not take place only through text of language. Oftentimes, people communicate more information and emotions they could not express through word using their facial expressions, body language, and actions thereby giving communication vitality and diversity.

Also in apparel, people have used clothes as a form of communication for expressing their individuality, emotions, status, social position, and information surrounding their circumstances.[3]

Recently, as can be seen in wearable computing concept products, smart wear concept products and various studies, development of various smart fabrics and related technologies made possible use of electric equipment and materials in clothes. As a result, it became possible to see cases in which light is used in clothes for visual expression.

This study is one pertaining to interaction for exchanging people's emotions or information between the wearer and surrounding people using light in clothes.

II. Visual Perception Process and Psychological Effect

Clothes and light both can be said to be subjects of center of perception. When the process of visually perceiving objects and shapes is observed, light reflected from objects are recognized by eyes, and this information is transmitted to the brain from optic nerves and goes through the process of perceiving objects and their color. From the psychological aspect, it can be said that objects are felt rather than simply seen.[4]

Figure 1. Visual Perception and Emotions

However, such psychological aspects take place through visual symbolisms and associations, they have differences based on previous learning, similar experiences, cultural differences, and personal interpretations, and as a result, there are also differences in the resulting psychological reactions.[5]

Elements of visual language pertaining to clothes and light classified as follows through documentary records.

Category	Elements of visual language of clothes	Elements of visual language of light
Mutually Complementary Elements	Shape(Design), Color, Texture,	
Unique Elements	Silhouette, Accessories, Textile. Coordination, etc	Blink(rhythm), Sort, Speed, Throw Method, Position , Strength, Pattern. , etc

Table 1. Comparison of elements of visual language of clothes and light

III. PSYCHOLOGICAL EFFECT BASED ON CLOTHES AND LIGHT

A. *Mutually complementary visual language of clothes and light (Shapes, Colors, Textures)*

The shapes of cloth , colors of cloth, and textures of cloth are influenced by shapes of light, colors of light , and textures of light. we researched the elements of visual language of cloths and light are examined through documentary record to know the visual elements of clothes and light.

Emotion	Color	Brightness	Chroma
Feeling	Warm Color -Stimulating Cold Color - Calming	Bright luminosity – brightens mood Dim luminosity – makes melancholy	High chroma - Strong feel Low chroma – peaceful feel
Attention	Cold colors attract more attention than warm colors	Dramatic light and shade – attracts eyes (more effective with greater contrast in colors)	High chroma attracts attention better than low chroma
Size	Warm colors expand shapes, cold colors shrink shapes	Bright luminosity – increase size (stronger color contrast with surrounding colors is more effective)	High chroma expands objects, Low chroma – same size
Distance	Warm color extrudes objects Cold colors pulls back objects	Bright luminosity – pulls back objects Dim luminosity – extrudes color (Extruding effect more effective with greater contrast in light and shade)	High chroma – Shortens distance, Low Chroma – lengthens distance
Out-Line	Warm colors make contours light and soft than cold colors and contrasting colors make contours more vivid than similar colors	Contrast in color and shade is an effective method for stressing contours.	Contrast chroma emphasizes contours

Table 2. Example of Psychological Influence Language Based on Color Attributes

B. *Characteristic Visual Language of Light*

Lights sorts and lights expressions (Blink Speed & Blink Rhythm and so on) are characteristic visual languages.

IV. EXPRESSION OF EMOTIONS USING LIGHT IN CLOTHING

The types of emotions and information for expression using light in clothing are diverse and are difficult to classify objectively. In this study, among the various forms of human emotions, those that are most fundamental were extracted and by integrating various studies, they were classified into 8 emotions that include happiness, excitement, anger, hatred, sadness, shock, fear, and shame.[6] Language pertaining to each emotion and forms of expression (mutually complementary visual language elements of clothing and light and characteristic elements of visual language of light) were mapped and were organized in a matrix of expression of emotion using light in clothing.

Object	Expression			
Emotion& Willing	**Shape**	**Color Scheme & Property**	**Texture**	**Light Expression**
Joyful, Happy	Horizon Oblique, Zigzag wave, Scallop	Competently Color Scheme , Orange, Yellow, Worm Color, High Brightness ,High Saturation, High Brightness Contrast	Transparent, Glossy& Non Glossy ,	Fast, Repeat, Rhythmic (gradually fast)
Excited	Oblique Acute angle	Competently & Triad & Tetrad Color Scheme ,Red, Red-Orange, Orange, Worm Color, High Brightness ,High Saturation, High Brightness Contrast	Opaque, Glossy, Non glossy	Fast, Repeat, Rhythmic (gradually fast)
Anger, Annoying	Vertical Oblique Acute angle	Mono Chromatic Color Scheme, Analogous Color Scheme, Red, Red-Orange, Worm Color, High	Opaque, Glossy, Non glossy	Fast, Repeat, Rhythmic (gradually fast or
	Zigzag	Brightness ,High Saturation, High Brightness Contrast		slow)
Hateful, Disgusting	Unbalance Line	Analogous Color Scheme, Pink, Black, Low Brightness, Low Saturation, Low Brightness Contrast	Opaque, glossy	Fast, Repeat, Rhythmic (gradually slow)
Sad	Vertical oblique	Mono Chromatic Color Scheme, Purple, Blue-Green, Blue , Violet, Gray, Black, Low Brightness, Low Saturation, Low Brightness Contrast	Opaque, Non glossy	Slow, Repeat, Rhythmic (gradually slow)
Surprising	Oblique, Zigzag Scallop	Competently Color Scheme , Triad Color Scheme, Orange, Purple, Blue-Green, High Brightness ,High Saturation, High Brightness Contrast	Transparent, opaque, glossy	Fast, Random
Fearful, Frightening	Acute angle, oblique , Perfect Curve Line	Analogous Color Scheme , Purple, Blue-Green, Blue, Purple, Cold Color, Low Brightness, Low Saturation, Low Brightness Contrast	Semi transparent, glossy, non glossy	Random, Rhythmic (gradually fast or slow)
Shameful	Horizon, Fluent	Mono Chromatic Color Scheme, Analogous Color Scheme Pink, Green, Blue-Green, white, Black, Low Brightness, Low Saturation Low Brightness Contrast	Semi transparent, opaque, non-glossy	Slow, Repeat, Rhythmic (gradually fast or slow)

Table 3. Matrix of expression of emotions using light in clothing

V. CONCLUSION & FUTURE WORK

This study is a base study for studies pertaining to interaction methods for delivering emotions and information between wearers of clothes that use light and surrounding people. In order to express emotions using light in clothing, elements of mutually complementary visual elements between clothing and light which include elements of shape, color, and texture were extracted as well as elements of characteristic source of light and method of expression of light (speed, rhythm and so on), and also extracted psychological language and expression method for each element.

Based on this, a matrix for expression of emotions using light in clothing was organized, and in the future, through scenarios of use and ideation, interactions using light in clothing will be designed and a selection among these will be made to produce a concept design of interaction that uses light in clothing.

As mentioned earlier, formation of human emotions are based on individual experience, learning, and culture, and factors of formation are also difficult to typecast. And elements of consideration for expression of emotions that could not be addressed in this study are areas that will need to be studied and supplemented. For that, in future studies, when light is used in clothing, additional elements that have psychological effects need to be identified, and through user evaluation, emotion expression matrix using light in clothing needs to be supplemented, and also, studies pertaining to direct expression through symbols or text using light also need to be conducted.

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