Journal of
Design Sciences and Applied Arts

Determining the visual Impression of cotton fabrics while Rotating.

Ahmed Ramadan Abd-EL Hamid Mohamed EL-Tantawi .

Lecturer, spinning weaving and knitting department, Faculty of Applied Arts, Damietta University, Egypt

Submit Date: 2020-05-09 18:19:57 | Revise Date: 2021-01-01 12:03:52 | Accept Date: 2021-01-02 00:49:13

DOI: 10.21608/jdsaa.2021.29820.1028

Keywords:
Spun yarn –Light reflectance-Visual sense – Aesthetics.

Abstract:
In order to identify the light reflectance from cotton fabrics produced from various (spun yarn., carded – open end) ,an attempted measured Light reflectance distribution (CIELAB L*) by using a (GCMS-4 Gonio- Spectrophotometric color measurement system) at various Illumination angle (θi) and Viewing angle(θv) with turning point(θw) from (0-90)o in both direction .Results clarify the relations between the distribution pattern (L*)with fabrics made from different spun yarn which had an effect for fabrics on visual sense of hymen and indicate more about aesthetics of cotton fabric while rotating.

1. Introduction:

When we see the surface of an object, we encode information that allows us to make perceptual about that object for the purpose of recognition or action, or for more aesthetic judgments such as the quality or attractiveness. Brand R.H. and Hollies (1,2), reported that there is a series of aesthetic vocabulary for fabrics, and it began with optical properties such as color, luster, and transparency, ended with a tactile feeling by hand.

Luster is the inaction of different intensities of light, reflected both specular and diffusely from different parts of a surface exposed to same indicate light (3).

Hunter (4) reported that the specular gloss is related to the perceived shininess or brilliance of highlights, and that luster is associated with the observed contest between specular highlights and diffusely reflection surface area for woven fabrics.

This paper expects the visual impression to be affected primarily by the reflection of light from fabric surface, as Fig .1 shows a model of light reflection from surface of textile which consists of three kinds of reflection :(1) diffuse reflection at surface layer of fibers, (2) diffuse reflection by multifarious reflection between surfaces of internal fibers, and (3) regular reflection at the surfaces of fiber.

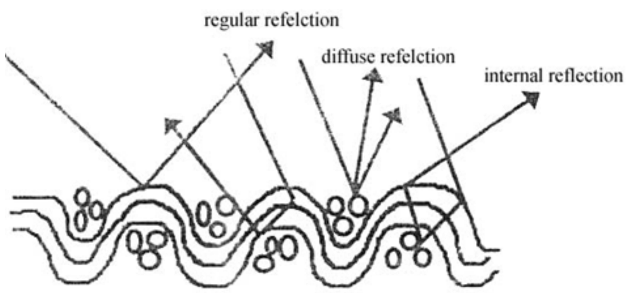


Fig .1 Schematic diagram light reflection from surface of textile.

In Textile we suppose that the striking visual impression of fabric is related to distribution of light from texture of fabric's constituent yarn fabric, Also The perception of textile texture via light is important for human life because the surface, texture of fabrics has a great impact on design and planning not only for various products but also in computer graphics (5).

Wonjoung Lee (6) reported that we can determine the character of textile by reflected light: Identification of the object and its material, surface geometry, surface texture and so on. However, the relation between geometric structure of an object surface and reflected light and the relation between stimuli provided to eye by reflected light (7).

Tomoko Awazitain (8), reported that the light reflectance of fabrics varies depending on linear density and color of the constituent yarn color and weave structure.

Noman Halem (9), reported that light permeability which may be a potential characteristic of woven fabric is less know yet compared to other characteristic such as tensile, tear, thermal, etc. Also he noted that Light permeability of fabric is not that the sort of property which decided that the fabric aesthetic or quality but is the parameter which has strong relationship with up ultraviolet protection factor of the clothing and garments which relates with certain issues.

Endo Manami (10) reported that yarn count is a factor influencing lightens of fabric and changes in lightness while rotating in measurement had an effect on the high – grade feeling of fabric.

In previous studies difference investigate the mechanism of visual sense and its reflectance from texture of fabrics, it founded that the surface characteristics and reflected light derived from textile texture might exert complex influences on each psychological factor. In particular, memories related to fabric were recognized as possibly affecting visual perception of texture (11).

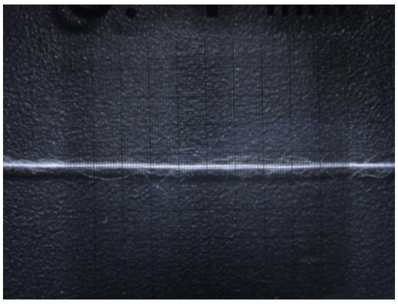
Other studies showed difference in weave structure of wool fabrics were reflected in L* distribution pattern measured while rotating, the technique involving fabric rotation is useful in distinguishing some surfaces structure such as fuzzy–surfaces and clear finish based on difference in their L*as Endo Manami reported (10).

In this study light reflection measurement were carried out while changing the yarn spun methods, weave density and condition of illumination and viewing angle to obtain (CIE LAB), the researcher elected to use L* values which Indicate lightness as an optical charac-teristic value an attempt to measure of L* during fabrics rotating. A*, B* values are chromaticity coordinates, but values for A* and B* isn't consider a parameter in this paper because samples are made from raw white cotton woven fabric non colored and non-bleached.

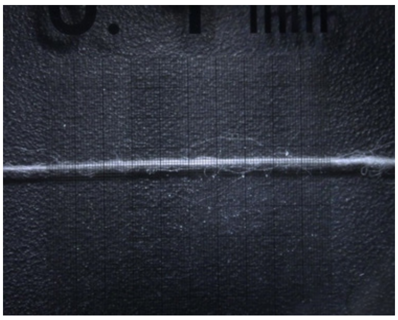
The Final goal of this study is to find a parameter that can associated with the visual sense of most common cotton fabrics made from various spun yarn (ring- carded and open end) with using weave structure twill (1/4) in addition to parameters obtained from (GCMS-4) system which concerned with aesthetic sense for lighting. Fabrics were evaluated using parameters obtained from light reflectance measurement. The various reflectance measurements geometric were utilized and influence of geometric was investigated.

2.1. Samples:

Four Egyptian cotton woven fabrics were used. 24 experimental are measured. The specification of the samples in given in table (1) and their weft yarn surface pictures captured by Digital Microscope (VHS-GOO, Keyence) are given in Fig.2(a &b).



a: Diameter of 40Ne Ring- Carded (20 mm)



b: Diameter of 40Ne Open end (21 mm)

Fig.2a, b. weft yarn surface pictures.

As shown in Table (1): All samples made from Egyptian cotton Giza 86 with ring spinning carded (40Ne) and same warp ends 110/cm, using weave structure (Twill ¼).

Sample no1,3 are made from weft count 40Ne ring- carded with (90-130) pick /cm respectively.

2.2 Light Reflectance:

The spectral reflectance of samples was measured using Gonio- Spectrophotometric color system, in Kitaguchi Saori Labo at Kyoto Institute of technology Japan.

Fig.3 shows the measuring geometry, the combinations of Illumination angle(θi) and Viewing angle(θv) and also rotating angle (θw) of fabric are donated as (θi/θv/ θw).

The measurement for all samples were carried out at three combinations of angles are given in Fig.3(a, b, c) as following in both direction (warp and weft) Where is (θw) =0 corresponds warp direction., (θw) = 900 corresponds weft direction:

a) θi/θv= 30o/30o.

b) (θi/θv) = 45o /45o.

c) (θi/θv) = 60o /60o.

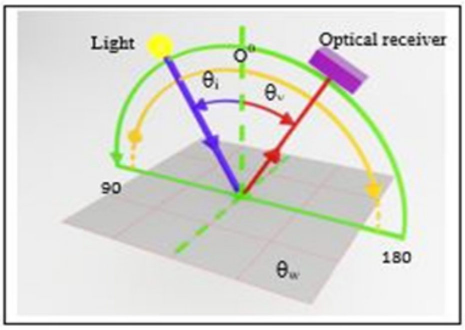


Fig.3. The Measuring geometry, Illumination angle (θi), Viewing angle (θv) and Rotating angle (θw).

Table 1. Specification of the samples

Sample No.	Structure	Warp yarn	Warp ends/cm	Weft yarn	Weave density	Thickness (mm)	Weight (g/m^2)
1	Twill (1/4)	Giza 86 40Ne Ring-Carded	110	40NeRing Carded	90	30	134
2				40Ne Open end	90	31	132
3				40NeRing-Carded	130	32	159
4				40NeOpen end	130	33	157

Sample no2,4 are made from weft count 40Ne open end with (90-130) pick /cm Respectively.
All samples' thickness was measured; also, weight of samples was counted.

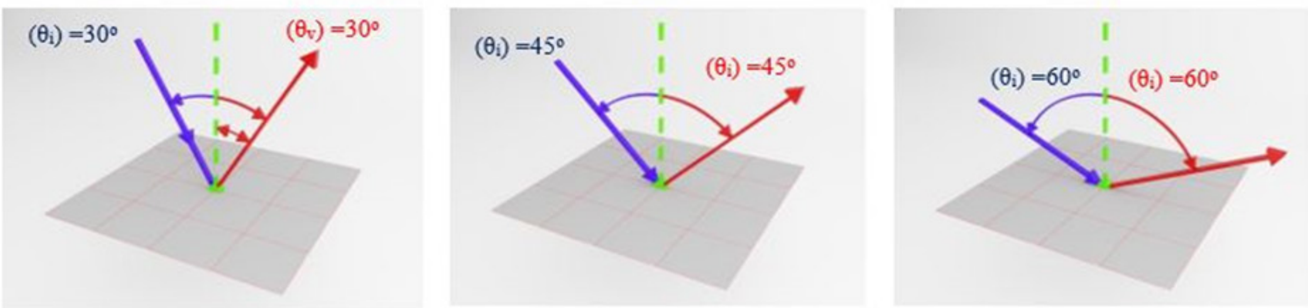


Fig.4 The Illustration of angles

3. Result and Dissection:

1. Effect of different spun Yarn and weft density on (CIELAB L*) distribution pattern:

The reflectance was measured at Illumination angle of (θi) = 30o,45 o,60 o and Viewing angle(θv) = 30o,45o,60o and rotating angle (θw) =0o,90o.

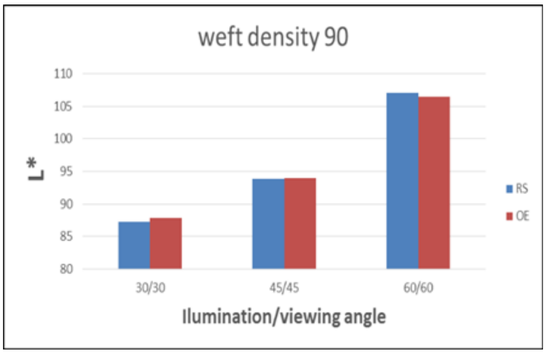


Fig.5 L* values for samples No. (1, 2) in warp direction.

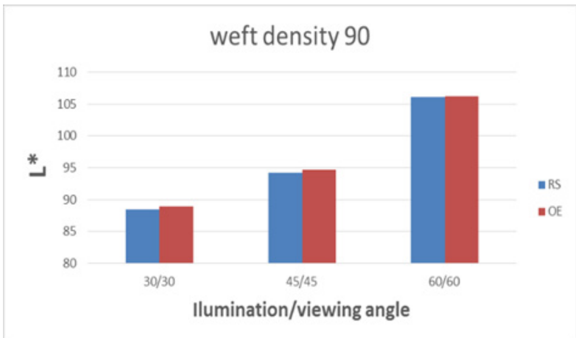


Fig.6 L* values for samples No. (1, 2) in weft direction.

The CIELAB L* values for samples No.1 and No.2 at weft density 90 pick/cm in warp direction were plotted in fig.5, the diagram indicates that when using (θi/θv) = 30o/30o and(θi/θv) = 45o/45o illumination angle viewing angles: the difference between L * for samples., Noting that the carded or open end spun woven fabrics which used, do not give an effect or a significant value with clear differences for L*.

The difference value appearance when measured at Illumination angle of (θi) = 60o and Viewing angle(θv) = 60o and rotating angle is constant at (θw) =0o in warp direction., the woven fabrics made from ring spun yarn had the largest value at weft density 90 pick /cm.

As in the case when reflectance was measured at Illumination angle of (θi) = 30o,45o,60o and Viewing angle(θv) = 30o,45o,60o –but- in weft direction of samples while rotating using turning point (θw) = 90o L* values which plotted in fig.6 is very closer for woven samples made from ring or open end yarn but rotating angle (θw) is the most affective parameter for changing lightness .

When using (θi/θv) = 60o /60o shows clearly that Lightness from both ring spinning and open samples is higher comparing when use (θi/θv)= 30o /30o or 45o /45 o .

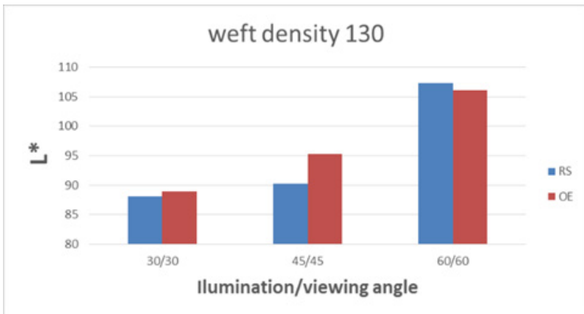


Fig.7 values for samples No. (3, 4) in warp direction.

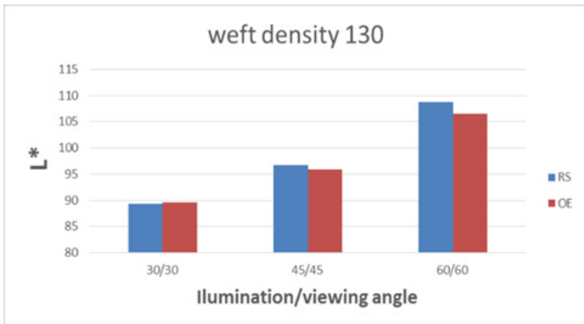


Fig.8 values for samples No. (3, 4) in weft direction.

Fig., 7 and Fig,8 also shows the reflectance when measured at Illumination angle of (θi) = 30o,45o,60o and Viewing angle(θv) = 30o,45o,60o in warp and weft direction using weft density 130 pick /cm at rotating angle is constant at (θw) =0o ,90o.

Fig.7 had the largest L* value for woven fabrics made from open end spun yarn at (θi/θv) = 45 o /45 comparing with woven fabrics made from ring spinning at warp direction when(θw) =0O.

Fig.8 had the largest L* value for woven fabrics made from ring spinning at (θi/θv) = 45 o /45 and(θi/θv) = 60o /60o comparing with woven fabrics made from open end spinning at weft direction when(θw) =90O.

When using (θi/θv) = 60o /60o shows clearly that Lightness from samples for both ring spinning and open end is higher comparing when use (θi/θv) = 30o /30o or 45o /45 o

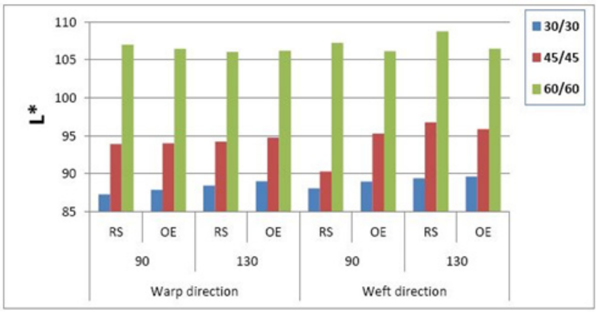


Fig.9 L* value for all samples.

As shown in Fig.9:
1-Woven samples from cotton ring spinning had the largest (Lightness) L* values in warp direction when (θw) =0O using weft density (90 or 130 pick /cm) at (θi/θv) = 60/60 .
2-The diagram indicate Cleary that cotton woven fabric produced by open end spinning method had the largest lightness in weft direction(θw) =90O using weft density (90 or 130 pick /cm) at (θi/θv) = 60/60.
3- Viewing angle (θ v) and (rotating angle) or turning point (θw) was found to be the most parameter which effected in L* for woven samples.

4. Conclusion:

In order to identify the light reflectance from cotton fabrics produced from various (spun yarn., carded – open end) with different weft density by using various Illumination angle and Viewing angle for both directions while rotating θw from 0O to 90o.

Therefore, the results indicate that L* reflectance measurement for cotton woven fabric shows that lightness values depended on method of spinning but in closer values, weave density also give parameter in light reflectance from woven fabric in weft direction, Illumination angle and Viewing angle also indicate an important parameter for visual sense from fabrics and its related to aesthetic properties. In shorts: (θw) was found to be the most accurate parameter for determining the change of lightness from shiny to dull in visual assessment for cotton woven fabrics.

These finding suggest that when using the correct geometrical and mathematical methods for produce balanced woven fabric, it already will gave a property with a texture, smooth surfaces roughness (SMD) , lightness which had an effect on aesthetic visual vision.

Therefore, further investigation needs to be made establish the relation between L* and take into account the condition which a subject perceiver for weaving using different yarn count and different spinning methods as vortex yarn to know more about one of aesthetic parameter in cotton woven fabrics.

Reference:

1. Brand R.H: Measurement of Fabric Aesthetics: Analysis of Aesthetic Components, Textile Research Journal, Vol 34, Issue 9, 1964
2. N.R.S. Hollies: Visual and Tactile Perception of textile quality. Journal of textile institute vol 80, Issue 1, 1989.
3. M J Denton; P N Daniels: Textile terms and definitions, Manchester, UK: Textile Institute, 2002.
4. Richard S. Hunter, Richard W. Harold: The Measurement of Appearance, 2nd Edition, by Richard S. Hunter and Richard W. Harold, John Wiley & Sons, New York, 1987.
5. Masako sato: Study on the reflection of light by yarn and fabric. Journal of color science association, Japan, c23:3:131-140, 1999.
6. Wonjoung Lee: Visual Perception of texture of textile, journal of color research and application, vol.26 No.6, December 2001.
7. T.Aisling Whitaker, Crisina Simoes – Franklin, Fiona N.Newll :Vision and touch :Independent or integrated system for perception of texture ?. Brain research (2008).
8. Tomoko Awazitain, Sachiko sukigara: Characterization of optical proprieties of traditional Japanese fabric, textile research journal. vol 86(1) 13-23, 2015.
9. Noman Halem, Sayed Ibrahim: Determining light transmission of woven fabric through different measurement methods and its correlation with air permeability, journal of engineering fibers and fabrics, Vol 9, Issue 4 ,2014.
10. Endo Manami, Kitagushi Saori, Morita Hiroyuki and other: Characterization of fabric using light reflectance and surface geometry measurement, journal of textile engineering, vol.59, No. 4, 75-81, 2013.
11. Sario kitaguchi, chhiyomiizuatni, Kana Kurahayshi and others: Psychological factor in color characteristics of casual wear: proceeding of AHEF. Vol No.3 Issue 6 2012.
12. Chokrivhen F.: Textile Materials for light contracture, spring Heidelberg, New York, 2014
13. Japanese slandered Association: color specification. CILAB and CIEUV color space. 2004