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# Using Adobe Photoshop to Scale the Rate of the Shape's Deformation By Colour Contrast Application

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**ABSTRACT**

Interior designers are quite cognizant of the colour significance as a basic element of design, in order to achieve aesthetic and functional demands. This paper aims to present an empirical model for interpreting the relationship between the colour' contrast and highlighting the foreground objects, by measuring the values of the deformation via using Adobe Photoshop software. The experiment contained practical steps of calculation and analysing the amount of the chromatic deformation of the foreground objects, which is represented by 6 samples model. These samples of coloured spots are tested within two phases; with coloured background based on *Itten colour wheel*, and with a neutral background "greyscale wheel"; and comparing the results by calculating the amount of distortion, through measuring angle's values. The findings showed that using of contrast application is useful as an empirical method for scaling the chromatic interaction between the foreground and the background. By using T-Test analysis the findings emphasized that the colour contrast had a significant impact on highlighting or distorting the foreground shapes.



## 1. Introduction

Adobe Photoshop is well known leading photo-editing software. It includes a wide range of standard filters, effects, and advanced variety of editing applications.

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The contrast is one of these techniques, it can be used to increase or decrease the ratio of colour contrast (Marinia & Rizzib, 2000). The experiment is a test under controlled conditions, that is made to prove a known fact, determine the effectiveness of something is restricted in the past, or to test the validity of a hypothesis (Shadish, Cook et al., 2001).

This study is not attempting to reinvent the wheel, but it is presenting an empirical scale for measuring and explains the interaction between the background and the foreground objects, positively "highlighting"; or negatively "Chromatic Deformation", by expanding the contrast slider in Photoshop see Figure 1, and recording the amount of changes on the experimental samples. There are many of visual applications of colour contrast, where were themes of many studies deal with colour contrast from different perspectives such as the role of colour contrast in occupational safety, warning symbols' design, design of safety apparel, workplaces Design and Ergonomics (Sayer & Mefford, 2000 ).

The objective of this experiment is to study the deformation amount of the foreground shapes "coloured spots", and how the coloured background affects the foreground shape, via the contrast function, and compare the results in both of cases pretest and posttest. This article contained the terminology, methodology, analysis, discussion of results, and conclusion.

## 2. Terminology

### 2.1 Adobe Photoshop

Photoshop is one of most important professional softwares manufactured and developed by Adobe Systems Inc. It is used for images' printing, editing, add effects and designing via some of the innovate tools that have a deep impact to design and projects (www.businessdictionary.com ; Adobe Systems Inc, 2005).

### 2.2 The Contrast

The contrast is the visual properties difference that makes the object in image recognizable from the background (Campagna, Mergler et al., 1995). The contrast plays a vital role in presenting the image colours and the level of brightness or darkness tones in a scene. It had a significant effect on the clearness of colours; otherwise the image will be

appearing too grey or dull (Marinia & Rizzib, 2000). According to George (1985) the contrast had an impact on the heighten awareness, whether greyscale image by highlighting the foreground against the background; or coloured image showing the strong effect especially with colours like red and yellow appearance against the background. It can be summarized that the function of contrast is widening the chromatic gap between the bright and dark hue within the limitations of the image.

## 2.3 The Contrast Application by (Adobe Photoshop)

The contrast application in Adobe Photoshop software comes within the (Brightness/Contrast) adjustment box, as in Figure 1. This application helps the user to adjust the tonal range of images. The contrast slider can shrink or extend the value of the image's tonal. The normal mode of this application (Brightness/Contrast) adjusts the image layer in proportionate (nonlinear), such as adjusting the levels and the curves (http://help.adobe.com).

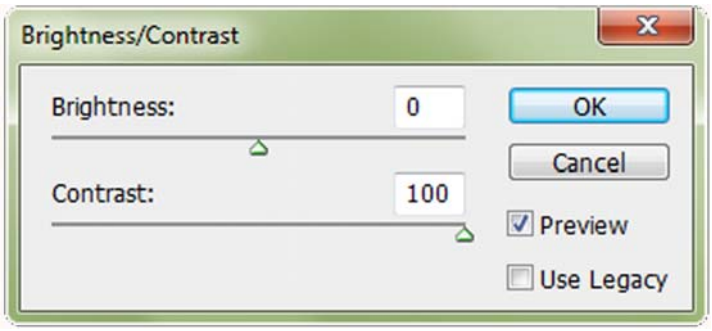


**Figure 1:** The slider adjustment for Brightness/Contrast box (Adobe Photoshop).

## 2.4 Itten Colour System

Johannes Itten in his book "The Elements of Color" described his colour system, which consists of 12-hues colour wheel as in Figure 2. He developed his wheel from the three primary colours yellow, red, and blue. The three primary colours were formulated as an equal triangle; at the top (yellow), at the lower right (red), and the (blue) in the lower left. The three primary colours generate the three secondary colours as followed: yellow + red = orange, yellow + blue = green, and red + blue = violet. The six colours forms a regular hexagon, (primaries and secondaries) all together generates the 12-hues colour wheel by sequential mixing such a rainbow or natural spectrum (Itten, 1970).

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## 3. Methodology

There are many phenomena relates to the visual perception were accepted as realities, some of which have not yet been resolved because it is not subject to empirical scale. The rationale of this experiment is to develop a measurable model inspired from Itten colour theory (Figure 2), to explain empirically the relationship between the colour and the highlighting the foreground.

### 3.1 The Experiments Procedure

The experiment required to test the model that developed as in Figure 2:

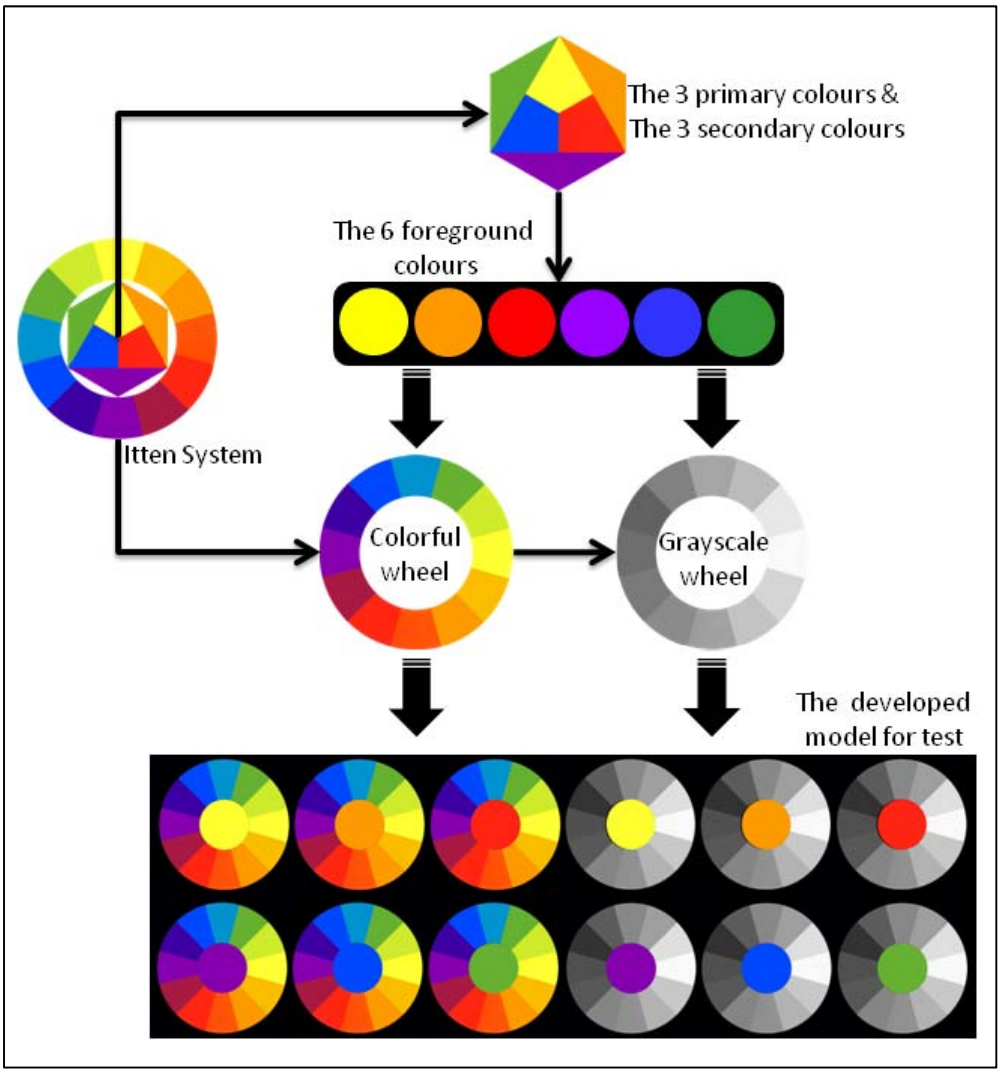


**Figure 2:** The test model.

The model contained 12 colour samples inspired from Itten theory. These samples are three primary colours (yellow, red, and blue) in addition to the secondary colours (orange,

violet, and green). The six samples are tested with colourful backgrounds; and six samples with neutral (greyscale) as in Figure 3.

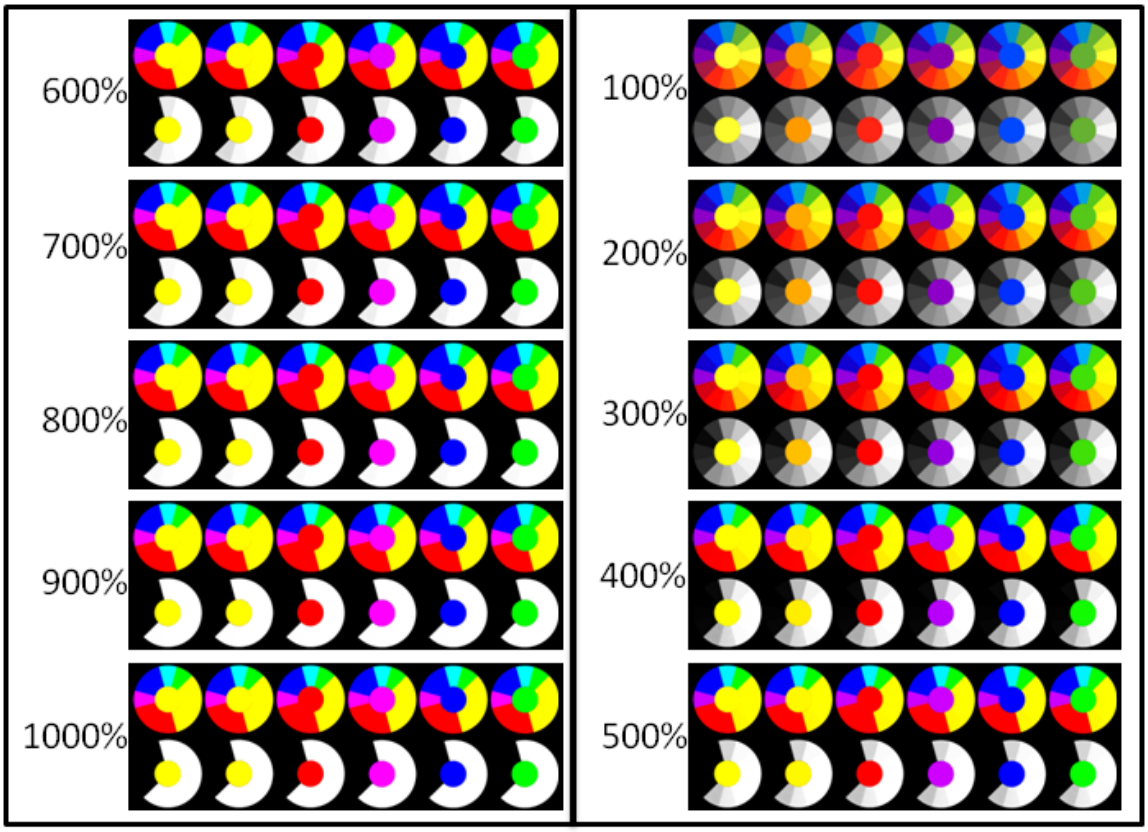


**Figure 3:** The contrast sequence from 100% to 1000% value

By using Adobe Photoshop software, the model in Figure 2, tested with the contrast application. The test requires repetition the contrast function for 10 times, in order to reach the 1000% and observe the change of the model under the effect of the contrast, as in Figure 3.

## 3.2 The result of 1000% contrast showing the difference after and before the contrast application as in Figure 4. Initial Observations

After applying the contrast experiment as shown in Figure 3, and 4, the initial observations are as follows:

- In Figure 3, the samples with coloured background, after applying contrast (500%) will be never changed; unlike the neutral
- In Figure 4, the samples in column 2 (the orange spots), orange colour changed to yellow after contrast function, so that the researchers excluded orange spots as (neglected samples).

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- The spot's shapes of samples with neutral backgrounds, in both of the cases (pretest and posttest) didn't distort the colour spots.
- The spot's shapes of samples with coloured backgrounds in pretest phase have been an equal amount of deformation; and after applying the contrast function posttest phase there are distorted due to the background colours deformation.

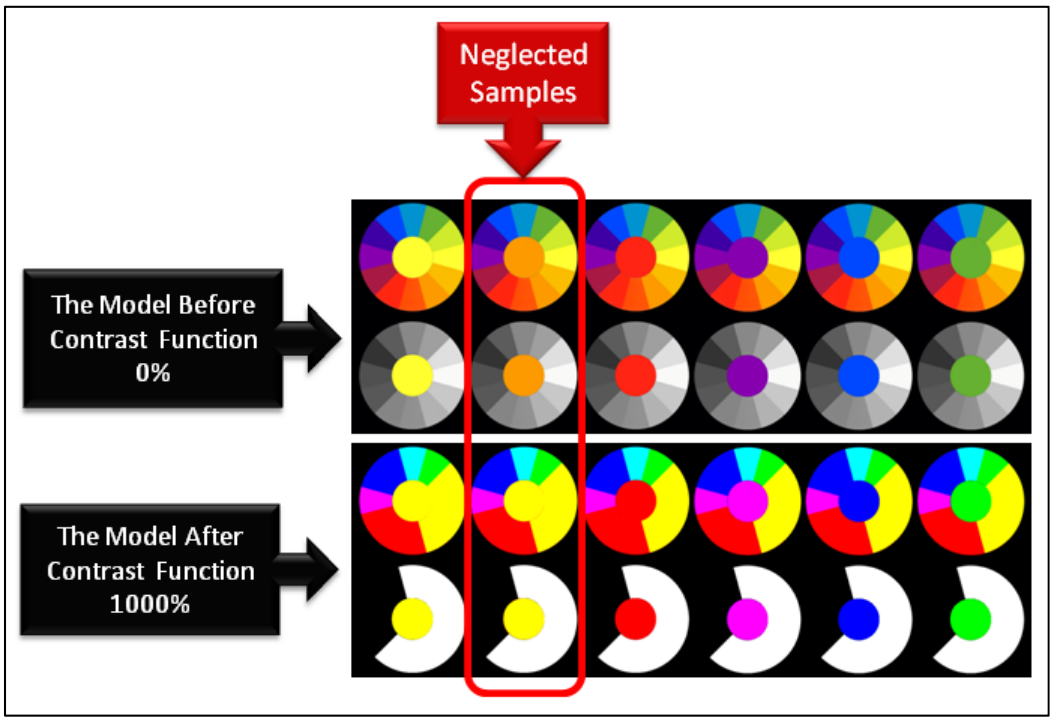


**Figure 4:** The difference between the model before the contrast and after 1000% contrast

## 3.3 Justifications

Researchers were keen to get an acceptable level of validity and reliability by provoking the following questions:

### 3.3.1 Why Contrast?

As is well known, that the contrast is important for distinguishing the features and highlighting objects (Wang, Giesen et al., 2008). The researchers assumed that there is a significant relationship between the colour contrast and highlighting foregrounds. This assumption is based on the logical relationships between the colour and the attracting the attention that proved by using the "*Photo Album Test*" (Al-Helly & Fuziah, 2013).

### 3.3.2 Why not applying the (Use Legacy)?

In Figure 1, the Brightness/Contrast box, the option of "Use Legacy" is not activated, the reason is that the use legacy option shifts all pixel values higher or lower, that function will

clip or lose some details of the image, deforming the shape by highlighting or shadowing image components According to Adobe, this option is not recommended, it is just useful for mask editing and some scientific applications (http://help.adobe.com).

### 3.3.3 Why use the circular shape?

The coloured circular shape used in this experiment, it is the simplest systematic shape that can be used for experimental models as a focus, the colours distribute more regularly (Al-Helly & Fuziah, 2013), this shape is a measurable to scale the deformation angles on the other hand.

### 3.3.4 Why the Contrast rate is 1000%?

The justification for the using contrast function till 1000% is to the limit the function. In other words the contrast after 1000% value, will not give any visual changes.

### 3.3.5 Why Using *Itten System*?

Instead of using *Itten system*, a virtual colour wheel, of 12 colours is created for the reliability of the experiment as shown in Figure 5.

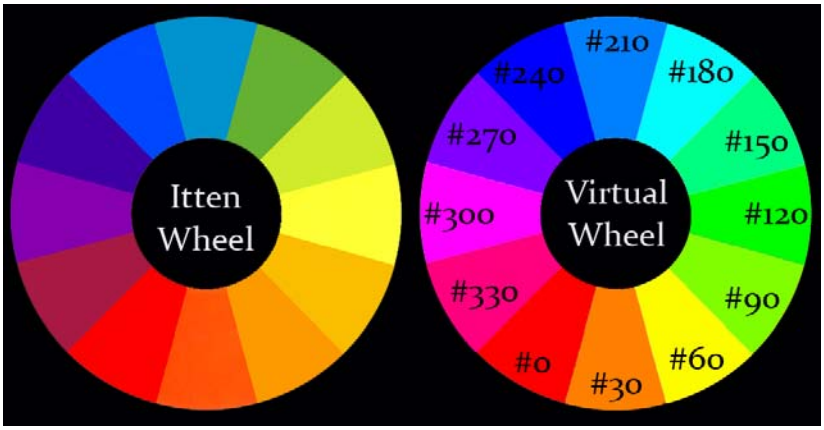


**Figure 5:** Itten and the virtual wheels

**Notes**: the values of the hue sequenced from (0# to 330#) instead of (0# to 360#); in-fact the values of 0# and 360# have the same hue (Red colour), as the colour circle start and end at the same point.

Despite the systematic procedure that adopted by researchers to obtain the reliable colour wheel for the experiment, consist of 12 values (0# to 330#); The virtual wheel was neglected by the researchers due to the visual quality of contrast among the 12 colours, the Hues

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visually seem unrecognizable due to the contrast gap among them. Within Itten wheel, the colour hues visually seem more acceptable due to the contrast gap among the 12 colours.

## 4. The Analysis

Figure 6, presents a comprehensive description for applying the contrast function. It shows the deformation amount for the samples within the experimental model in both of cases

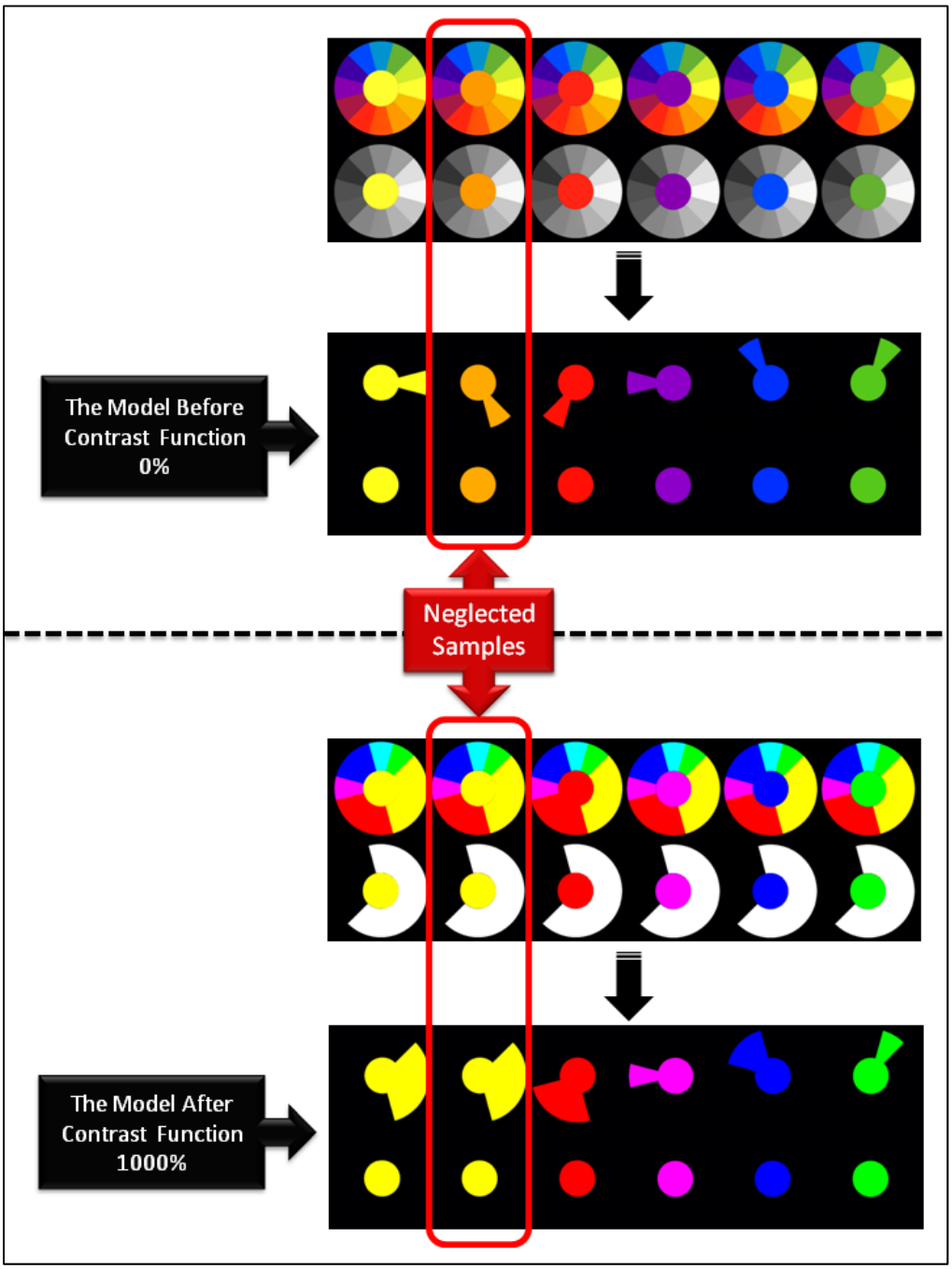


**Figure 6:** The result of deformation

pretest and posttest. The applying 1000% of contrast function leads to samples with measurable angles of deformation, as follows:

### 4.1 The Measuring Of Deformation Angles

By using the following equation, can calculate the value of deformation angle:

$$Angle\ Value = \frac{n\ 360^{\circ}}{12} \quad (1)$$

Where, n = the summation of deformation colours of 12 from the Itten system. From the equation, the angles the deformation angle for each of samples before the contrast function is:

$$Angle\ Value = \frac{(1)\ 360^{\circ}}{12} \quad (2)$$

The angle value of each sample before the function (pretest) is=30° as in Figure 7.

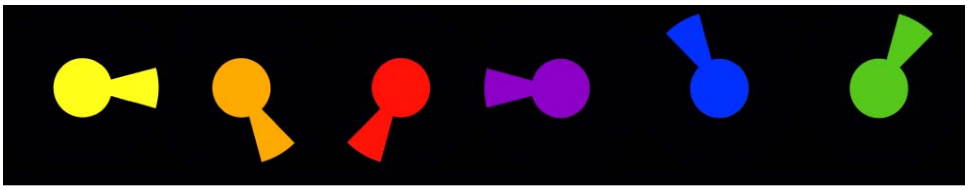

**Figure 7:** The angle's deformation of each sample before applying the contrast function.

## 5. Discussion of Results

The angle's values of the samples after applying the contrast function (posttest) calculated as follows:

**Table 1:** The calculation of deformation angles for each sample.

| SAMPLE COLOUR | | THE VALUE OF THE DEFORMATION ANGLES |
|---|---|---|
| 1 | YELLOW | (4) 360º/12 = 120º |
| 2 | ORANGE | Neglected Sample |
| 3 | RED | (www.3dstereo.com) 360º/12 = 90º |
| 4 | VIOLET | 360º/12 = 30º |
| 5 | BLUE | 360º/12 = 60º |
| 6 | GREEN | 360º/12 = 30º |

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As presents in Figure 8, the deformation of samples with coloured backgrounds have varied angle's values depending on the amount of deformation backgrounds under the contrast function of each sample.

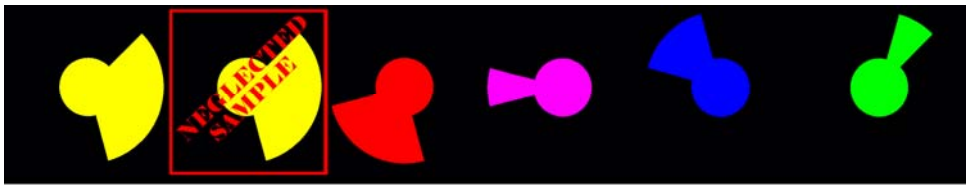


**Figure 8:** The angle's deformation of each sample (with coloured backgrounds) after applying the contrast function.

**Table 2:** The Average and T-Test, for pretest and posttest samples.

| Colour | Pretest samples | Posttest samples |
|---|---|---|
| Yellow | 30 | 120 |
| Red | 30 | 90 |
| Violet | 30 | 30 |
| Blue | 30 | 60 |
| Green | 30 | 30 |
| Average | 30 | 66 |
| p-value | 0.05435 | |

From Table 2:

The average of pretest samples = 30

The average of posttest samples = 66

For T-Test that the value of p= 0.05435.

## 6. Conclusion

Table 1 showed that the amounts of angles deformation have varied depending on the amounts of contrast affection. The experiment results emphasized that the expanding of the contrast slider showing clearly the visual deformation of samples with coloured background; unlike the expanding of the contrast slider never changes the shapes of the samples with neutral (greyscale) background.

In Table 2, the T-Test results showed the difference between the averages of pretest and posttest samples (30 and 66). The value of p = 0.05435 proves that the experiment presented visual evidence:

- The colour contrast has a significant impact on highlighting the foreground objects with neutral (greyscale) background.
- The colour contrast has an impact on deforming the shape of foreground objects due to the chromatic interaction between the foregrounds and the backgrounds.

Figure 9 shows the variance of experimental samples. And the deformation amounts for each sample of five colours (3 primary and 2 secondary colours). The orange colour sample was excluded for more reliability of the test.

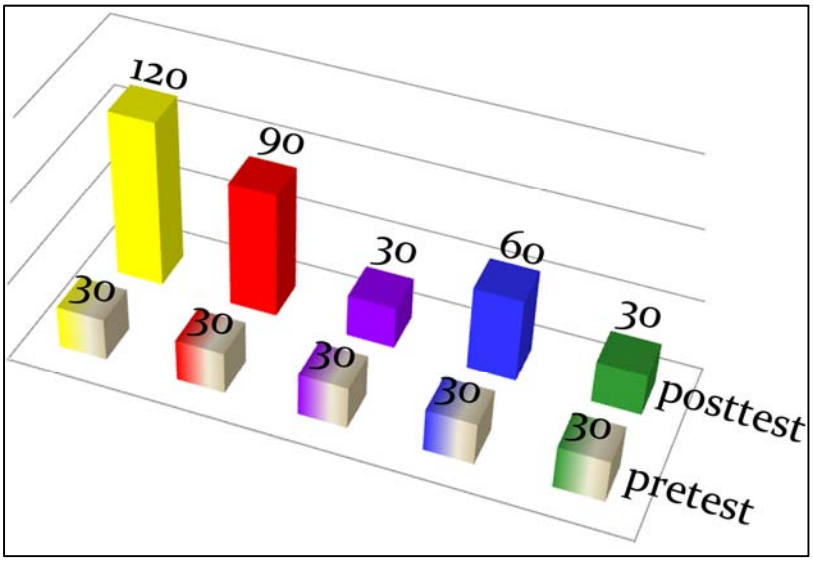


**Figure 9:** Chart presents the samples pretest and posttest.

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