

Computer Graphics and Understanding Semiotics in Design

Manoj Majhi and Debkumar Chakrabaty

Abstract—The objective of the paper was to understand the use of an important element of design, namely color in a Semiotic system. Semiotics is the study of signs and sign processes, it is often divided into three branches namely (i) *Semantics* that deals with the relation between signs and the things to which they refer to mean, (ii) *Syntactics* which addresses the relations among signs in formal structures and (iii) *Pragmatics* that relates between signs and its effects on they have on the people who use them to create a plan for an object or a system referred to as design. Cubism with its versatility was the key design tool prevalent across the 20th century. In order to analyze the user's understanding of interaction and appreciation of color through the movement of Cubism, an exercise was undertaken in Dept. of Design, IIT Guwahati. This included tasks to design a composition using color and sign process to the theme '*Between the Lines*' on a given tessellation where the users relate their work to the world they live in, which in this case was the college campus of IIT Guwahati. The findings demonstrate impact of the key design element *color* on the principles of visual perception based on image analysis of specific compositions.

Keywords—Color in Semiotics, Cubism and novice designer, visual perception, multimedia and communication.

I. INTRODUCTION

THE world is argumentative with contending cues and varied roots and visual perception pays an important role in effective communication. Multimedia is perhaps the most effective means of communication and Semiotics is prevalent in the modern world's multimedia based design. It was in the 1980's where semiotics was first utilized in multimedia industry for promotional material for distinctive commodities. Traditional text book based literacy is important [1]. However, in today's world, semiotic multimedia literacy including text, audio and videos is proving to more effective and perhaps more important for learning, teaching and communicating ideas that are both complex as well as simple. Multimedia is immediate and rich, and it enables us to amplify and clarify the meaning of its content in ways text or narration alone cannot [2].

Today's digital multimedia as we know it came up in the later part of the 20th century and is a broad term that circumscribes various mediums. It includes the bunching of customary communications through film, images, music, spoken and written words, with the shared power of computers

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and communications technology through computer-enabled consumer devices and most importantly the internet. [3]. New media also holds out possibility of on-demand access to content anytime, anywhere, on any digital device, as well as provides a platform for interactive user feedback, creative participation and community formation around the media content [4]. In such an intricately connected world, image analysis and understanding of semiotics holds key to the effectiveness and reach of the subject media to serve its purpose.

II. IMPACT OF COLOR ON SEMIOTICS

A. Motivation and Approach

As discussed in the previous section, today's digital multimedia significantly influences one's learning and awareness. In order to evaluate effectiveness of the medium, it is important to identify the key factors of interactive multimedia design that impacts one's sub-conscious awareness. They are:

- Interaction of various elements of design
- Signs and context used to communicate (Semantics)
- Relationship between signs used (Syntactics)
- Impact of signs used on their users (Pragmatics)

In order to understand these factors, a task was devised to use *colors*, an important design element, to develop a composition using a given tessellation using the theme '*between the lines*' [5].

A tessellation is a repetition of a pattern to form of small squares or blocks such as tiles on pavements that is arranged in a checkered or mosaic pattern. The subject tessellation (Fig. 1) [6] is developed using the slide, reflection, and rotation techniques. The slide technique is utilized to redraw the middle tile to the tile above it. From the top, the tile is reproduced clockwise using the slide, reflect and rotate techniques consecutively.

B. Case Study Exercise

To analyses semiotics for an user group, a group of 34 users were given 25 minutes to complete a task of designing a composition based on the subject tessellation using the design element *color* to address the theme of '*Between the Lines*' to the *context* of your world i.e, the IIT Guwahati college campus. The task also required the subjects to provide a 10 point description about the composition and relate their inputs to the given task. The subjects were not bound by any specific rules and formal design structure in their compositions.

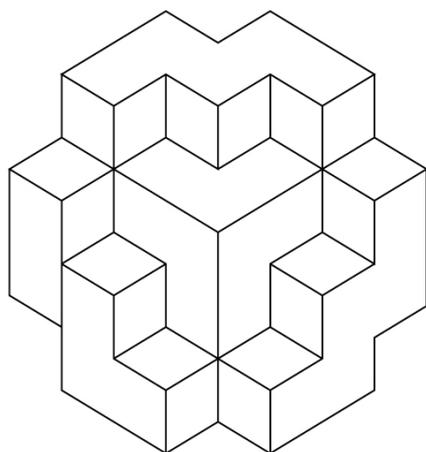


Fig. 1 Subject Tessellation [06]

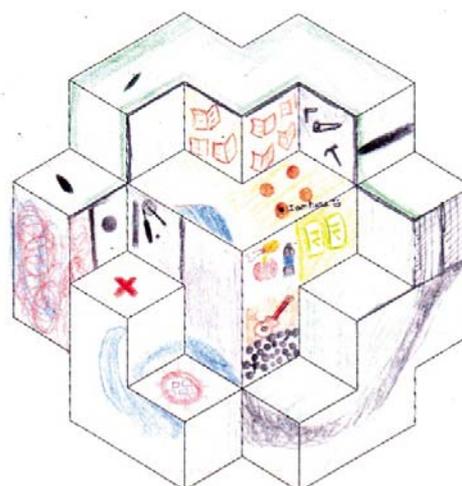


Fig. 3 Composition-1

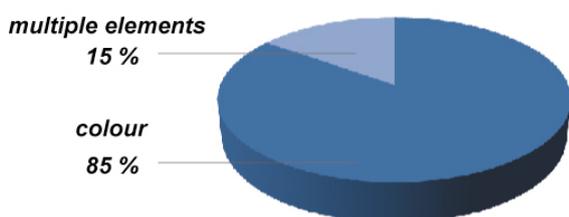


Fig. 2 Analysis Result of Compositions

C. Review of Subject Compositions

The review of the 34 subject composition indicated that the subjects used various elements of semiotics in their design to convey the central idea. An analysis of the data contained in the composition showed 85% of the subjects used the element of color and 15% of the subjects used multiple elements to communicate their concepts. A pie-chart (Fig. 2) illustrates this split

Looking into the evolution of basic design tools it is clear that effectiveness and creativity of the subjects transcends their counterparts over a century back who were bound by formal styles of creative design such as *Cubism*. Cubism is a style of painting and sculpture developed in the early 20th century which is characterized chiefly by an emphasis on formal structure, reduction of natural forms to their geometrical equivalents. It was encouraging to note the vigor and self-realization in multimedia semiotic design that the exercise brought out from subjects and enabled them to communicate their ideas in unique and effective manner. A few random compositions are presented below.

D. Observations on Select Compositions

A few random compositions are presented in this section along with observations

In Composition-1 (Fig. 3) the life in the college campus is well represented. The greenery that is abundant in the college campus is conveyed with signs between the lines to the context and using the color green. The various activities in which an individual indulges are communicated using the sign for the female sex [7]. The signs of hand tools indicate a workshop. The Indian currency *rupee* symbolizes signification of banks. Sports icons are used to communicate a stadium. The user has also used a tandoori chicken leg to symbolize non-vegetarian food, a musical instrument to designate musical performances for the Diaspora with the audience represented by black dots. The guitar performance indicates taste of the audience is catered to. In summary, this composition is successful in providing a good representation of the various activities the subject relates to in his life in the college campus.

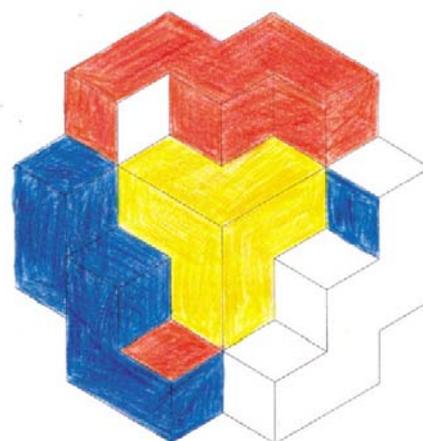


Fig. 4 Composition-2

In Composition-2 (Fig. 4) the subject has the colors red, blue, yellow, orange and white. The color white signifies knowledge [8], yellow signifies intellect or freshness [9], red signifies energy and strength [10], white signifies purity [11][12]. It may be noted that the motto of IIT-G is

"knowledge is power" [13] and the composition conveys the message that the life at IIT-G being joyful and knowledge imparted being pure. The colors incorporate within itself the mottoes and ideas in context with IIT-G.

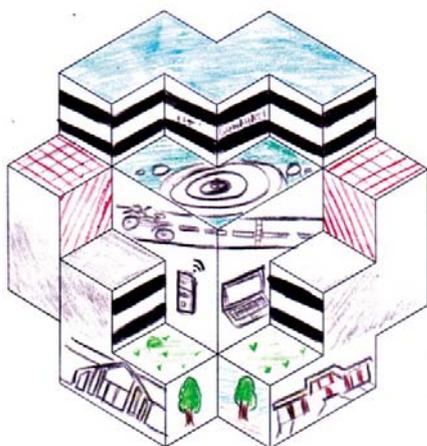


Fig. 5 Composition-3

In Composition-3 (Fig. 5) the subject indicates that the design circle is progressively growing, which symbolizes the increasing number of Designers graduating from the Department of Design, IIT-G that has been in existence over a decade [14]. The subject used strips of black and white in combination, such that many designs involve the exciting usage of these two exceptional colors. The circle that signifies the Design Circle and the various shapes representing the achievements, the light shadow signifies the future campus.

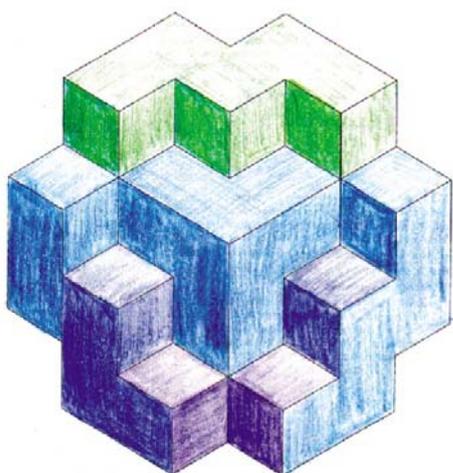


Fig. 6 Composition-4

In Composition-4 (Fig. 6) the subject defines the life at IIT-G by using a cool color scheme in the 3 dimensional grid. The user has used shades of blue and green that depicts that life here is cool where the user has made a metaphorical representation of the life at campus. Another reason for having used the cool color scheme is that it is soothing to the eye, to metaphorically showing the life here is also soothing to the

inner eye i.e. the mind. The lower levels are greener and the higher levels are bluer, by this the user seems to show that life here is easy and 'greener' at the lower levels and it gets difficult and 'bluer' as one rises to the higher levels. But, it also gets 'cooler' here at the campus which is close to nature. The colors the subject sees most in the campus are flowing rivers and dense forests which seem to influence predominance of blue and green. The user has changed colors at every step of this composition and used a different solid color to demarcate the various levels of life one is subjected to at campus that also signifies growth and change. The user has used gradient and shadows through gradient to show light falls on this grid. This is recognized to the continuous light of knowledge.

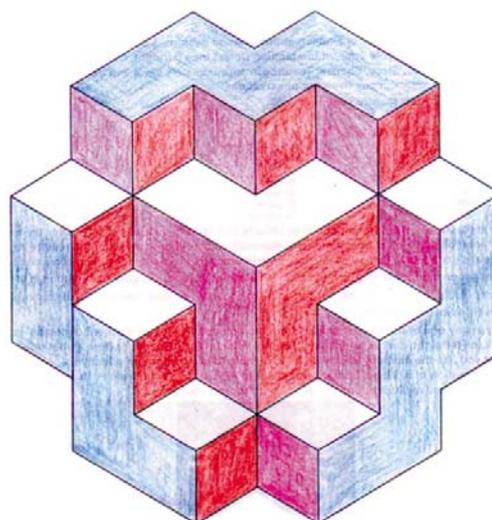


Fig. 7 Composition-5

In Composition-5 (Fig. 7) the colors used are the subject's favorite ones i.e. pink, blue, red and white. The lines provide a 3D feature to the composition giving it the appearance of projecting out of the surface and the subject has leveraged this feature by using light and colorful shadows. The user has used white color at the top facing areas, red color at right facing areas and pink color at left facing areas. In the composition the exception was the outline where the user used color blue. The motivation of the subject was that though the image looked like a 3D structure it still was made on the 2D which prompted the intent was to maintain some 2D flavor as well. White was used to signify the present of strong overhead light source on the structure, whereas red and white signify shadow of and weak reflected light coming from objects not visible on image but can be perceived at a significant distance. Since the surfaces are approximately at right angles, the subject has used combination red and pink to signify reflection of incident from two perpendicular surfaces. In the background the subject has used a bit of grey to give the mainframe spotlight. Though the subject intended to use shadows outside the frame but refrained from doing to comply with the objective. The overall color combination seemed to show a sense of harmony as they are quite contrasting but still managed to fit in the frame quite

well enhancing the aesthetic quality of the composition.



Fig. 8 Other Design Compositions

The other compositions that were a part of the case-study are summarized in Fig. 8. 5 compositions of the total 34 have been discussed in this paper and the rest are presented above for reference.

III. CONCLUSION

The influence of on Semiotic design and its impact on the effectiveness to communicate an idea using a specific media was evaluated in this case study. The study demonstrated the ability of the subjects to comprehend and utilize signs (semiosis) including indicators, symbols, metaphors in realm of the visual communication. A range of visual perceptions was developed based on a simple given task of using color through which the subjects could relate the following

- Signs to their meanings
- Signs with other signs
- Signs and their effects on the diasporas

In summary the paper provides an interesting insight to application of semiotics in conveying a range of ideas through a basic medium. The observations and patterns can be leveraged to enhance effectiveness of the compositions using multiple mediums which was evident in subsequent case studies.

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REFERENCES

- [1] Gert Rijlaarsdam, Huub Van Den Bergh, Michel Couzijn, "Traditional literacy ", *Effective Learning And Teaching Of Writing: A Handbook Of Writing In Education* p 445 2005.
- [2] Ralph M. Stair, George Reynolds, George W. Reynolds .*Principles of Information Systems* p 258 2009
- [3] Noah Wardrip-Fruin, Nick Montfort, "internet", *New Media Reader* p 17 2003
- [4] Keith A. Roberts, David Yamane, "media content", *Religion in Sociological Perspective* p 34 2011
- [5] Tom Bassarear, "between the lines", *Mathematics for Elementary School Teachers* p 579 2011
- [6] <http://www.math.wichita.edu/history/Images/tessellation1.gif> CiCi Naifeh 28.09.12
- [7] Eric S. Rabkin, "female sex ", *Mars: A Tour Of The Human Imagination* p 31 2005
- [8] Johan Fornäs, "color white signifies knowledge", *Signifying Europe* Ch 6 2012
- [9] Marcia Moses, "yellow signifies intellect or freshness", *Understanding Color: Creative Techniques in Watercolor* p38 2008
- [10] Arnold Bittlinger, "red signifies energy and strength ", *Archetypal Chakra: Meditations and Exercises of Opening Your Chakras* p 98 2001
- [11] John Kitto, Henry Burgess, Benjamin Harris Cowper, "white signifies purity ", *The Journal of sacred literature* p 409 1857
- [12] Yogendra Singh , "white signifies purity ", *Social Sciences: Communication, Anthropology, and Sociology* p 114 2010
- [13] Syed V. Ahamed, Victor B. Lawrence, "knowledge is power", *Intelligent Broadband Multimedia Networks* p 475 1997
- [14] Kavita Dass, "Department of Design , IIT-G ", *Guide to Top Campuses in India* p 213 2009

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