Abstract: This paper proposes to explore the nature of graphic language documents from the contrasting perspectives of structure and function — from the perspectives of the document’s structure as a spatially-oriented object. Using design principles derived from Gestalt theory and the Bauhaus concept that form (or structure) follows function, the paper addresses the relationship that exists between structure and function in the broad domain of graphic language documents.

1. Defining Image.

In the literature on non-verbal phenomena, the terms image, graphic, and picture are frequently used interchangeably or with topical specificity. Within the present context, image is defined as a collection of signs and symbols that have been created or mediated. This means that the mere act of seeing does not create an image, as indicated by the quotations in Table 1. For example, when a landscape is surveyed from the top of a skyscraper, the act of perceiving creates an internal, mental representation. Within the current definition, however, this representation is not an image until it is either mediated, as in framing to produce an aerial photograph, or created, as in drawing or painting to reproduce the mental representation. Just as Fenk (1998) restricted the term sign to special cases of external representation, this definition serves to eliminate any need to consider mental representations. This does not deny that mental representations do not impact processing and interpretation of images; rather, they are simply not the focus of the current discussion. This definition would place image in the first of the five categories that comprise the typology proposed by Mitchell (1986): graphic (e.g., pictures or statues); optical (e.g., mirrors or projections); perceptual (e.g., sensory data); mental (e.g., memories, ideas or dreams); and verbal (e.g., descriptions or metaphors). It should be apparent, however, that these five categories are not mutually exclusive, but are highly interactive and frequently demonstrate overlapping relationships.

In the digital environment, then, an image is what is seen on the digital display (i.e., the computer screen or monitor) because it is both created by a human encoder and mediated by the size and resolution characteristics of the display device itself. This definition of image creates problems within the digital environment, however, when emphasis is placed on the non-verbal aspect precisely because the image on the display can be or can contain verbal elements. To generate the image seen on the display, both verbal and non-verbal elements are indiscriminately represented as ones and zeros (the code) and identification of displayed elements as text or image is not a representational issue. Differentiation between text and image occurs only at the level of internal processing respective to the particular digital encoding-decoding system (i.e., relevant to text codes such as ASCII or to image codes such as TIFF or GIF).

Because the present discussion is not about internal systems, whether human or digital, but about external representations, the term image must be understood to subsume all digital displays of text, pictures or graphics. Within this framework, then, pictures is used to refer to displays that contain no text. In the digital domain, graphic may refer to any of the following:
to any non-text entity; to raster-based but not vector-based non-text entities; or to an informational chart but not to a rendered scene. It is used here to refer to displays that contain combinations of text and pictures. These definitions are not necessarily mutually exclusive; for example, many corporate logos, such as those of IBM and 3M, include alphanumeric characters but are commonly accepted as pictorial conventions. Their identification as text, picture or graphic is dependent on the application.

It is estimated that 75 percent of the information entering the brain is from the eyes, and that 38 percent of the fibers entering or leaving the central nervous system are in the optic nerve. Current research indicates that the eyes have 100 million sensors in the retina, but only five million channels to the brain from the retina. This means that more information processing is actually done in the eye than in the brain, and even the eye filters our information. (Hanson, 1987, 39)

Studies indicate that vision is about one-tenth physical and nine-tenths mental. In visual perception, sensory input in the form of light patterns received by the eye is transformed by the brain into meaningful images. The interpretation depends on preconditioning, intelligence, and the physical and emotional state of the viewer. The variety of our responses to visual stimuli is demonstrated by artists. Twelve people depicting the same subject - even from the same vantage point - will create twelve different images because of their different experiences, attitudes, interests, and eyesight. (Preble & Preble, 1985)

Table 1: Seeing, perception and image

Due to the nature of the digital environment, an image can be static or dynamic. Taking film as an example of dynamic image, there is ongoing discussion as to whether the basic coherent unit of filmic representation is the frame (or still), the shot or the scene (Barthes 1985, Carroll, 1992; O'Connor, 1996). In the digital environment, and for the purposes of this discussion, the frame or static display will be considered the basic unit. Dynamic images can then be subsumed as a specific context in which static images occur. The dynamic context and its associated conventions will impact perception as well as the mental representations and interpretations of the viewer; but, in combination, the context and its convention shape the semiosis of the image. Working from the definition of image as a static collection of signs and symbols which have been created or mediated, it can be seen that the visual display on a digital device, regardless of the codes used to manifest the image, cannot be interpreted without considering its immediate context and the sociocultural knowledge of the viewer.

2. Gestalt Theory

Gestalt is a German word without a direct English counterpart. Loosely identified with form and shape or, more broadly, with essence, Gestalt reflects the concept that, as Krampen (1994) observes, "'wholes' are experienced as such and not as the sum of their parts" (290). Early in the twentieth century, this concept entered discourse in philosophy, psychology, and visual design. In psychology, Gestalt theory was applied to perception and sensory organization to explain how the individual sees the world and the relationships that exist between physical pattern in the world and human physiological activity. Kohler (1947) adopted Gestalt theory to counter behaviorist theorists who rejected the study of direct
experience. He argued that «when discrete entities unite in a group, the part which equality (or similarity) play in the unification cannot be explained in terms of learning» (84). The application of Gestalt was carried to the extreme in the study of optical illusions by the Berlin school which held that there was a «direct and lawful connection between physical stimuli and their sensory perception» (Kampen 1994, 291). Cataldo (1966) points out that, over time, these differences in the application of Gestalt to perceptual psychology were resolved by focusing on the principle of an isomorphic correspondence between the structural characteristics of visual form and the observed phenomena in human behavior.

Gestalt holds that «there are wholes the behavior of which is not determined by that of their individual elements, but where the part processes are themselves determined by the intrinsic nature of the whole» (Cataldo 1966, 109). This organismic approach to perception was in contrast to the more mechanistic approach of traditional science which endeavored to solve problems by isolating elements and reassembling them. The outcomes of these processes revolve around "the intrinsic nature of the whole" and have been delineated in subtle variations as a set of Gestalt principles. Of the fourteen principles articulated by Kampen (1994), five are of particular interest:

1. A field naturally tends to become organized into forms. Thus Gestalt can be identified as a field theory.
2. A form tends to be a figure set upon a ground which, in the visual sense, is synonymous with field.
3. Forms vary by their articulation ranging from simple to complex.
4. Similarity and adjacency of forms results in their integration or grouping.
5. The stronger a form, the more meaningful and objective it appears.

Thus, strong forms are well articulated, resist disintegration into parts or fusion with other forms, tend toward closure if open, and depend more on the dynamics of central forces than upon stimulus properties.

The figure-ground relationship was considered the starting place for perceptual activity (Kennedy 1985) and included principles of good continuation, closure, proximity, and similarity. Good continuation refers to the linearity of form that allows us to follow a line of text across a page. Closure is related in that it implies we tend to close areas or gaps in what is seen as incomplete. Just as closed figures are more stable, it is psychologically more rewarding to achieve closure in activities. In proximity, forms tend to group based on the nearness of their parts. In similarity, those visual parts that resemble each other tend to be seen as a group. Similarity can involve shape, size, color, direction or even a time period. Thus similarity in time period accommodates the dynamic of film which reflects similarity of both time and place. These Gestalt principles were applied to education in graphic design and visual communication in the Bauhaus in the early decades of the twentieth century and formed the basis of stimulus design. Later, in the middle of the century, Arnheim (1974) extended this work to explore the dynamics of forces and tensions, the central pull-and-push of image design.

As Kennedy (1985) points out, critics of Gestalt have argued that figure-ground is just a pictorial effect -- nothing more than lines and contours on flat surfaces creating edges but not depth. Taking an extremist position, Kennedy argues that, "In principle, perception is simply a means of grasping the underlying mathematics of forms" (35). Currently, fractal geometry is used to simulate varieties of landscapes as well as other animate and inanimate forms. These simulations are perceived as coastlines, clouds, hills or deserts, yet they are based on geometry and variations of lines as edges. Another argument against Gestalt reflects the notion that individuals hold in memory schema for types of objects such as noses, houses or even scene arrangements (Gombrich 1960). The extremist Gestalt reply is that individuals privilege basic
forms and perceive by constructing objects out of the visual building blocks of circle, square, and triangle (Arneheim 1974; Dondis 1973). In this sense, Gestalt is based in perceptual simplicity and basic geometry for visual analysis; and the extreme position that there are basic privileged forms is reminiscent of schemata. If these extreme views, which were manifested in the Bauhaus movement, are rejected, then the task of perceiving shape is endless as there are infinite variations in nature. This is not to say that recognition is based first or foremost on perceptual form, as related here to basic geometry. Rather, gestalt theory contributes to the definition of image the principles of perception, continuation, similarity, proximity, and closure. These form a geometric basis for visually analyzing the physical world and inform the interpretation of the viewer. Because coding in the digital environment is itself grounded in mathematics, it is therefore possible to develop coding systems that represent the basic geometric forms of perception.

3. Semiotics

In contrast to the narrow focus of these extremist arguments, semiotics offers a potentially more comprehensive context for the perceptual process and its isomorphic correspondence with human behavior. Semiotics is the science of signs and, as Fiske (1990) points out, it is concerned with the exchange of meaning. In semiotics, sign is defined generally as something that stands for something else.

There are two basic approaches to understanding sign in semiotics: the linguistic dyadic of Saussure and the general triadic of Peirce. Saussurean linguistics describes the sign as an arbitrary, learned or conventional relationship between a signifier and a signified. Berger (1989) points out that, to account for infinite variation in the perception of a sign, Saussure held that «no signifier - whether a word or drawing or any other kind of sign - is self-explanatory and implies a specific signified» (30). The triadic description of Peirce, on the other hand, expands semiotics beyond linguistics to include natural phenomena. From this extreme position, Peirce suggests that the universe is made entirely of signs. For the interpreter (the perceiver as encoder or decoder), the triad consists of the sign itself, or representamen; the interpretant of the representamen; and the object to which the representamen and the interpretant refer. However, the term sign is often used indiscriminately to refer to any of the components that comprise Peirce's triad.

Gestalts as holistic perceptual structures have also been interpreted as or equated with the concept of sign (see, e.g., Nøth 1990; Krampen 1994). Moles explains Gestalt as supersigns or holistic elements of information processing which are made up of subsigns, or sign element building blocks. Nøth (1990) explicates Moles's position:

According to Moles, the perception of a visual image is a process of integrating such subsigns and supersigns within the pictorial whole. More specifically, he proposes a hierarchy of perceptual levels extending from a differential optical element, a geometrical morpheme, a partial image of a signifying object to an iconic phrase and discourse. (451)

The Gestalt is one of these subsigns within the overall sign system and, as Krampen (1994) observes, it can provide connections between sign systems. The "geometric morpheme", in particular, becomes the focus of Gestalt as applied in the Bauhaus movement to the encoding process of image design; but definitive interpretation can never be extracted because of the iterative interpretant-representamen-object process. Peirce has noted that semiosis in practice is unlimited since signs necessarily generate further signs; and Cobley and Jansz (1997) point out that «we are all aware of how one sign triggers a chain of associations that eventually seem quite removed from the initial sign» (26).
4. Function and Communication

The function of an image can broadly be defined as communication. The nature of this communication, however, is dependent on the interests and purposes of the discussant or encoder/decoder: to inform interpersonal and social relationships; to provide information processing; to persuade; to convey knowledge; to express beauty; etc. (Barthes 1985; Larsen 1985; Doblin 1980; Twyman 1985, 1979). There are many models of communication but none are comprehensive due to the breadth of its nature. Fiske (1990) describes two approaches to communication which he characterizes as the semiotic and the process models. The semiotic model is concerned with the exchange of meaning and the process model with the transmission of the message. Fiske states that the semiotic "school has no concept of breakdown in communication and is not much concerned with efficiency and accuracy in other words, the determinants of communication lie in society and the world around us, not in the process itself" (Fiske 1990, 190). The process approach, initiated by Shannon-Weaver, is integrally tied to the development of digital information retrieval systems by the mere fact that it involves a machine. The centrality of the process model to the development of information retrieval systems does not deny the simultaneous involvement of a semiotic model. The process and semiotic approaches should not be viewed as rival approaches but as a Gestalt—an integrated whole that is greater than the sum of its parts. One could say that process studies generalities, and semiotics studies specifics, in the same sense as words are general and images are specific. Aspects of each model can be studied in detail to inform both design and process development, but neither holds a holistic answer to problems of communication.

As encoders of visual communications, designers, whether of persuasive advertising or of expressions of beauty, are concerned with understanding how visual phenomena are used in the act of communication. Working from the perspective of an encoder, Berger (1989, 39) describes the semiotic context in terms of five interacting factors: the artists or encoders who create images; the audiences or decoders who receive images; the work of art which is an image itself but may actually consist of a number of elements that are images in their own right; the social context, whether that within which the images are encountered or that within which the images have been created; and the medium.

On the other hand, Twyman (1979) presents a matrix for categorizing "graphic languages", by which he means visible communications. This matrix is based on practical applications or functions. He notes that there is little interaction between practitioners of various graphic language systems: e.g., between typographers and iconographers or between fine artists and commercial artists. Twyman's matrix (1979, 119) adopts a global perspective in the attempt to address visible communications in terms of the "method of configuration" (e.g., graphic organization, structure, or form) and the "mode of symbolization" (e.g., alphanumeric, pictorial or combination of the two). By focusing on the relationship between these two aspects rather than on the aspects themselves, he attempts to avoid the semiotic issues of meaningful exchange and the complications arising from interaction among Berger's five factors. Twyman's initiative appears to have been undertaken from a structuralist or process-based perspective that attempts to isolate the various encoding options and build an analysis of their application. In art theory, his approach would generally be identified with formalism since it considers only the visual elements and properties of an image. But Carroll (1982) points out that, while «No one doubts that there is a structure to visual communication», these structures may be manifested in a multiplicity of forms that can encompass «innate structure, semiotic structure, grammatical structure, cognitive structure, the structure of eye movements, even the structure of convention» (371).
5. Structure as Form

All too often, spatial dynamics -- the geometry of the Gestalt involved in interpreting the physical world -- are taken for granted. They provide a foundational relationship between individuals and the representations and creations of the objects of the world in which they live and move. Bragdon (1922) points out that, in the microscopic world of nature, the constructing units tend to arrange themselves with relation to simple geometrical forms -- the visual building blocks of circle, square, and triangle. These forms give rise to unity and simplicity in the face of complexity: the honeycomb, the snowflake, the proportions of the human figure, the triangular arrangement of the features of the human face. Boulding (1968) suggests a typology of images beginning with the simplest level of organization, called static structures, which are exemplified by the statue, the picture, or, more abstractly, the atom. Successive dimensions of organization are mechanical, homeostatic, biologic, botanical, animal, and human; but, because Boulding's typology is agglomerative, "Each level of organization includes characteristics from all the lower levels» (28).

There are many terms to describe the concept of form, or structure, as applied to images. In everyday conversation, many of these terms are used interchangeably; but within specific domains, individual terms are applied more carefully. In graphic design, the terms shape and form demonstrate specific differences in that form implies the three dimensions of length, width and depth, while shape indicates only length and width (Ragans 1988). According to Hurlburt (1977), the publishing activity of page layout exemplifies the notion of form defining structure. Focillon (1948) contends that, in fine art, form is the "modality of life", a graph of activity that is inscribed in space and time. The iconography of images has been described by Focillon as having three categories: variation of form with the same meaning, variations of meaning with the same form, and form devoid of meaning. In information retrieval systems, the iconography of images is limited to the first two of Focillon's categories and involves the naming of entities and/or their component parts. This process serves as the basis for representational languages in most information retrieval systems that include images. Focillon (1948) illustrates his third category -- form devoid of meaning -- with the history of the interlace form. The history of this form has its origins in the symbol of entwined snakes in the caduceus of Aesculapius, the Roman god of medicine and health. The symbolic association with medicine was lost, however, as the interlace form became incorporated into such cultural materials as the ornaments and monumental architecture of Islam and East Christian communities. Though not claiming universality, the interlace form has thus taken on a life of its own.

Barthes (1985) explores the relationship of form to meaning in a discussion of Eisenstein's film "Ivan the Terrible." The specific frame, or still, that he discusses shows two courtiers showering the young tsar's head with gold. Barthes distinguishes three levels of meaning in this frame: the informational or communication level; the symbolic level; and a third level that he labels the obtuse. On the informational level, Barthes finds meaning in the setting, the costumes, the characters, and their relationships. On the symbolic level, he finds that the shower of gold conveys the theme of wealth and a more general signification of exchange. The obtuse level is focused on the signifier or representamen -- the physical features found in the visual image itself which can only be described by the density of the courtiers' makeup, the delicate line of one courtier's eyelid or the shape of the "stupid" nose on the other. These are the structures of the image -- the forms or shapes -- selected by the filmmaker as encoder. These images are the signs that contribute to the Gestalt of the frame. Furthermore, the obtuse meaning is not semantically situated but «remains suspended between image and its description» (Barthes 1985, 55). The implication here is that there can be no
linguistic description of this meaning, suspended as it is between the visual and the verbal. However, the principles of Gestalt might be brought to bear to explicate the relationship between communication and structure -- between function and form. Focillon captures the essence of this approach in his statement regarding the principle of form: «namely: the sign bears general significance, but having attained form, it strives to bear its own individual significance; it creates its own new meaning, it seeks its own new content, and then endows that content with fresh associations by the dislocation of familiar verbal modes» (5).

Although physical arrangement in space is ubiquitous in all human relationships and occurs as an attribute of creations and/or interpretations across all dimensions of reality, physical arrangement of entities within an image document is a spatial attribute that is frequently neglected in systems of representation. Broadly speaking, it is easy to look at pictures and assume that they can be represented in the same fashion as alphanumeric documents. Reliance on existing schemes devised for alphanumeric documents, however, overlooks the graphic nature of pictures and their inherent spatial physicality. Although it is commonly accepted that no one scheme can order reality for everyone, current attempts at the development of standards for representing collections of pictures are driven by the verbally-oriented ethnocentrism of the current classificatory workforce. If objects are represented solely by linguistic interpretations of conceptual meaning generated within such a verbally-biased context, then objects residing in both public and private collections risk becoming irretrievable. Such a representational system closes the door to future interpretations that might actually be based upon physical arrangement since current methods of physical description generally fail to incorporate representations of a picture's internal spatial attributes or geometric structure.

6. Form and Function: The Bauhaus

Focillon (1948) contends that «A work of art is an attempt to express something that is unique, it is an affirmation of something that is whole but it is likewise an integral part of a system of highly complex relationships» (1). If the phrase «work of art» is replaced with the word image, as it has been defined for this discussion, Focillon's statement would reflect the challenge confronting the design of digital retrieval systems. This challenge involves issues of representation -- of naming or categorizing for subject access -- for non-verbal materials (Jørgensen 1996; Shatford Layne 1994; Small 1991). All images are, at a minimum, a slice from the real world: from the selection of a plot of ground to produce an aerial photograph to the selection of what to display within the confines of a medium's viewport (the book page, television screen, or computer display). All pictures are at once complex but simple in their wholeness: that is, all images integrate the unique view of the selector with the complexity of the selected.

In the twentieth century, the foundation of the selection process has its roots in the Bauhaus, a progressive school of art founded in Germany by Walter Gropius in 1919. The Bauhaus ushered in a new era in graphic, industrial, and architectural design. It emphasized social (or self-) consciousness; valued craftsmanship at all stages of production; and not only crystallized but systematized the industrial age, accepting the machine as the essential vehicle of form by combining quality craftsmanship with art (Cataldo, 1966). Lupton and Miller (1993) acknowledge the mythic proportions of the Bauhaus as the originator of modern design; and they note that the search for a unified work of art centered around a system of signs that were both natural and universal -- a language of vision and a fundamental visual grammar whose central elements were the triangle, circle, and square. But Hurlburt (1977) contends that "No movement of modern design has had more written about it - and probably
no movement has been so misunderstood than the Bauhaus» (38). Indeed, Wolfe (1981) humorously attacks its application in architecture by asking «has there ever been a place on earth where so many people of wealth and power have paid for and put up with so much architecture they detested?» (7).

The misunderstanding of the Bauhaus can easily be traced to several sources. In the first place, the language of vision was understood as speaking directly to the eye, following Gestalt theory as it was manifested in the physiological optics of the Berlin school. Secondly, although the word graphic was acknowledged as relating to both writing and drawing, as well as the convention of data display in the sciences, its relationship with verbal language was only analogical. Nonetheless, subsequent research has focused on the ability of visual languages to replicate the forms and functions of verbal languages (Carroll 1982; Knowlton 1966; Kolers et al. 1980). These efforts continue in the arena of digital systems with the work of Cobb and Petry (1998); Chang et al. (1986); Caivano (1994), and others. For the most part, these researchers are working on algorithmic grammars for the geometry of image processing. Existing digital systems already match alphanumeric strings or use algorithms to match configurations of alphanumeric strings; and edge matching in images is the logical next step.

The popular legacy of the Bauhaus is contained in the cliches that purportedly originated with two of its proponents: Sullivan's "form follows function" and van de Rothe's "less is more". Sullivan was an American architect who advocated the design principle that "a building should publish to the beholder the purpose which it subserves - what it is for, what it is about, why it is as it is and not otherwise" (Bragdon 1932, 5). Bragdon's accounts of his interaction with Sullivan demonstrate that by function Sullivan meant the natural characteristics of the materials themselves and not the sociocultural application or utility of the final product. Thus, for example, buildings using steel-framed construction materials of the industrial era should not be given the appearance of solid masonry structures. Rather, the form should follow the function of the materials themselves and the techniques employed in construction using those materials.

Sullivan's legacy -- the notion that form follows function -- has been removed from its original context and its intended meaning has consequently been lost. The notion that function should determine form was intended to address the need for architecture to take into account the unique characteristics of the construction materials themselves. Instead, popularization of "form follows function" led to misinterpretation of Sullivan's intent and subsequent neglect of the material characteristics of the medium in favor of the utility of the end-product. This misinterpretation of the notion of function can be extended to the representation of images in digital retrieval environments in that the verbal description of the image is privileged over the graphic form -- the visual structure or geometry of the image.

7. Graphic Language Documents

There is wide-spread acceptance of the notion of document as more than written text and including graphic images, pictures, and objects. Twyman (1979) defines graphic language as two-dimensional, intentional, visible communication. This leads to a notion of graphic language documents which subsumes any traditional alphanumeric text as well as any combination of text, graphics, and/or pictures. The image as display of signs and symbols in a digital environment can be reconciled with Twyman's definition of graphic language documents by applying traditional graphic design principles drawn from Gestalt psychology. Thus, within the environment of a digital system, there is no difference between the representation of an alphanumeric text and a picture: each form of display simply requires a different internal code for processing the ones and zeros that constitute the digital display.
Each letter code is individually manifested as an array of pixels or picture elements that conforms to Gestalt principles of structural relationship to create the image on the digital display. That is, each pixel is either on or off so that the spatial arrangement of the one/off picture elements creates meaningful forms. All standard digital displays, regardless of specific content, are actually graphic language documents and thus equivalent to the concept of image as defined in this paper.

In electronic environments, there is a growing dominance of resources that are not strictly alphanumeric. Yet the traditional organization of graphic language documents in electronic systems is based on the assumption that they can be represented only through words -- through text-based, linguistic representations. This subordination of non-text, or more-than-text, documents is currently under challenge as their availability and use increases in electronic environments such as the World Wide Web. Within this evolving context, consideration must be given both to the adequacy of linguistic representation as the predominant means of organizing graphic language documents and to the potential for additional approaches to representation that can apply to all forms of documents.

Traditional representational structures tend to create stability and in so doing impose an internal rigidity on information storage and retrieval systems. When applied to text documents, physical description (cataloging) has little impact on information gleaned from contextual and conceptual interpretations of the document's content. Within this expanded notion of graphic language documents, physical structure need not be independent of the meaningful content of a document, thereby impacting the conceptual potential of the document. When it is assumed that the specific arrangement of objects and entities within a spatial or pictorial process of communication is equivalent to the arrangement of words that form a sentence or a paragraph in a process of verbal communication, the physical arrangement of entities within such a framework holds potential meaning that cannot be captured in standard verbal representations.

8. Conclusion

The migration of classification theory and practice into the digital environment opens new possibilities for representation. The current discussion would not be useful if it were not for growing interest in the development of tools that can be applied to the retrieval of digital document representations. Because the essential characteristic of the digital medium is mathematical, application of Gestalt principles in line with the reinterpretation of "form follows function" would point to the potential for retrieval informed by the internal structural characteristics of the image -- retrieval informed by structural characteristics that would utilize the potential for geometrical recognition. The mathematically-based communication model of Shannon and Weaver is integral to the mechanics of digital activities, yet it has been rightly criticized for inhibiting the development of information processing systems by focusing too rigidly on a single modality (Sonesson 1995). Just as structure and function are intertwined, however, so are geometry and representation: each contributes an important thread to the texture of description.

References:


