

**ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE**  
**ENGINEERING AND TECHNOLOGY**

**SEEING AND LEARNING FROM FAMILIAR SHAPES  
OF A SELJUK PATTERN**



**M.Sc. THESIS**

**Bahar AKGÜN**

**Department of Informatics**

**Architectural Design Computing Programme**

**DECEMBER, 2016**



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**İSTANBUL TEKNİK ÜNİVERSİTESİ ★ FEN BİLİMLERİ ENSTİTÜSÜ**

**BİR SELÇUKLU BEZEMESİNDEKİ TANIDIK ŞEKİLLERDE BİR GÖRME VE  
ÖĞRENME DENEYİMİ**

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**ARALIK, 2016**



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**Date of Submission : 25 November 2016**

**Date of Defense : 19 December 2016**





*To my family,*



## FOREWORD

I would first like to thank my thesis advisor, Prof. Dr. Mine Özkar, who shaped my thinking, my growth and evolution as a designer and researcher from the very beginning of my design education and gave me the opportunity and encouraged me to make this research driven by curiosity alone. I would also like to thank to my jury members included Assoc. Prof. Dr. Meltem Aksoy and Asst. Prof. Dr İdil Üçer Karababa for their insightful inputs.

I would like to extend my warm gratitude to my good friends. First I would like to thank Sibel Yasemin Özgan for her ongoing support and friendship and being a mentor to me which is rare to come by and I have been honored to have found one. A special thank you to my friend Lara Mehling, with whom I have shared the first discussions have had an invaluable impact on my thinking and I look forward to a future collaboration. Fikret Kuşadalı: thank you for making where we live a home to me. And Dilşad Aladağ: thank you for your friendship and inspiring me with your ways of being, your open heart and open mind. Cansu Kilciler and Fahriye Gürsoy: you gave me the strength to get through the hard times. And Burak Uğur Kara: your true friendship and genuine support is beyond anything I have ever experienced.

And finally my family, Mother, Father and Sister: thank you for being always there and supporting me in every step I take. You all taught me how to dream, how to be free and how to grow as an individual.

My master's studies have been supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK) Project Number 114K283.

January 2017

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## SEEING AND LEARNING FROM FAMILIAR SHAPES OF A SELJUK PATTERN

### SUMMARY

The designer develops personal sensibilities in the course of the design process. Personal sensibilities through appreciations and emotional responses lead the designer to follow a non-linear trajectory. The trajectories, consist of a process that the information is retrieved in-toto rather than a step by step generation of images, depend on the idea of distinctive design worlds constructed by the designer. Highly personal design worlds entail how we perceive our surroundings. The diversity in perceiving the outside world give rise to every single designer do things in a particular way. Design processes and design thinking have been extensively investigated by several studies (Akin, 1986; Goldschmidt, 1991; Newell & Simon, 1972; Schön, 1992; Suwa & Tversky, 1997). However, neither the conclusions they have arrived at nor the processes they have been through coincide with the nature of design processes they have described. The methods for analyzing design processes and design thinking that these studies employ lack personal sensibilities. Therefore, they do not reveal anything novel. This study proposes a new kind of method for investigating and learning from design processes and design thinking with a distinct personal voice. This method is an attempt to develop a model of designerly way of conducting a research and approaches design processes as a process of defining, redefining and changing the problems-as-given. It consists of four steps and each step sets a ground to freely explore ideas without necessarily coming up with a solution or an answer.

The study begins with a visual deconstruction of a Seljuk pattern. The deconstruction aims to find a congruency between how a composition is made and how it is perceived. Then, we set out an explication of all the questions as appeared as successive thoughts in writer's mind in the first place which all together started the curiosity to initiate this study. Following the path formed out of successive thoughts allowed us to obtain unanticipated relations and features. After that, the author narrates her encounter experience with a photographic representation of a Seljuk pattern. In order to reveal the structure of repeating phases, a dissection method was applied on the narration. The narration of the plastic experience aroused interest in how others experience this encounter experience. We explored this in a study consists in seeing and drawing; each participant drew what he/she had seen while looking at a photographic representation of a Seljuk pattern on computer screen. And finally the outcomes of the study was dissected based on the findings of the dissected narration. This part aims at finding correspondances between the outcomes of the dissection of the narration and the study.



## BİR SELÇUKLU BEZEMESİNDEKİ TANIDIK ŞEKİLLERDE BİR GÖRME VE ÖĞRENME DENEYİMİ

### ÖZET

Tasarımcı tasarlama sürecini, dışsal ve nesneleştirilmiş bir zihinsel süreçten çok, kendi bedeninin ve varoluş deneyiminin sürece dahil olduğu bir biçimde deneyimler. Yapma sürecinde ortaya çıkan, beden ve zihin etkileşimleri üzerinden deneyimlenen süreçler doğrusal, önceden tanımlı bir yol izlemez. Bir tasarım problemine ait tüm bileşenler ya da girdiler, tasarımcının bedeniyle, varoluş deneyimiyle bir bütün içinde tasarlama sonucu oluşan farklı tasarım dünyalarına farklı şekillerde girer. Tasarımcı tasarlama süreci içerisinde kendi düşünce süreçlerinin ya da izlediği yolun niteliğinden çok kendi-kendilik imgesinin ve varoluş deneyiminin geliştirdiği kişisel duyumsamalarının farkındadır. Sürecin kişisellik vurgusu, her tasarımcının tasarım süreçlerini kendine has bir şekilde deneyimlenmesine ve bunun sonucu olarak sürece getirdiği farklı yorumların görünür kılındığı farklı tasarım ürünlerinin ortaya çıkmasına sebep olur.

Tasarım süreçleri ve tasarım düşüncesi, üzerinde çok sayıda çalışmanın yapılmış ve yapılmakta olduğu konular (Akin, 1986; Goldschmidt, 1991; Newell & Simon, 1972; Schön, 1992; Suwa & Tversky, 1997). Bu çalışmalar arasında tasarımı, tasarımcı tarafından inşa edilen farklı tasarım dünyaları üzerinden tarifleyen ve kişisel duyumsamaların rolüne vurgu yapan bir takım çalışmaların olmasına rağmen, ne sonuçlarında tariflenen çıkarımlar ne de geçtikleri süreçler makalelerin başında uzun uzadıya tariflenen tasarım süreçlerinin doğası ile hiçbir şekilde bağdaşmamaktadır. Bu tez, bir araştırma sürecini tasarım süreci olarak yeniden tanımlar, tasarım bilgisini araştırma sürecine uygulayarak tasarımcı bakış açısıyla araştırma yürütme yöntemlerine dair bir model geliştirmeyi hedefler.

Anadolu Selçuklu döneminde binaların ağırlıklı cephelerinde yer verilen bezemelerin yapılma amacı, halkı bu desenlerle karşı karşıya bırakarak belirli bir anlam iletebilmektir. İletilen bu anlam irdelendiğinde, kökleri Asya'ya uzanan, Anadolu'ya doğru farklı coğrafya, dil, toplum, din ve inanç süreçlerinden geçerek değişip dönüşmüş; tasavvuf ve beraberinde gelen imgeler, 'evren düzeni' bilinci ve Şamanist semboller karşımıza çıkar (Ögel, 1986, s. 2-5). Yaşanılan dönemin geliştirdiği imgeler, görme deneyimini anlamlandırmamızı sağlayan kişisel ölçütlerin üzerinden üretildiği bir sözlük gibidir. Hatta her dönemin kendi geliştirdiği imge sistemleriyle duyular sistemini ilişkilendirdiği söylenebilir. Bezemelerin ortaya çıkışında etkili olan imgelerin yaygın olduğu 12-14. yüzyıl Anadolu'sunda bu bezemelere değen gözün ne gördüğü ve gördüğünü nasıl anlamlandırdığı bilinmez ancak görme, diğer bir deyişle karşı karşıya kalma deneyimi, günümüze ulaşan Selçuklu yapıları aracılığıyla Anadolu'da halen devam etmekte. Değişip dönüşen imge sistemlerinin yaşadığımız dönem de dahil olmak üzere kendi algı ölçütlerini oluşturduğunu düşündüğümüzde, Ortaçağ'dan günümüze gelen bu desenlerin, bu

değişen ölçütlerle sayısız göz tarafından, sayısız defa tekrar üretildiği bilgisi, bu üretimin ortamına, doğasına ve oluşumuna dair merak uyandırır. Bu imgelerin kaybolduğu daha doğrusu artık gündelik hayatta yer almadığı günümüzde, bezemelerle karşı karşıya kalma deneyimi neye karşılık gelir?

Günümüzde karşılaşma, direkt cephede ya da yapıda bezemenin bulunduğu kısımla, fiziksel olarak gerçekleşebileceği gibi, dijital ya da fiziksel ortamda fotoğraf, model ya da çizim gibi bezemenin temsilleri üzerinden de gerçekleşebilir. Sıklıkla 'sanal miras' olarak sınıflandırılan kültürel mirasa ait dijital ortam temsillerini içeren sanal ortamlar, günümüze ait yeni karşılaşma halleri tanımlar (Tan ve Rahaman, 2009, s. 144). Özellikle iki buçuk boyutlu bezemelerin iki boyutlu görsel düzleminde tekrar üretildiği ortam; dijital fotoğraf temsili, bu yeni karşılaşma hallerinin en yaygın olanıdır. Karşılaşma, görsel imaj deneyimine dönüşmüştür.

Kişinin ne gördüğünden bağımsız olarak her görsel deneyimi, bir şekil verme; dinamik bir araya getirme süreci; plastik deneyim olarak tanımlayan Kepes, buradaki plastik kelimesi ile sürecin biçim verme niteliğine işaret eder (Kepes, 1969, s. 15). Selçuklu bezemelerinde geometrik elemanların tekrar, simetri ve hiyerarşi ilişkileri ile kullanımı sonucu çeşitli seviyelerde elde edilen geometrik uyum, anlamların iletiminde bir tasarım aracı olarak kullanılır ve zengin bir plastik deneyim sunar. Geleneksel olarak aşına olduğumuz bütün görünüşler, tek tip ifadeleri yüzünden dilsizleşir; görünüşle aramızda herhangi bir etkileşim gerçekleşmez, tepkisizleşiriz (Kandinsky, 2013, s. 25). Yalnızca yakından ve ısrarcı bir göz tarafından deneyimlenebilecek tekrar, simetri ve hiyerarşi ilişkilerinin zenginleştirdiği plastik deneyim, özde sahip olduğu şekil verme doğası sayesinde yeni ve bilinmeyen etkileşim ve anlamlandırma biçimleri üretebilir.

Bu çalışma geleneksel olarak aşına olduğumuz görünüşler üzerinden yeni görme ve öğrenme yolları üretmeyi araştırır. Bir Selçuklu bezemesinin fotoğraf temsili ile karşılaşma sürecinde gerçekleşen plastik deneyim, düşüncede izlenmiş ve yazıya geçirilerek kaydedilmiştir. Yazıya geçirilen metin bu sürecin diğer insanlardaki işleyişine dair merak uyandırmış ve sürece dair veriler elde edebilmek adına bir çalışma tasarlanmıştır. Elde edilen çıktılarla ve yazıya geçirilen plastik deneyim betimlemesi ile bakılan Selçuklu bezemesinin yapısal strüktürü arasındaki ilişkiyi deşifre edebilmek adına görsel çözümlene önerisi getirilmiştir. Bakılan desenin görsel olarak çözümlendiği süreç desenin oluşumuna dair yeni bakış açıları oluşturmuştur. Plastik deneyimin betimlendiği yazı geliştirilen bir yöntem ile analiz edilmiş, analizin çıktıları deney sonucunda elde edilen verileri analiz etmek için kullanılmıştır.

## 1. INTRODUCTION

The mind, body and senses collaborates in the course of design processes. And this sets a highly characteristic and personal medium. And it is only through this characteristic and personal medium that the designer gains access to her design knowledge. The sensory, bodily knowing which reveals itself by putting themselves into the mode of doing does not follow a straightforward linear path. Facing a design problem in the fraction of a second the designer has a feeling about it right before the thoughts, images begin to stem from one another which constitutes an eminently dynamic trajectory that the designer follows. This feeling, the immediate appreciation or incredibly quick emotional response, sets the very early phase of design process by putting the designer into the mode of doing. The appreciation or emotional response is so dense and ambiguous creates a space which is only but vaguely comprehensible to its owner. This dense and ambiguous problem space requires the designer to construct her design world to resolve itself. All of the components or inputs of a design problem enter into different design worlds in different ways which designates a quality of personal sensibilities. It is simply not possible to evaluate and process the same design problems within different design worlds in the same way. This highly personal design world entails how we perceive our surroundings which is also particular with every individual. With the aim of giving an idea of what he means by saying "things move me", Peter Zumthor reads from his notebook to the audience in the lecture he delivered on the occasion of <Atmospheres Architectural Environments>, a Festival of Literature and Music in Germany in 2003:

"It is Maundy Thursday 2003. Here I am. Sitting in the sun. A grand arcade - long, tall, beautiful in the sunlight. The square offers me a panorama - the facades of houses, the church, the monuments. Behind me is the wall of the cafe. Just the right number of people. A flower market. Sunlight. Eleven o'clock. The opposite side of the square in the shade, pleasantly blue. Wonderful range of noises: conversations nearby, footsteps on the square, on stone, birds, a gentle murmuring from the crowd, no cars, no engine sounds, occasional noises from a building site. I imagine the start of holidays making everybody walk more slowly. Two nuns - we are back to reality now, not just me imagining - two nuns waving their hands in the air, trip lightly across the square, their bonnets lightly gently swaying, each with a plastic carrier bag. Temperature pleasantly fresh, and warm. I am sitting in the arcade on a pale-green upholstered sofa, while the bronze figure on its tall pedestal in the square before me has its back turned, looking across, as I am, at the twin towered church. The helmshaped spires of the two church towers are unequal identical at the bottom, they gradually rise into individual shapes. One is taller, with a golden crown surrounding the peak of its spire. In a minute or two B. will walk diagonally from the right across the

square towards me (Zumthor, 2006, p. 15-17)."

Zumthor conducts a simple experiment: he takes away the square and he tells that his feelings are not the same. Things moved him as he claimed: the people, the air, noises, sound, colours, material presences, textures, forms, his feelings, the sense of expectation that filled him while he was sitting there disappears. The small change that Zumthor created in his perspective of perceiving the outside world gives rise to a tremendous difference and yet, it is still the same person. If someone else was in his place, sitting in the sun on that Thursday morning; under exactly the same circumstances, the described world from Zumthor would have never come into existence. The perception of the new person would take place on the scene in an entirely different way which would form another world.

Zumthor's surroundings which we are informed by his portraying it through the paragraph given above was there without his doing anything to produce it. That "given world" is not the same with the world described by Zumthor (Arnheim, 1969, p.14). Zumthor's world has emerged from his direct exploration through the given world. Arnheim (1969) describes this emerging world as active perceiving "some of its aspects build up fast, some slowly, and all of them are subject to continued confirmation, reappraisal, change, completion, correction, deepening of understanding" which are highly sensitive and individual issues (p. 14-15). A designer asks questions, develops curiosities, provokes thoughts, creates a problem space and sets the dimensions of it, searches within it. Thereby she portrays a world through materials, objects, words, thoughts, sounds etc, which are given, within different mediums. A dialectic, develops between her perceiving and thinking, serves as an instrument and a tool to construct a design world within she functions. The designer is not necessarily conscious of her ways of thinking, perceiving or the trajectory she would be following in the course of actual designing. It is not a process followed as a step by step generation of images or ideas but rather a process the information is retrieved in-toto. What designer is conscious of and benefits from is the personal sensibilities, making every single designer do things in a particular way, they have and develop through the actual designing from which the new artifacts are brought into being.

Design processes and design thinking have been widely investigated topics by researchers (Akin, 1986; Goldschmidt, 1991; Newell & Simon, 1972; Schön, 1992; Suwa & Tversky, 1997). And these pioneering studies have taken one of the two approaches, formal analysis and informal analysis. Formal protocol analysis looks at

designing from a problem-solving perspective which is a search process through a solution space. In informal analysis, on the other hand, design is seen as a process depends on the idea of distinctive design worlds constructed by the designer. The structure of the studies and the trajectory they follow are in general very similar. The linear trajectory they follow roughly consists of applying formal or informal protocol analysis to the process of designing in order to reveal design reasoning, parsing the protocol into its smallest components, and analyzing interconnectivity among segments in order to arrive at generalizable insights which can not go any further than repeating the facts already known and does not reveal anything novel to design reasoning that the designer can get benefit from. Goldschmidt (1991) makes the definition of design as a plan for the making of something new (p. 125). A research is a place to generate new ideas, ask questions, develop curiosities, provoke thoughts, create a problem space and set the dimensions of it, search within it, in its very essence it is a plan for the making of something new. Although the studies, which take on informal analysis approach, sees design as a process depends on the idea of distinctive design worlds constructed by the designer, appreciation of design qualities, the evolution of design intentions in the course of the design process which designate the key role of personal sensibilities, neither the conclusions they have arrived at nor the processes they have been through has nothing to do with the nature of design processes they have described at the outset of the papers. Both the processes and the conclusions lack personal sensibilities; a personal voice which is indispensable to any design process. This raises an interesting question: is it possible to gain an understanding of design reasoning from a perspective does not belong to any design world, or in other words, from a non-designerly way of reasoning? This study proposes a new kind of method for investigating and learning from design processes and design thinking. The method consists of four steps. First step is to narrate any kind of encounter experience which originates a sense of wonder. This encounter might be sensory, bodily or visual and can take place in various mediums. And then the second step is to dissect the narration. The dissection method should be unique and designed by the narrator to each narration. And the next step is to set a ground where similar kind of encounters can be experienced by other people. The aim of this step is to multiply the encounter so as to obtain a certain amount of outputs. And the last step is to dissect the outputs of the encounter experiences of other people.

In order to cope with design problems, which are widely recognised as ill-defined, ill-structured, or wicked, the designer defines, redefines and changes the problem-as-given in order to find a solution (Cross, 1982, p. 226). This defining, redefining and changing the problems-as-given form the nature of design processes

which initiates novel forms. Lawson (1980) claims that “scientists adopted a generally problem-focused strategy and the architects a solution-focused strategy” which gives an insight to the view separates ‘designerly’ form of activity from scientific activities (p. 32). Schön (1992) describes the design knowledge, which reveals in and by solution-focused strategy, as “mainly tacit, in several senses of the word: designers know more than they can say” (p. 3).

Through this solution-focused strategy, gives rise to the tacit design knowledge, the designers learns how to think in it. Cross (1982) argues that learning how to think corresponds to “learning an artificial ‘language’, a kind of code which transforms ‘thoughts’ into ‘words’” (p. 226). The present study is an attempt to develop a model of designerly way of conducting a research; applying the gained design knowledge to a research problem in order to externalize the codes.

The thesis is comprised of six chapters including an introduction and a conclusion which are structured by the actual research process of the author. A visual deconstruction carried out and presented in Chapter II in order to reveal the processes of creation. The Chapter, which sets a background for the overall study, aims to find a congruency between how a composition is made and how it is perceived. Chapter III sets out an explication of all the questions as appeared as successive thoughts in author’s mind in the first place which all together made this study come into existence. This part of the study corresponds to the early phases of design process which is a place where creative minds are free to run riot, and contains so much information with a distinctly personal voice without which creativity could not flourish. Although some of the questions recede into the background and never mentioned again throughout the study, they are all integral part of the study in terms of revealing the creative processes that led to it.

Chapter IV summarizes the encounter experience with a photographic representation of a Seljuk pattern, mentioned in detail in Chapter III, as ‘the leap’. The author regards the leap as an indicator of a plastic experience. In order to gain a deeper understanding of what has been meant with ‘the leap’, the author narrated the entire plastic experience. After narrating the plastic experience, a dissection method was applied on the narration so as to reveal the structure of repeating phrases.

The narration of the plastic experience aroused curiosity towards the character of the patterns of perception in looking at a picture. How does a person visualize and experience this forming activity? With the aim of revealing and obtaining visible

outcomes out of these processes, a simple study carried out by the author. Chapter V illustrates the study which consists in seeing and drawing. In the study a group of subjects draws what they have seen on a piece of paper right after being shown the digital representation of a Seljuk pattern (Figure 2.1) through a computer screen (see Appendix for study outcomes). The findings of the narration's dissection were used as components of a second kind of dissection method. The dissection method was applied on overall drawings of the subjects.





## 2. VISUAL DECONSTRUCTION OF THE PATTERN

### 2.1 Introduction

Geometric compositions do not easily reveal the process of creation behind which offers visual layers for the viewer to discover. The process starts as a grid of circles, which is fundamental to the development of Seljuk patterns, lightly drawn onto the material that gives an underlying structure to a design (Bakırer, 1981). The craftsman used circles and lines as tools to obtain the overall effect of the compositions which is united although the composition has several visual layers; there is so much to look at.

One question here is how subjects segment or encode images which constitutes the “structural descriptions” in memory (Reed & Johnsen, 1975, p. 569). Encoded pattern in the form of structural descriptions in memory correspond to the perceptual organization of pattern. Gottschaldt’s work (1926) illustrated that the internal unity of a complete pattern influences the initial perceptual organization. Buswell (1935) in his book asserted that perceptual pattern of the gaze were related to the structures in the pictures, yet in a very loose way. What is the relation with perceptual organization of the subject and structural organization of the geometric compositions?

There exists numerous inquiries have been conducted by researchers to represent the construction methods behind the Islamic geometric design. The conventional method; the compass-straightedge is versatile enough to generate these varied patterns as illustrated in the work of Critchlow (1976). However, how a composition is experienced differentiates from how it is made. Even though these deconstructing methods provide a certain insight to the formation of the internal unity of the pattern, to provide an understanding of observer’s perceptual organization, there needs a visual deconstruction.

The artist Gyorgy Kepes, who founded the Center for Advanced Visual Studies (CAVS) at the Massachusetts Institute of Technology (MIT) in 1967, played a critical role in stimulating partnerships between art, science, and engineering during the 1960s in the United States (Goodyear, 2004, p. 611). Samuel Ichiye Hayakawa writes in the preface of his book: *Language of Vision* (Kepes, 1969):

“What Mr. Kepes would have us to do, then, by his attempt at visual re-education, is to compel us to take into consideration the “refraction” of our inherited modes of vision. This he does by showing us what goes into visual experience. He gives us the “grammar” and the “syntax” of vision: what interplays of what forces in the human nervous system and in the world outside it produce what visual tensions and resolutions of tensions; what combinations of visual elements result in what new organizations of feeling; what “visual statements,” apart from “literary” or representational content, can be made with line, color, form, texture, and arrangement.”

European art at the first decade of the twentieth century changed its direction toward an art purely of colors, lines and shapes that bore no direct relationship to the appearance of the outside world (Selz, 1957). The painter and art theorist Wassily Wassilyevich Kandinsky’s formulated ideas of non-objective painting played a catalyst role within this process (Selz, 1957). In his book *Point and Line to Plane* (Kandinsky, 1928) he formulated a scientific basis for the art of painting by dissecting the basic elements of art; point, line and plane. The terminologies developed by both Kepes and Kandinsky have been used as a mediator in this chapter between perceptual organization of the subject and structural organization of the pattern which provided a ground that a visual deconstruction is possible. The visual deconstruction presented in the following section.

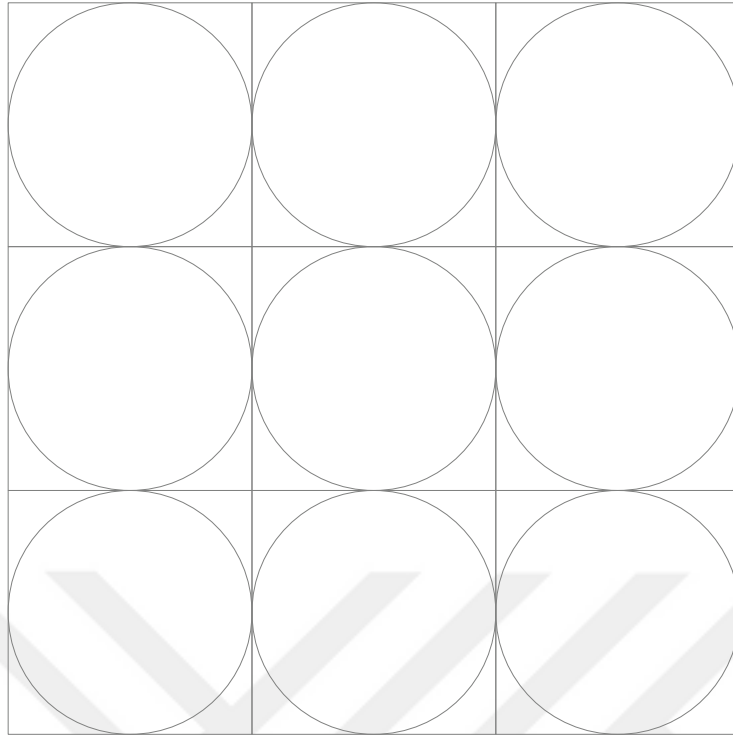
## 2.2 The Deconstruction

A geometric composition guides the eyes of the viewer and delivers different kinds of visual impacts. The construction process starts as a grid of circles and at the end the composition is brought to life by adding thickness. Through the forming process of the material surface, processes of creation step by step that yield to the final composition is formed in a way without losing the connection with the observer. Each step of the construction process led to the underlying structure of the pattern influence the way a composition is perceived. How is this underlying structure of the pattern we have and what are the repeat units? A closer observation of the pattern with the aim of understanding the relationships of elements to each other and to the plane reveals a hierarchical order which enables some elements to be imagined as central. Central elements can often give a clue to the underlying grid structure in which they have been placed. There are typically several central elements within a composition. And here, for the composition we have, the eight-pointed stars, aligned in rows horizontally and vertically, is one of them (Figure 2.1).



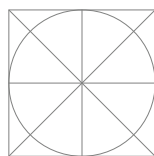
**Figure 2.1** : Eight-pointed star as central element.

An eight-pointed star, one of the most ubiquitous elements in Islamic geometric design, is usually tessellated within a square repeat unit to create a composition (Broug, 2013). Now we have a square grid (Figure 2.2) structure which the craftsmen were using just a pair of compasses and straightedge to create.



**Figure 2.2 :** Square grid.

Circles and lines are the basis of all geometric compositions. The eight-pointed stars are located in the center of each squares reveals that the composition is a fourfold design. Fourfold design is based on the division of a circle into four or eight equal parts (Figure 2.3) which is the first step in the design of any fourfold geometric pattern (Broug, 2013). The nature of Islamic geometric design is nothing more than variations on one theme which exhibits the most varied arrangements from. Some fourfold design processes were examined to have a certain understanding and a basic familiarity. The circle divided into eight equal parts is the basis shared by fourfold designs before they diverge in the design process. The basis consists of a circle surrounded by horizontal and vertical lines touching their diverging sides, so that creating the square and divided into eight equal parts results from three typical kinds of straight lines<sup>1</sup> organized about the center.

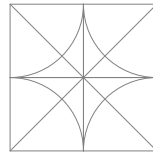


**Figure 2.3 :** The basis. Division of a circle into eight equal parts.

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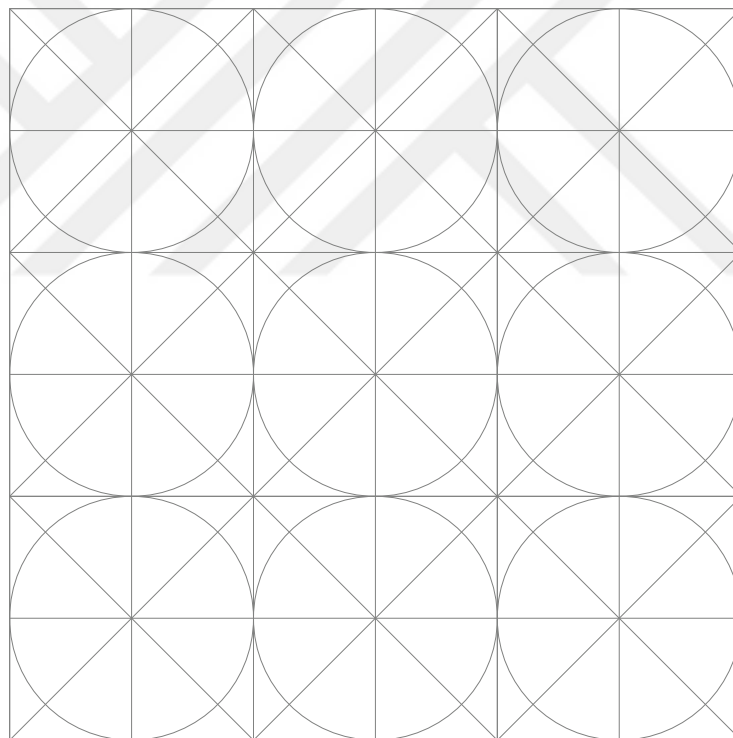
<sup>1</sup>There are three typical kinds of straight lines, horizontal, vertical and diagonal, of which other straight lines are only variations (Kandinsky, 2013).

The tessellation of the basis (Figure 2.5) to create the composition give rise to the formation of a second square grid, which is arranged in such a way to offer space for octagons (Figure 2.4 - 2.1).



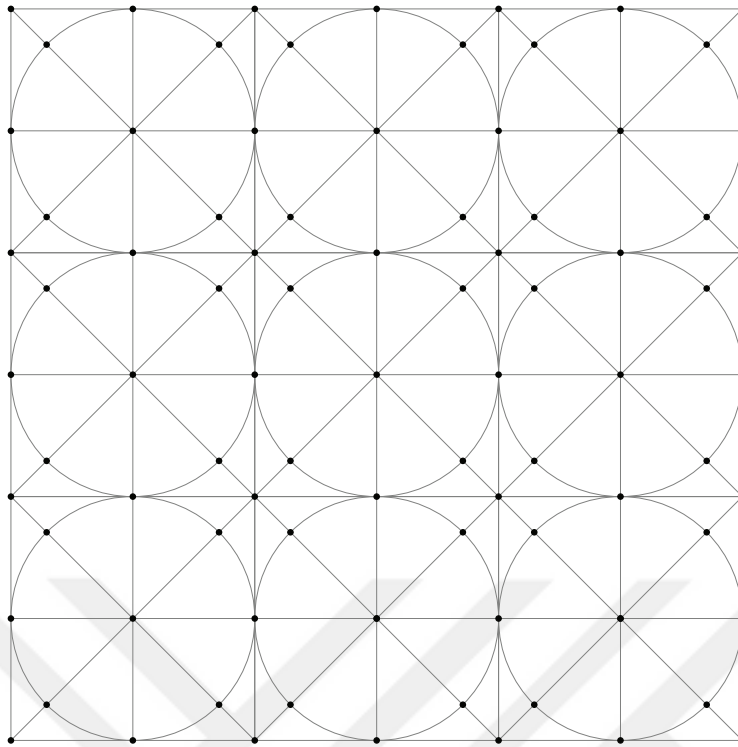
**Figure 2.4 :** The second square grid.

The octagons are the central elements of this newly created square grid (Figure 2.5). The introduction of more than one central elements located in square-grids, supplement and define each other, generate a dual experience of space. As the isolated basis is tessellated, in addition to the emergence of a higher-level structure, the entire plane is divided systematically into points results from the cross-sections of right-angle planes (Figure 2.5 - 2.6).



**Figure 2.5 :** The tessellation of the basis.

The eight-pointed star determined as central element, which can be found in all parts of the Islamic world, is created out of two overlapping squares.



**Figure 2.6 :** Entire plane is divided systematically into points.

By placing on the respective intersections, two overlapping squares are repeated three times along the directions of the straight lines of the basis towards the center so as to form the eight-pointed star (Figure 2.7). Here, the straight lines, organized about the center, function as a means of allowing the two overlapping squares to conquest the plane. The conquest yields to a division of the surface into unequal but repeating intervals which originate a variety of spatial sensation. Furthermore, the track made by moving squares continue to divide the entire plane systematically into points results in an accumulation of points (Figure 2.8 - 2.9). This is the ground zero, create an interpretation of the plane as a spatial world, that the structural organization of the pattern will be built up from (Figure 2.7). The newly created spatial world consist of purely schematic straight lines<sup>2</sup>, which are completely fused with the plane. The lines as spatial forces<sup>3</sup>, reach a balance in the form of a unified network. Since they exhibit equal optical quality and spatial strength, the network we have now appears inert, without tension<sup>4</sup> and static. The conquest; segmenting the plane into constituents to provide a basis to obtain the elements of the composition is only limited to the initial

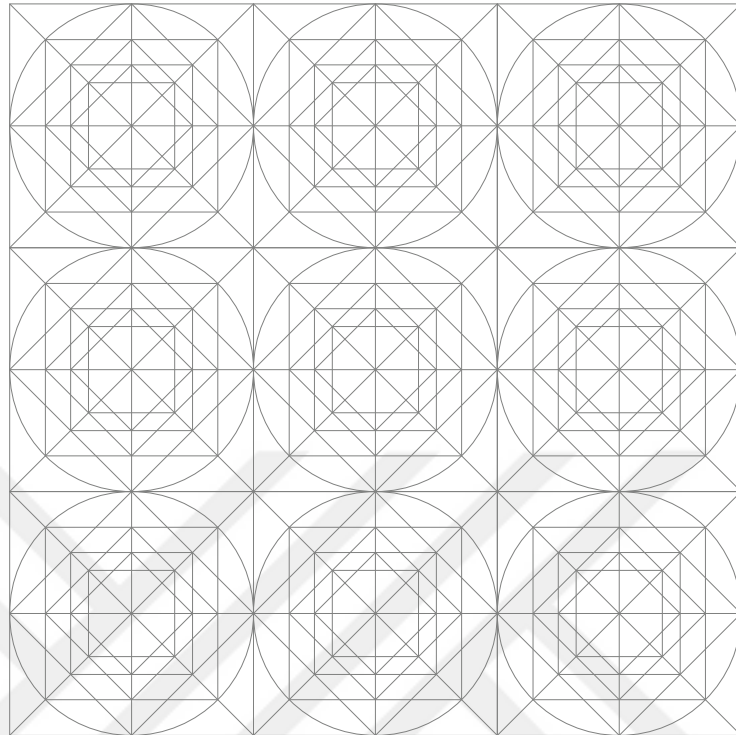
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<sup>2</sup>Horizontal, vertical and diagonal (Kandinsky, 2013).

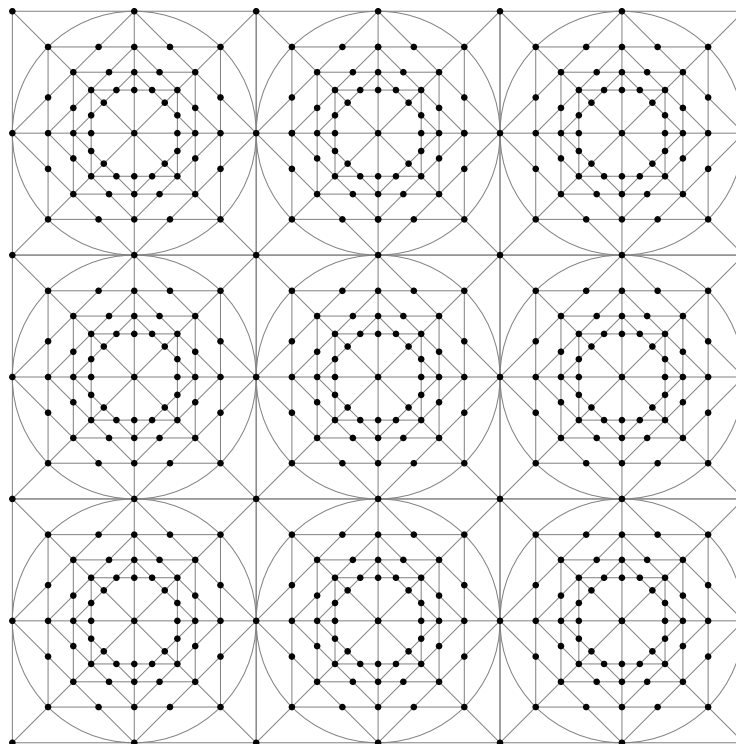
<sup>3</sup>A point, a line, or a shape on the picture-surface is seen as possessing spatial qualities. They have strength and direction, they become spatial forces (Kepes, 1969).

<sup>4</sup>The living quality of an image is generated by the tension between the spatial forces; that is, by the struggle between the attraction and repulsion of the fields of these forces (Kepes, 1969).

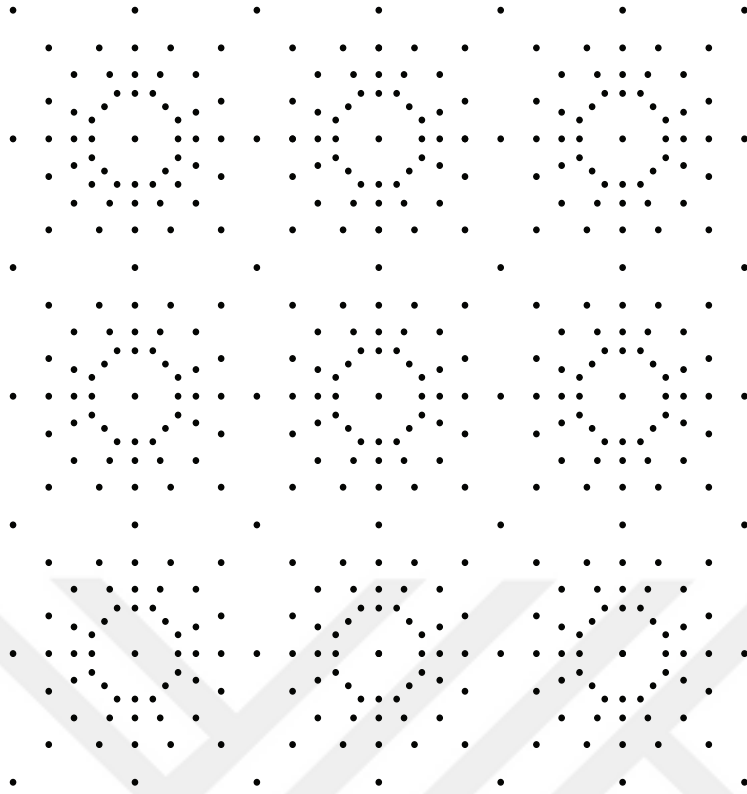
square grid. What about the second square grid? To order and measure the second grid, certain points, obtained from intersections of the moving squares, are tied together through the spacing of the second square-grid (Figure 2.12).



**Figure 2.7 :** The track made by moving squares.

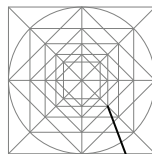


**Figure 2.8 :** The division of the entire plane into points.



**Figure 2.9 :** Accumulation of points.

The free straight lines<sup>5</sup> are used to connect the points become a bridge both to bring an order to create the elements within the second square; octagon shape, five-pointed stars and to connect the squares of the initial grid with each other. The introduction of acentric free straight lines<sup>6</sup> to the plane generate different spatial sensations by activating fields in the directions of other than horizontal, vertical and diagonal (Figure 2.10 - 2.11).

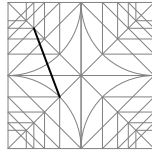


**Figure 2.10 :** The positioning of the acentric free straight line on the initial square grid.

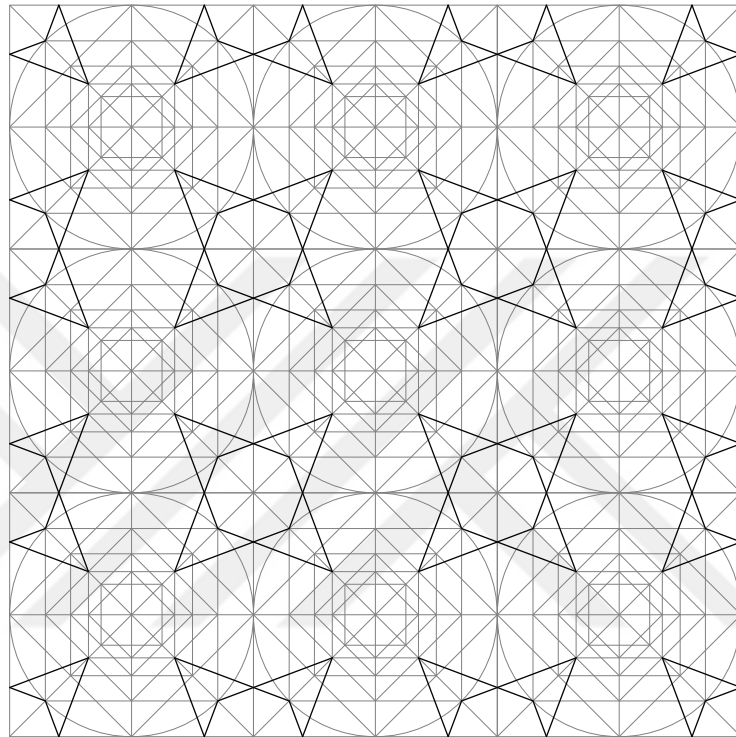
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<sup>5</sup>The difference between the diagonals and the other diagonal-like lines, which one could with justification call free straight lines, is also a temperature difference as the free straight lines can never attain a balance between warmth and coldness (Kandinsky, 2013).

<sup>6</sup>Free straight lines can, thereby, lie upon a given plane with a common center, or lie outside of the center; accordingly, they can be divided into these two classes: a)centric, and b) acentric (Kandinsky, 2013).

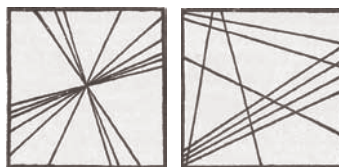


**Figure 2.11** : The positioning of the acentric free straight line on the second square grid.



**Figure 2.12** : Certain points, obtained from intersections of the moving squares, are tied together through the spacing of the second square-grid.

Now these different fields<sup>7</sup>, induced by different lines, being on the same plane-surface originate an inner contradiction which brings a vital tension (Figure 2.13).

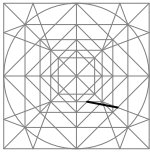


**Figure 2.13** : left - Free straight lines, centric, right - Free straight lines, acentric (Kandinsky, 2013).

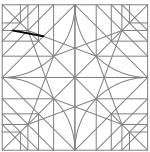
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<sup>7</sup>The living-quality of an image is generated by the tension between the spatial forces; that is, by the struggle between the attraction and repulsion of the fields of these forces. (Kepes, 1969).

The contradiction is resolved by placing some other acentric free straight lines (Figure 2.14 - 2.15) between those opposing fields (Figure 2.16 - 2.17).

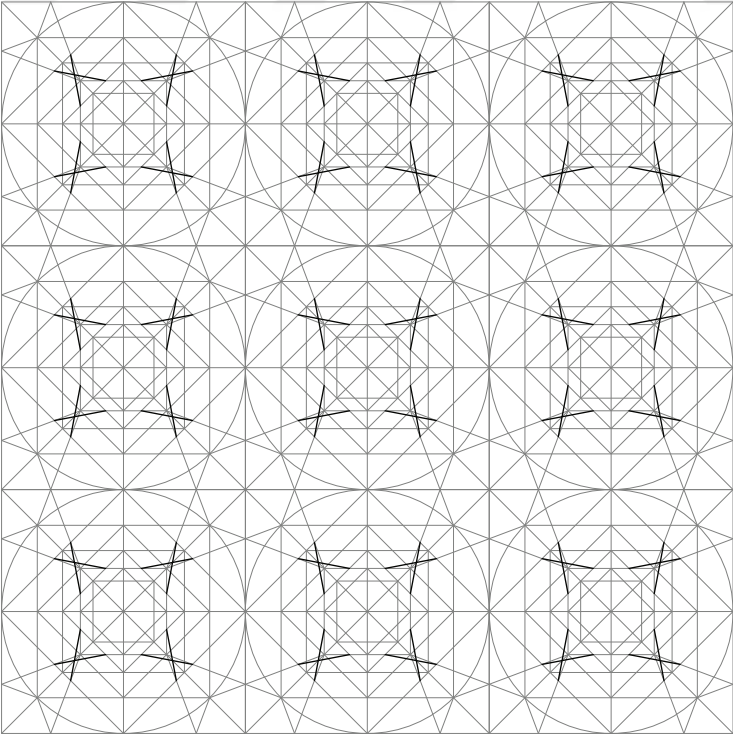


**Figure 2.14 :** The positioning of the acentric free straight line on the initial square grid.

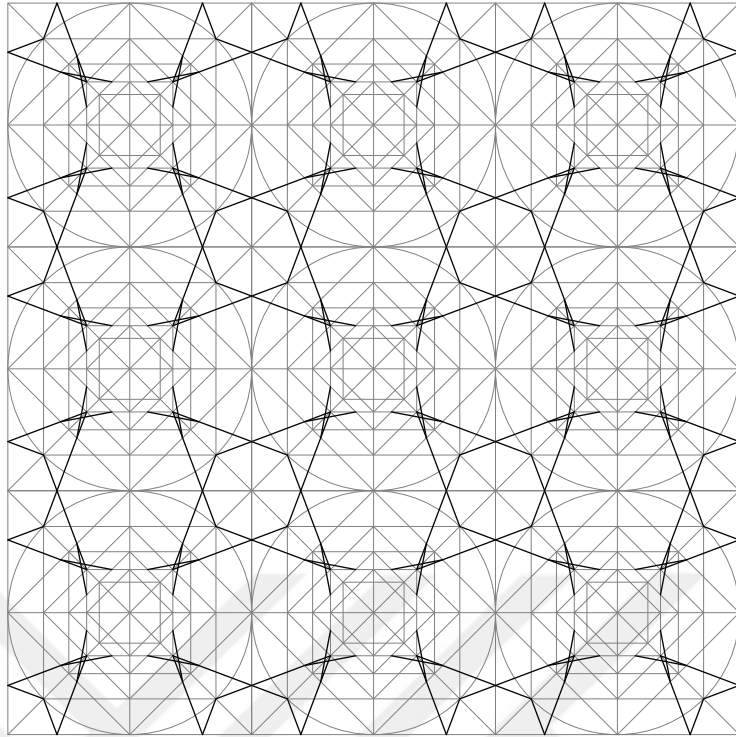


**Figure 2.15 :** The positioning of the acentric free straight line on the second square grid.

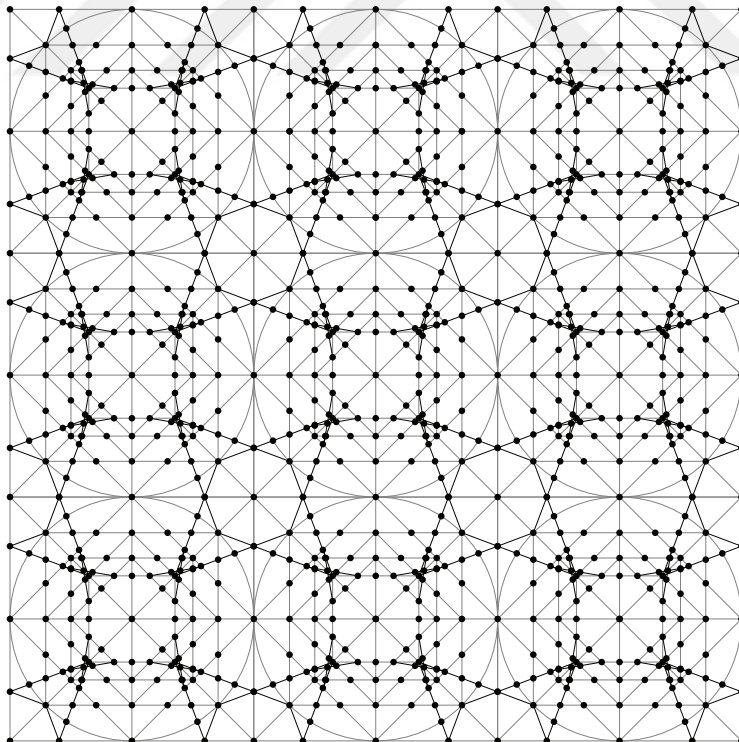
The acentric free straight lines function here as a mediator to balance those opposing fields in a way to have the appearance of movement. Moreover, they cut the plane into more points (Figure 2.18 - 2.19). After choosing which sections of lines or points to use for the eventual composition (Figure 2.20 - 2.21), the composition is brought to life by adding thickness (Figure 2.22).



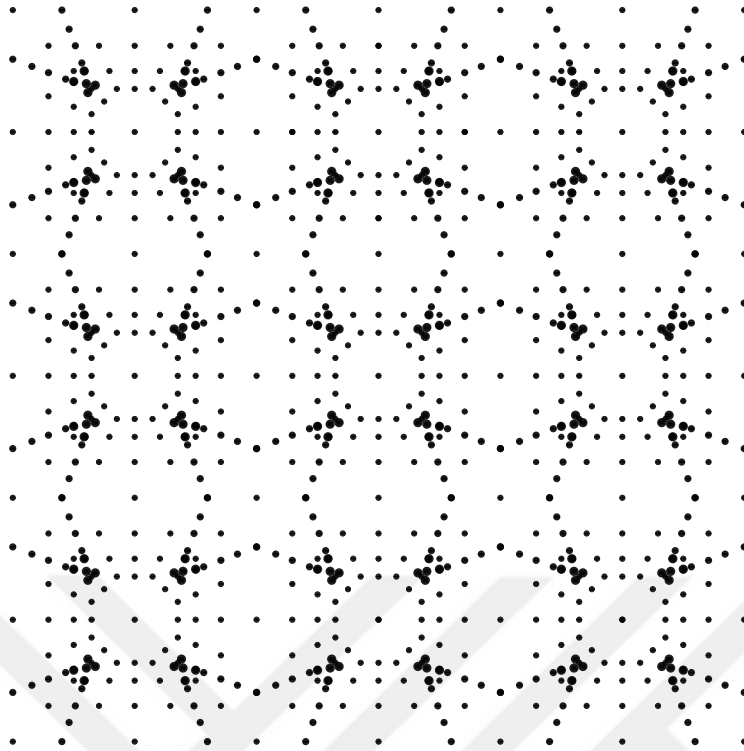
**Figure 2.16 :** Placing some other acentric free straight lines.



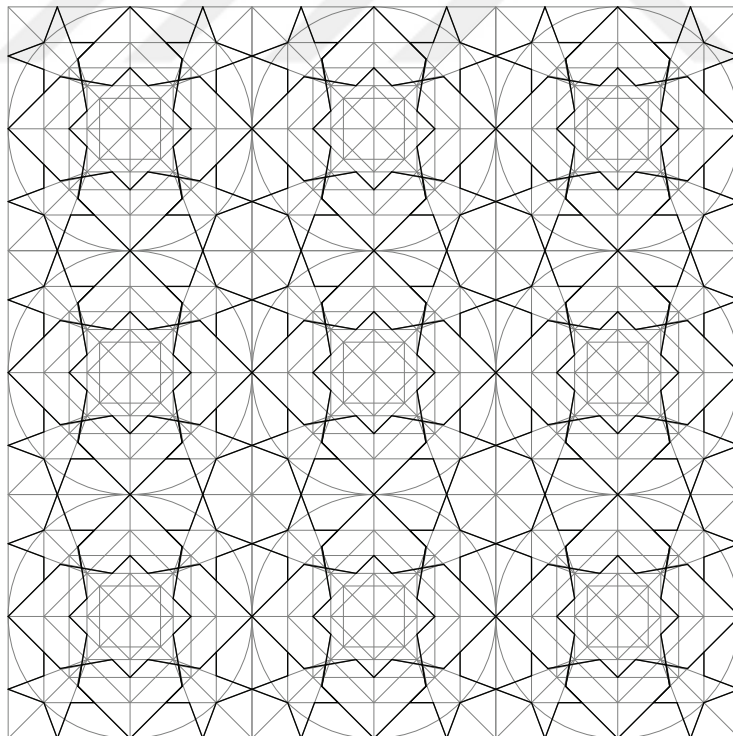
**Figure 2.17** : Highlighting the free acentric lines.



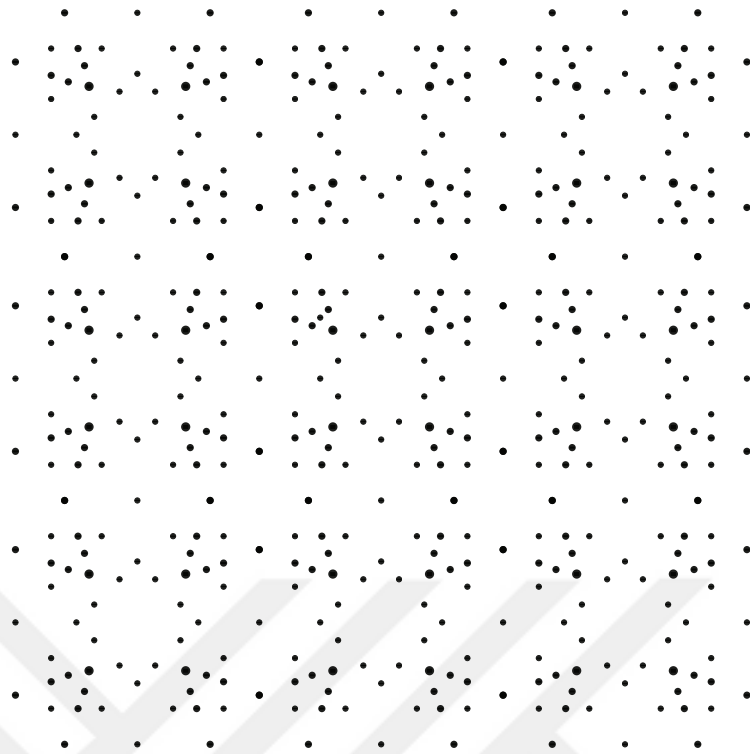
**Figure 2.18** : The acentric lines cut the plane into more points.



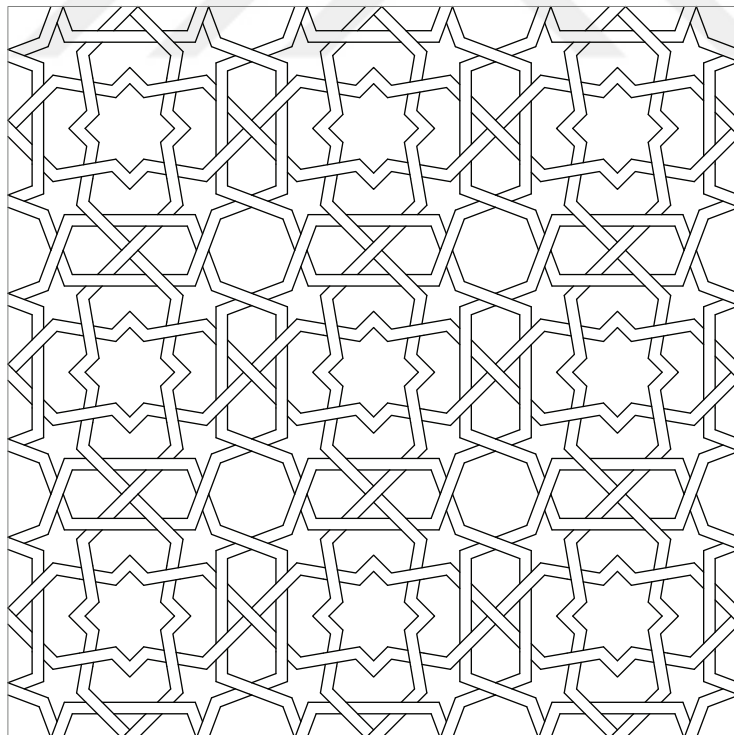
**Figure 2.19** : The eventual accumulation of the points.



**Figure 2.20** : Choosing which lines to use.



**Figure 2.21** : Choosing which points to use.



**Figure 2.22** : The eventual composition.

In this chapter a Seljuk pattern has been deconstructed so as to reveal the processes of creation step by step that led to the the final composition. In search for a novel deconstruction method in relation with how a composition is perceived, I have chosen to use the terminology developed by Kepes and Kandinsky. This terminology relies on the “grammar” and the “syntax” of vision developed by Kepes(1969) and a scientific basis for the art of painting by dissecting the basic elements of art; point, line and plane that is formulated by Kandinsky(1928). We have learned every single decision of placing a line on the surface made by the craftsman actually plays a unique role in originating a variety of spatial sensations. As we move from a rather objective perspective of analyzing methods to subjective and introspective approach, what we analyze will remain the same. Through the next chapter we will discover some successive thoughts appeared in author’s mind in the first place of the encounter experience with a photograph of a Seljuk pattern.



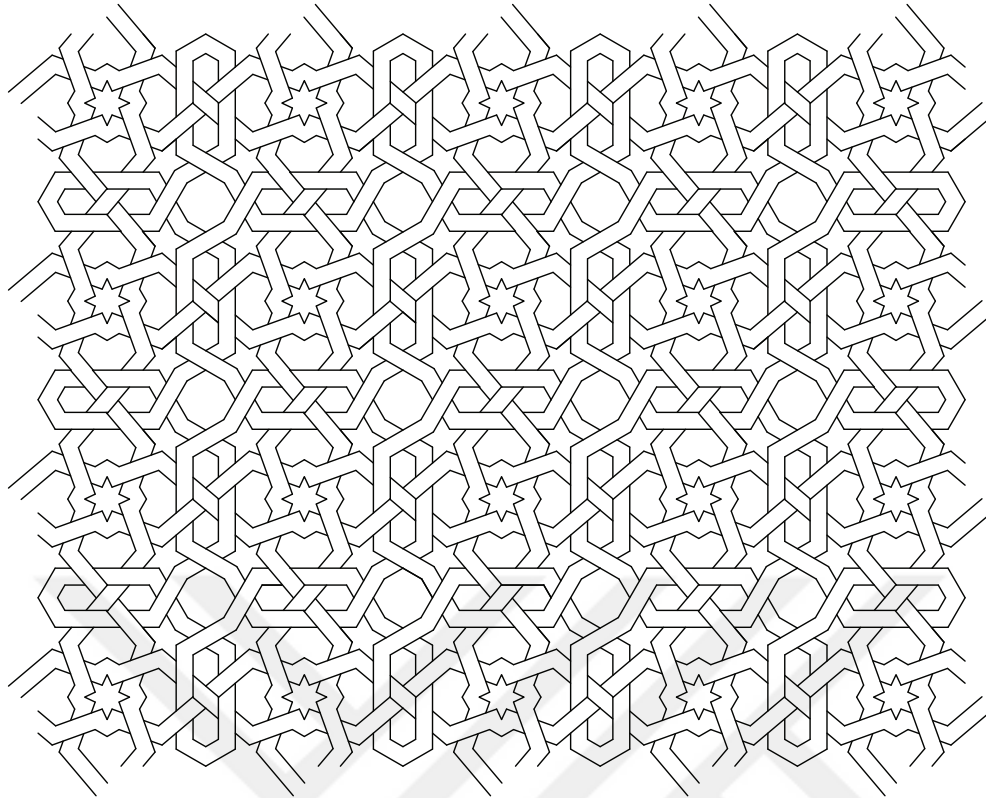
### 3. ANALYZING THE GAZE

With the aim of having a general view of the Seljuk patterns, I have gone through some photographs of patterns through the computer screen. Although I have been acquainted with Seljuk patterns more or less since childhood in Anatolia, one of the digital representations (a photograph - Figure 3.1) of a pattern I have seen for the first time has uniquely evoked my interest. I don't know if it was because of the screen or my intention of looking at them, but this traditional and thus familiar image leaped out of the static into the dynamic realm of simultaneously appearing and disappearing ever-changing shapes and relationships for a few seconds in a mental picture.

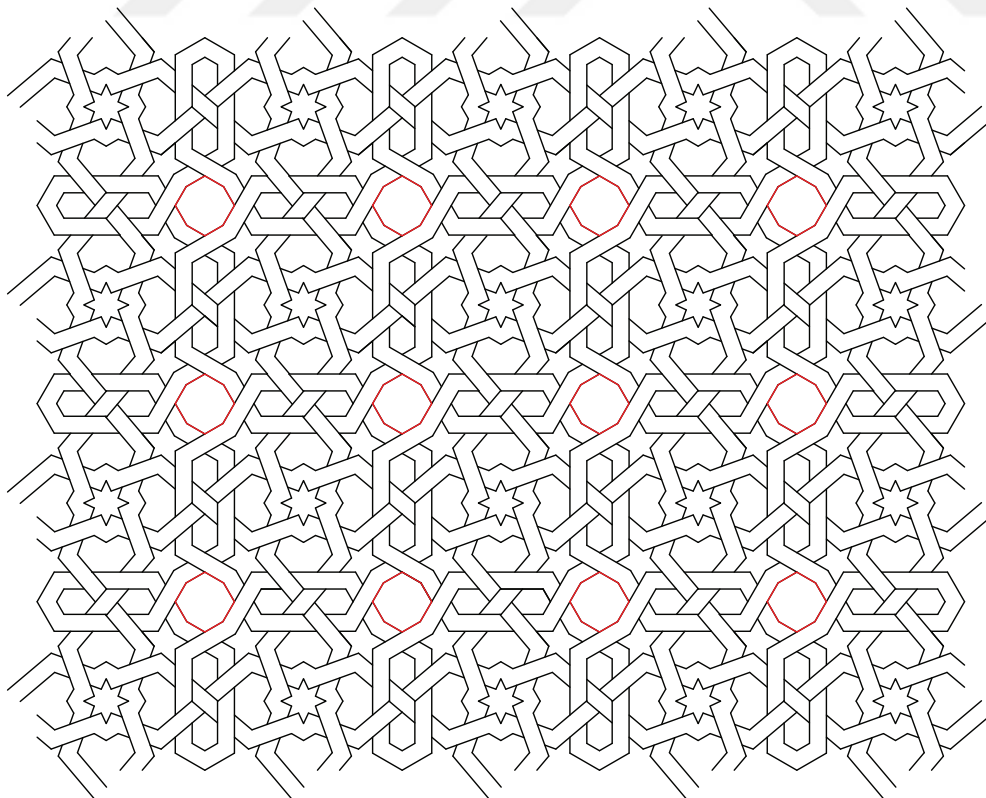


**Figure 3.1** : A photograph representation of a pattern from the upper left and right niche of Tokat Mahperi Hatun Caravansary.  
Photo Credit : Ezgi Baştuğ.

The interest aroused led to examining the pattern to be able to draw it. How can I draw this intricate pattern? By tracing the strips of small positive width and estimating the possible angles of the crossing points, the drawing in Figure 3.2 was obtained. Seljuk patterns display features of repetition, symmetry and hierarchy which produce internal unity of the complete pattern appears to consist of intersecting points and geometric shapes. The analysis of the geometric shapes and crossings might form a bridge to dissecting the internal unity of the pattern.

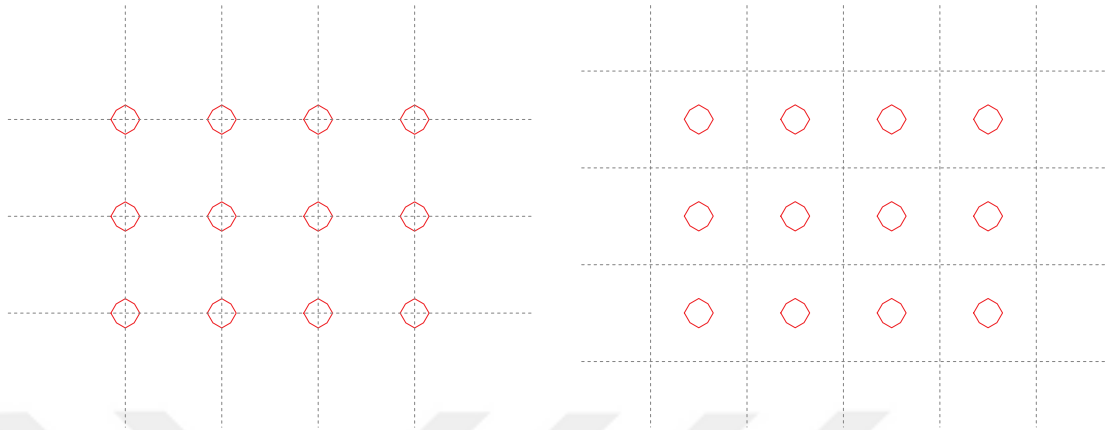


**Figure 3.2** : A drawing representation of the pattern.



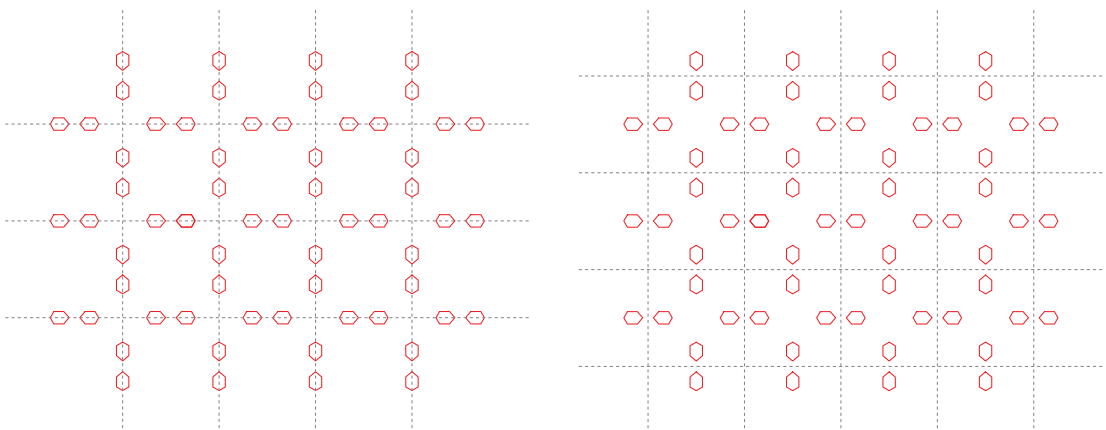
**Figure 3.3** : Octagon repetition structure.

Let's take the octagons as an example. What is the repetition structure of the octagons (Figure 3.3)? And how is the symmetry axis of this repetition structure? Two types of symmetry axes, indicated by dashed lines, catch the eye; symmetry axis A and B (Figure 3.4).

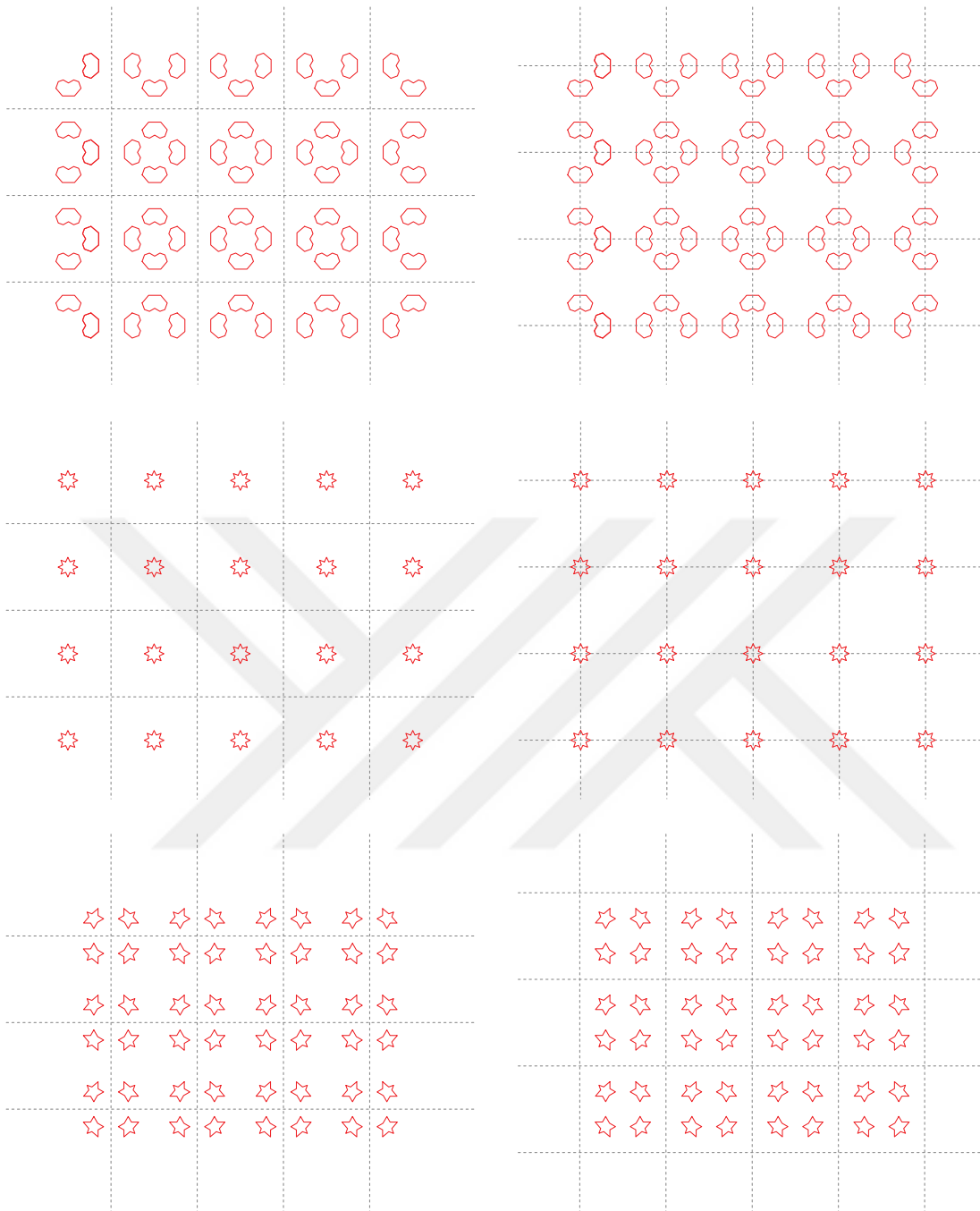


**Figure 3.4 :** Symetry axis A(left) and B(right) of the octagon repetition structure.

As the gaze commute between two of the drawings of octagon repetition structure (Figure 3.4) differ only in the way symmetry axes drawn, each octagon-shape “gains its unique mode of appearance in a dynamic interrelationship with” its symmetry axis (Kepes, 1969, p.18). And this one mode of appearance flipping back and forth with another reminds me how I got first interested in the pattern; simultaneously appearing and disappearing ever-changing shapes and relationships. What I have experienced back there are reduced here to a somehow basic level which I can fully comprehend and explain. Do they have any connection? And what about the other geometric shapes (Figure 3.5-3.6)?

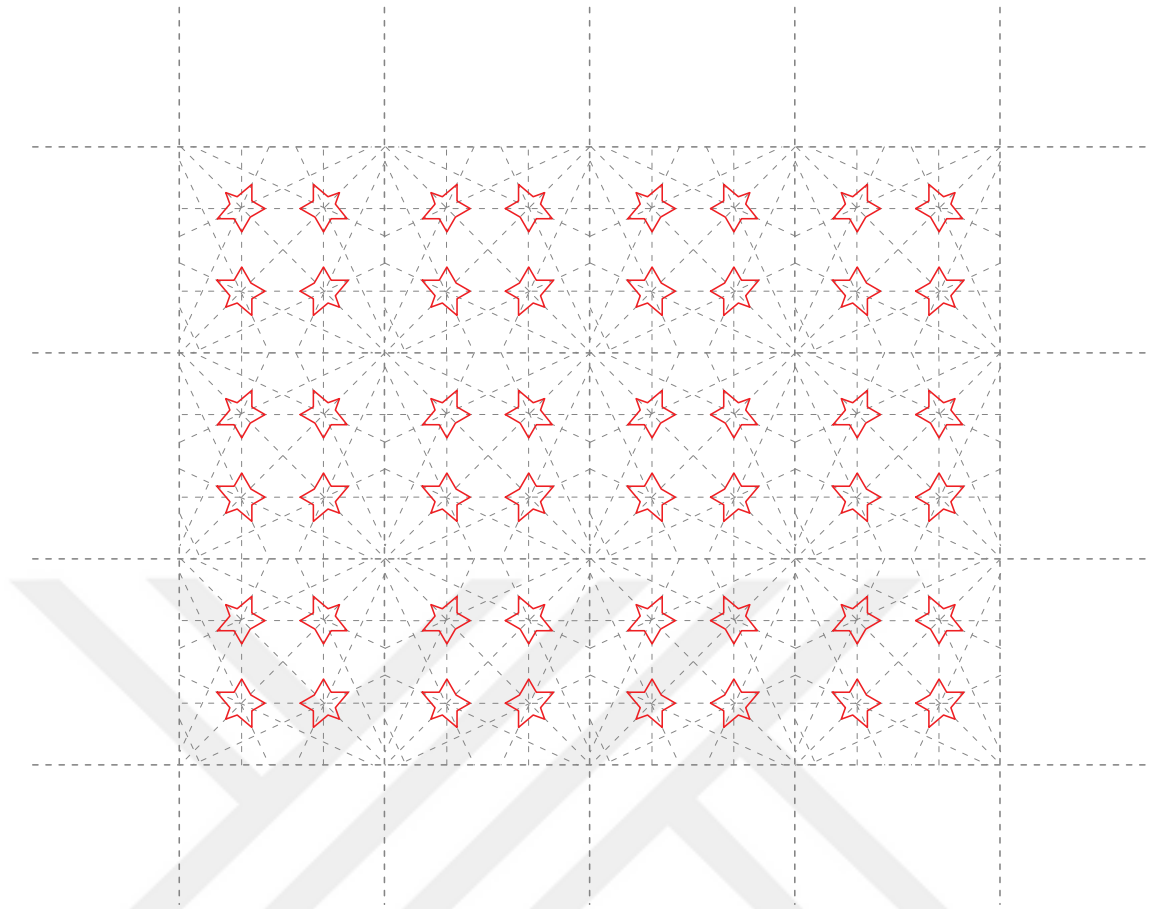


**Figure 3.5 :** Other geometric shapes' repetition structures overlapped with symmetry axes A and B.

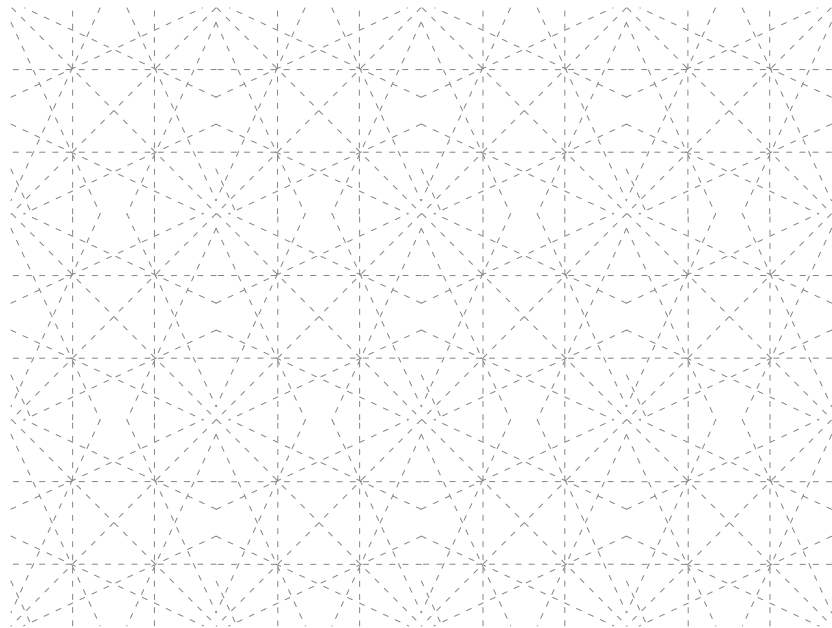


**Figure 3.6 :** Other geometric shapes' repetition structures overlapped with symmetry axes A and B.

Among the drawings of each geometric shape repetition structure overlapped with symmetry axes A and B, the arrangement of five-pointed stars differs from the others in perception. Presence of symmetry axes force the eye to read the picture-plane as segregated rectangular wholes. All of the drawings appear inert, unified and static within the four borders of the segregated wholes and the picture-surface except the arrangement of five-pointed stars.

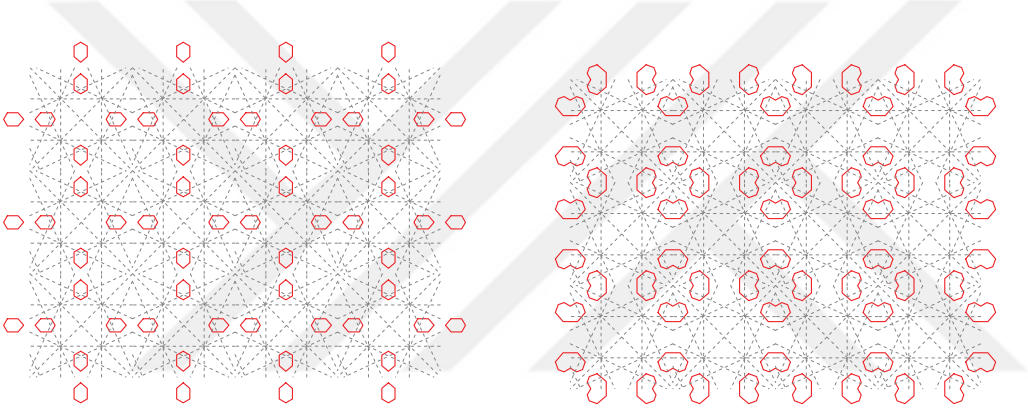


**Figure 3.7 :** Extension from points of stars to the respective symmetry axes until they meet other extended lines.

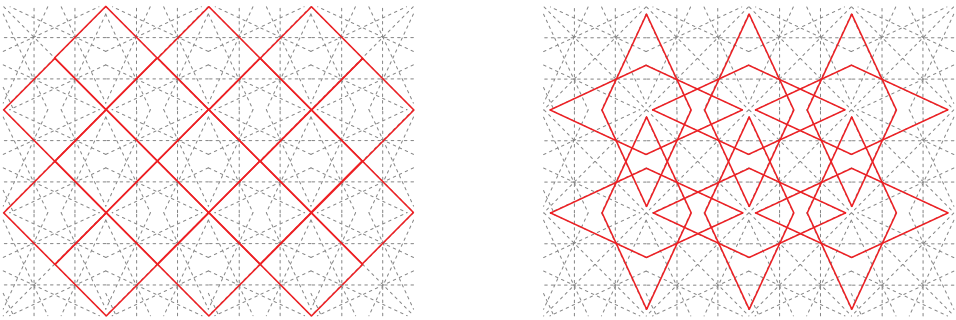


**Figure 3.8 :** Result of the extension; a multi-layered grid structure.

The stars are in accordance with neither the main directions of the symmetry axes nor the picture-plane. The directions of the points of the stars in relationships other than horizontal or vertical to the both picture margin and the symmetry axes force the eye to orient in other directions which evokes associations of a broader spatial order. The directions, that the stars point to, tend to be seen in their continuation as a straight line. What would I obtain if I draw lines, along the directions, from points of stars are extended to the respective symmetry axes until they meet other extended lines? Here, the natural extension results in a multi-layered grid structure like that of Figure 3.7-3.8. As indicated by Bakirer(1981), the use of the grid of interlocking circles is fundamental to the development of Seljuk patterns. What does this multi-layered grid structure which cut the plane into triangles, squares and other polygons correspond to (Figure 3.9-3.10)? And Is it related to the dynamic realm of simultaneously drawn and erased ever-changing shapes and relationships as mentioned above?

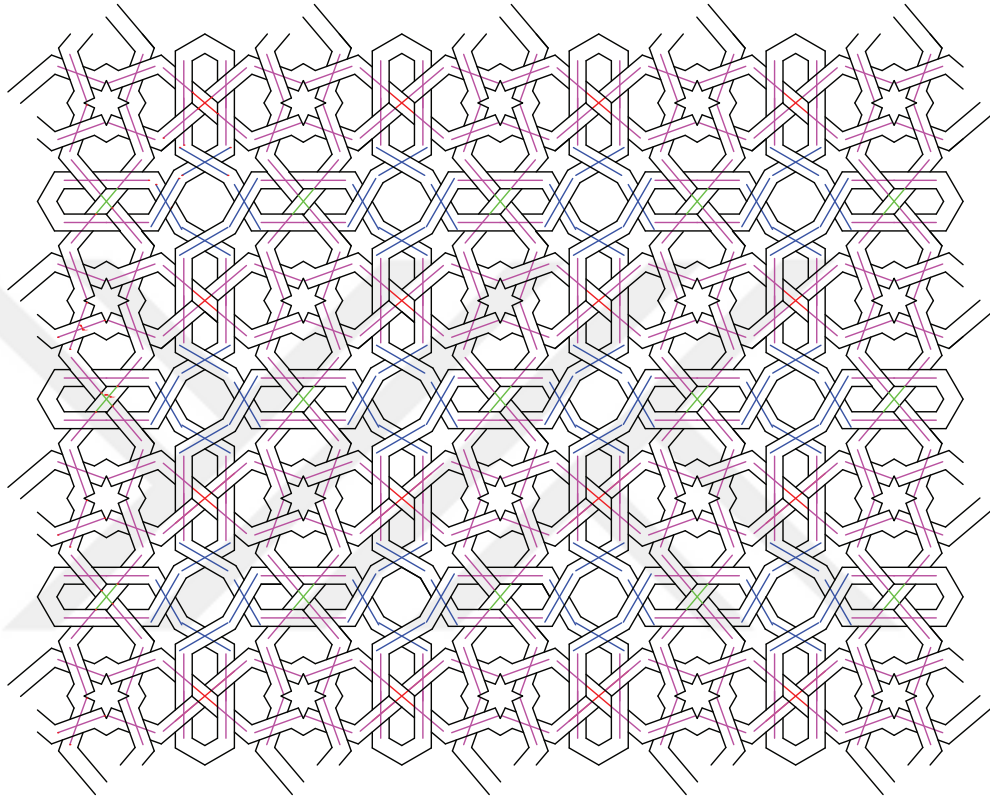


**Figure 3.9 :** How does the grid relate to the other geometric shapes?

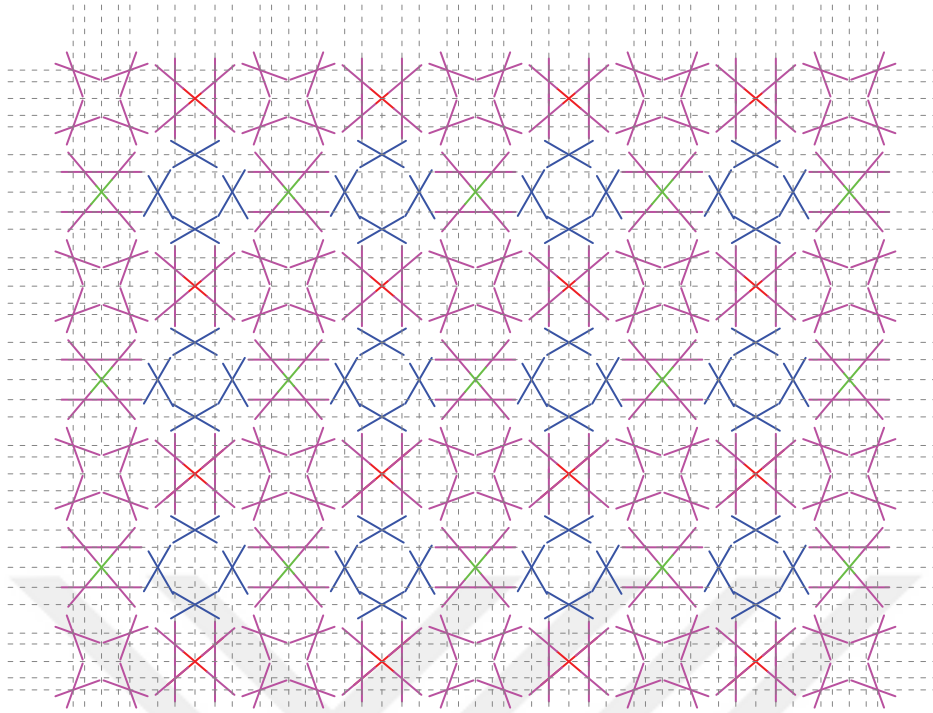


**Figure 3.10 :** Layers of the multi-layered grid structure.

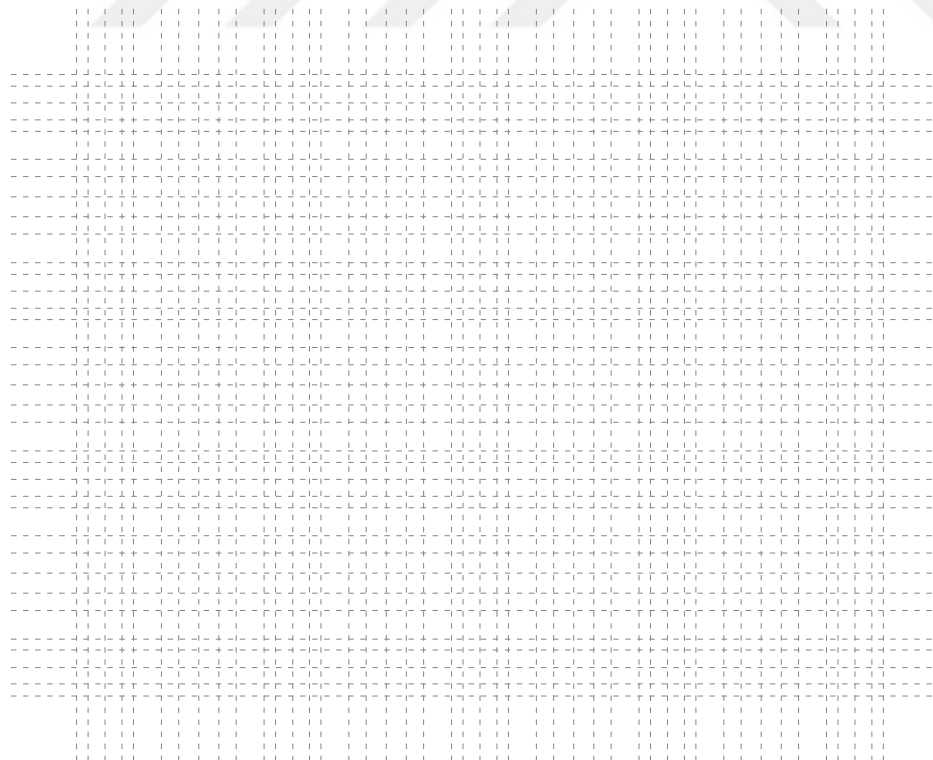
Let's put the geometric shapes aside and focus on the intersecting points (Figure 3.1). The only thing that differs between them is their angles; the angles between two strips which actually intersect. By interpreting the strips as lines, a mapping of different angles of intersecting points, indicated by different colors, was obtained (Figure 3.11). How is the rhythmic organization of the intersecting points? Connecting the intersecting points by drawing lines in both horizontal and vertical directions formed a unified whole; a grid (Figure 3.12-3.13).



**Figure 3.11** : A mapping of different angles of crossings, indicated by different colors.

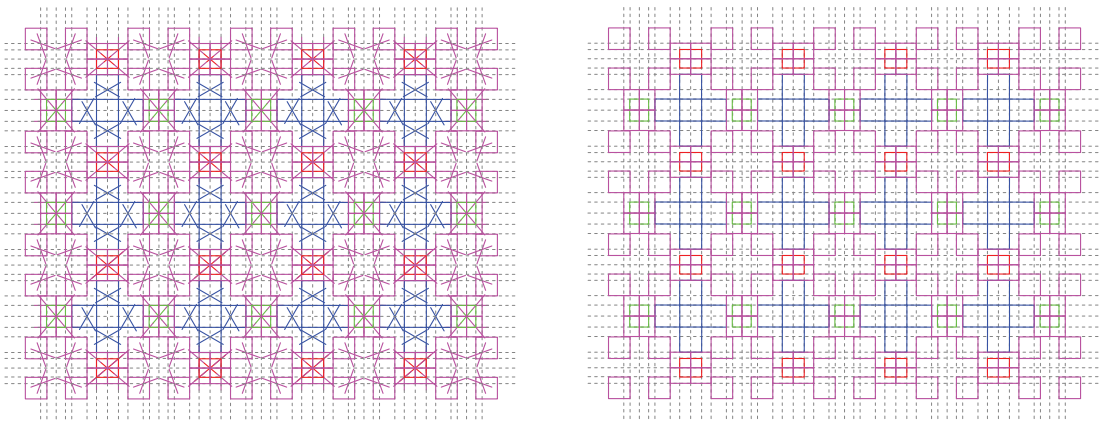


**Figure 3.12 :** Connecting the crossing points by drawing lines in both horizontal and vertical directions.



**Figure 3.13 :** Connecting the crossing points results in a unified whole; a grid.

How does this grid function or play a role in grasping spatial relationships and orienting the eyes from one place to another while one gazes at the pattern? What kind of spatial order does it imply (Figure 3.14)?



**Figure 3.14 :** What kind of spatial order does the grid imply?

Geometric shapes and crossings of a Seljuk pattern constitute the internal unity of the composition. Through this chapter, a quick examination of the repetition structures of the geometric shapes provided an insight to the overall visual impact that the pattern delivers. The arrangement of geometric shapes differ from each other. And this difference evokes associations of distinct spatial orders. Some experiments regarding the directions of the geometric shapes point to, revealed that so many multi-layered grid structure is hidden behind this pattern. In addition to these grids, the author obtained an another kind of grid by connecting the intersecting points. And here, all kinds of repeats, which constitute internal unity of the pattern, finds a correspondence in terms of spatial order. It is like providing a way to measure the complications of this intricately interwoven pattern through changing sizes of rectangles of the grid.

This chapter illustrates the departure point of this study as appeared as successive thoughts in author's mind in the first place. The early phase of design process sets a ground unbalanced and constantly moving which is a place the first time of an idea or an image emerges. And this is also true for the kind of experience has been illustrated through this chapter. This chapter searches for a balance in constant motion. At the outset of the chapter, the author mentions of an interest aroused led to examining the pattern to be able to draw it. In order to free this sense of wonder or interest, we will shift our perspective through the following chapter from an observer to a completely different one which is much more personal.



## 4. NARRATING THE PLASTIC EXPERIENCE IN A GAZE

### 4.1 Introduction

Seljuk patterns are created to lead the viewer to an understanding of the underlying meanings (Ögel, 1986). The meanings are shaped by the society's predominant philosophies were born and cultivated first in central Asia and after in Anatolia under the influences of Neoplatonism, Shamanist symbols, cosmology and mystical thoughts of the Islamic world (Ögel, 1986, p. 2-5). Political, social, and cultural aspects of the period lived in has a direct and significant influence on both formation and transformation of these meanings which function as a basis defines one's attitude toward things; how we read and make sense of our surroundings. It is not possible to estimate what one did see and how make sense of the things seen during the encounter with the patterns under the influences of prevailing images of the 12-14th century Anatolia. Yet, the seeing; the encounter experience still takes place in Anatolia through the surviving Seljuk buildings. The encounter experience of any ornamentation work must be quite different today than at the time of its constructing centuries ago due to the changing political, social, and cultural aspects. Things seen acquire their meanings by reference to the prevailing images of the period lived in. In the light of this information, the fact that the patterns have been perceived by countless eyes for countless times since the time it was created in Medieval era arouse an interest to the nature of this encounter experience. What does the encounter experience with the patterns in our day correspond to?

These two and a half dimensional ornamentations were typically built on portal facades so as to be encountered, approached and confronted not only by the users of the building they are applied on, but also the viewers pass by. In modern era, the encounter can take place in different mediums in various of ways. The encounter experience in the present study happened through a photograph of a Seljuk pattern on a computer screen. The photographed image, reproduces the two and a half dimensional pattern in two dimensional medium, is the most prevailing medium for the encounter experience today. From the viewpoint of the observer of a geometric composition, this completely shifts the nature of the encounter from a plastic, spatial and bodily experience to perception of an image.

“To perceive an image is to participate in a forming process; it is a creative act. From the simplest form of orientation to the most embracing plastic unity of a work of art, there is a common significant basis: the following up the sensory qualities of the visual field and the organizing of them. Independent of what one “sees,” every experiencing of a visual image is a forming; a dynamic process of integration, a “plastic” experience. The word “plastic” therefore is here used to designate the formative quality, the shaping of sensory impressions into unified, organic wholes (Kepes, 1969, p.15).”

Seljuk patterns display features of repetition, symmetry and hierarchy which produce the geometrical harmonization of the pattern. Moreover, the geometrical harmonization, achieved through the conscious use of geometric elements, was regarded as a transformative design agency to express these meanings and results in a rich plastic experience.

“All appearances that are traditionally familiar because of their singular expression, become mute to us. We no longer react to their appeal and are surrounded by silence; so we succumb to the deadly grip of practical efficiency (Kandinsky, 2013, p. 25).”

The plastic experience can happen only when a person takes time to look at the patterns closely and discover what they offer. Therefore, it is able to produce new ways of seeing, ordering, measuring and learning from these traditional and thus familiar appearances by virtue of its inherent nature of formative quality.

At the outset of the previous chapter, the author describes her own encounter experience with an image. The encounter could be summarized as a leap from a static state into a dynamic network of endlessly changing shapes and relationships as if they are in flux. The author regards the leap here as an indicator of a plastic experience. With the aim of having a deeper understanding of what has been meant with transformation of a state into another, could be summarized as ‘the leap’, the entire experience has been narrated. The author has narrated her own experience in looking at a photograph representation of a Seljuk pattern. The narration relies on this plastic experience and structured by certain phases of it. The author deliberately avoids to make any references to the literature to keep the material introspective and subjective.

The observation of one’s own spontaneous thinking, which Aristotle termed as sequence of thoughts, has a long history which can be traced back at least as far as the Greeks (Ericsson & Simon, 1993, p. 426). Prior to the cognitive revolution in the 1950s and 1960s, studying thinking has been to rely on introspective methods due to thinking cannot be observed directly by other people (Ericsson & Simon, 1993, p. 425). When Buswell made one of the first experimental study of eye movements in 1935, most of the attempts to describe the structure of thinking had been made in

literature were psychology of art related which was based upon introspective and subjective evidence.

It has been a complex process to follow up the sensory impressions in a mental picture to be able to narrate it. And that's why it required extensive amount of looking at the picture. After a certain amount of looking, the experience reaches the fullest saturation which reverses the experience from dynamic to static again. Therefore, the narration is never identical with the reality of the experience, but approximates it according to the impressions in memory left behind the lived experience. The author chose to convey the lived plastic experience in the form of a narration. The first intention was to make it only through words and yet, there is plenty can not be said with words. Therefore, the narration was supported by some visuals. The narration aims to take the reader through a very intense and brisk journey. The journey allows the reader to wander in this newly created world evolved through a process of organization in a mental picture. One thing has been noticed here was while narrating any kind of thought, we make inferences. That's why the validity of introspection have been questioned as the most objective way of studying mental processes by many psychologists (Verstijnen & van Leeuwen & Goldschmidt, 1998, p. 520). However, there is no perfect mapping even in the case of thinking aloud, where the connection between thoughts and reports is the closest (Ericsson & Simon, 1993, p. 430).

As the writer went through the narration, presented in the following section, for several times, she realized that the text is full of repeating phrases and structured with very detailed descriptions of eye movements. In order to reveal these repeating structures, the narration has been dissected. The dissected narration is given in section 4.3.

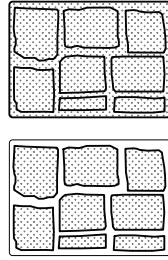
## 4.2 The Narration

I am looking at a pattern representation, a photograph, I have seen for the first time. The very first moment of the encounter takes place at a skin like surface (Figure 4.1), enclosed by four borders of the picture-plane, displays an intrinsic nature of the whole. (How would I picture the image if I close my eyes now?)



**Figure 4.1** : A skin like surface.

As my eyes are wandering around aimlessly through the pattern, the whole is being dissolved into parts as if I go beneath the surface (Figure 4.2).



**Figure 4.2 :** Dissolution into parts.

This dissolution yields to an erratic and hasty follow-up; the vision is now on this, now on that spot. The follow-up, initiated by the eye, is speeding up through some certain paths where the eye can move along and slowing down by virtue of getting lost in unknown territories where the eye can not trace and leap over (Figure 4.3). The organization of the rhythmic movement, formed out of speeding up, slowing down and leaping over are repeated progressively, feels like I am in search of something.



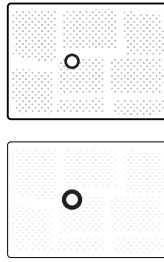
**Figure 4.3 :** The components of rhythmic movement.

Yet, my erratic and hasty follow-up lasts until I detect the first pre-defined shape. What I am detecting here, as I call pre-defined shape, seems like a mentally visualized geometry, fluctuates between the circle and the polygon, projected onto the relevant part of the pattern (Figure 4.4).



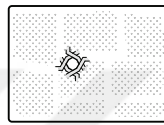
**Figure 4.4 :** Fluctuation between the circle and the polygon.

The appearance of movement induced by follow-up is halted, framed and focused around the detected shape which appears to be advancing whereas the rest recedes into the background and become dormant. Now the picture plane I am looking at is formed out of two opposing elements; the advancing and receding movements constitute a total three-dimensional space (Figure 4.5).



**Figure 4.5 :** The advancing and receding movements.

As I keep my focus on the pre-defined shape, visualized geometry fades away and for the first time I see the relevant part of the pattern beneath, which gradually stands out against the rest of the picture plane, directly and clearly (Figure 4.6).



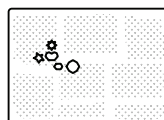
**Figure 4.6 :** Visualized geometry stands out.

Now the foreground undergoes a modification; expanding to include the relevant part of the pattern beneath, whereas the rest still recedes into the background. Now instead of the eye is made to fixate some particular spot, small scanning movements occur within the newly expanded area of the foreground (Figure 4.7). The eye stroke surfaces, contours and edges through the area and in doing so, it receives some tactile qualities. The eye reads the texture; the smoothness, the softness, the hardness and so on.



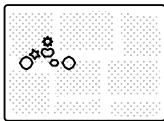
**Figure 4.7 :** Scanning movements of the eye.

As the reading process reaches to a point of saturation, I lose my interest. The gaze keeps roaming about aimlessly through the picture-plane results in detecting other pre-defined shapes (Figure 4.8).



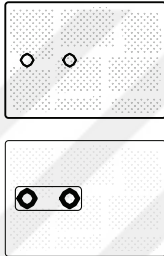
**Figure 4.8 :** Detecting other pre-defined shapes.

The moment I recognize a repetition of any two detected pre-defined shapes, a relationship is established among them (Figure 4.9).



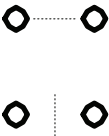
**Figure 4.9 :** Recognizing a repetition.

What I am doing here seems like framing two detected shapes with the space in between as a whole (Figure 4.10). The whole is segregating itself from its surroundings and forming the new foreground (The space in between reminds me the unknown territories early on encountered where the gaze was leaping over due to getting lost).



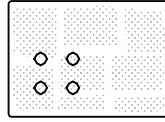
**Figure 4.10 :** Framing two detected shapes.

The gaze is commuting between both of the detected shapes back and forth through the space where I am either drawing a straight dashed line as if I am measuring the distance between the parts or a vertical dashed line in the middle of the parts as if I am mirroring the parts along it (Figure 4.11).



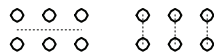
**Figure 4.11 :** Commuting between detected shapes.

The process of commuting back and forth, establishing the relationships (as I called), continues until all the possible ways are exhausted. Once again the eye continues to move through the picture-plane. Now the gaze distinguishes repetitions of these two pre-defined shapes with the space in between on both horizontal and vertical directions throughout the picture-plane (Figure 4.12). It feels like constructing; the repetitions articulated successively on both horizontal and vertical directions are constructing an infrastructure where the eye can trace. An erratic and hasty follow up is initiated this time through the infrastructure.



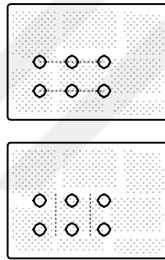
**Figure 4.12 :** Distinguishing repetitions.

The infrastructure is multi-layered in terms of being formed out of pre-defined shapes with the space in between, horizontal and vertical lines drawn through that space and the repetitions of all these on both horizontal and vertical directions which results in a visual two-way constant shift from one direction to another (Figure 4.13).



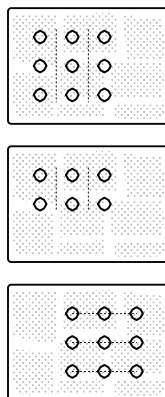
**Figure 4.13 :** Two-way constant shift.

The shift between directions in addition to the shift from one relationship to another between two shapes interact and fuse into each other (Figure 4.14).



**Figure 4.14 :** The shift between directions and relationships.

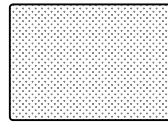
The eye is in the need of reaching a balance; a coherence. As my eyes go through the pattern in order to tie these ever-changing directions and relationships in a meaningful way, various types of structure-schemas composed of these dynamic relationships are drawn and erased erratically and simultaneously (Figure 4.15).



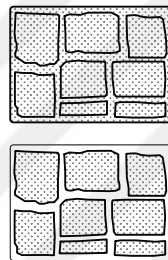
**Figure 4.15 :** Drawn and erased various types of structure-schemas.

### 4.3 Dissecting The Narration

*I am looking at a pattern representation, a photograph, I have seen for the first time. The very first moment of the **encounter** takes place at a skin like surface, enclosed by four borders of the picture-plane, displays an intrinsic nature of the whole. (How would I picture the image if I close my eyes now?)*



*As my eyes are **wandering around** aimlessly through the pattern, the whole is being dissolved into parts as if I go beneath the surface.*



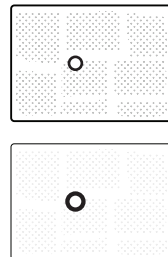
*This dissolution yields to an **erratic and hasty follow-up**; the vision is now on this, now on that spot. The **follow-up**, initiated by the eye, is speeding up through some certain paths where the eye can **move along** and **slowing down** by virtue of getting lost in unknown territories where the eye can not trace and **leap over**. The organization of the rhythmic movement, formed out of speeding up, slowing down and leaping over are repeated progressively, feels like I am in search of something.*



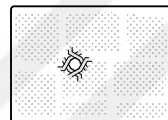
*Yet, my erratic and hasty follow-up lasts until I **detect** the first pre-defined shape. What I am detecting here, as I call pre-defined shape, seems like a mentally visualized geometry, fluctuates between the circle and the polygon, projected onto the relevant part of the pattern.*



The appearance of movement induced by **follow-up is halted**, framed and focused around the detected shape which appears to be advancing whereas the rest recedes into the background and become dormant. Now the picture plane I am looking at is formed out of two opposing elements; the advancing and receding movements constitute a total three-dimensional space.



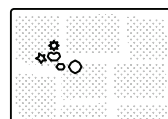
As I keep my focus on the pre-defined shape, visualized geometry fades away and for the first time I see the relevant part of the pattern beneath, which gradually stands out against the rest of the picture plane, directly and clearly.



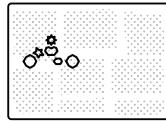
Now the foreground undergoes a modification; expanding to include the relevant part of the pattern beneath, whereas the rest still recedes into the background. Now instead of **the eye is made to fixate some particular spot, small scanning movements** occur within the newly expanded area of the foreground: The eye stroke surfaces, contours and edges through the area and in doing so, it receives some tactile qualities. The eye reads the texture; the smoothness, the softness, the hardness and so on.



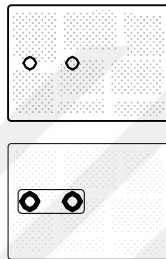
As the reading process **reaches to a point of saturation, I lose my interest. The gaze keeps roaming about aimlessly through the picture-plane results in detecting other pre-defined shapes.**



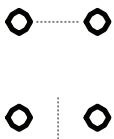
The moment I **recognize** a repetition of any two detected pre-defined shapes, a relationship is established among them.



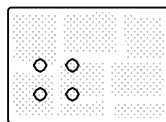
What I am doing here seems like framing two detected shapes with the space in between as a whole. The whole is segregating itself from its surroundings and forming the new foreground (The space in between reminds me the unknown territories early on encountered where the gaze was leaping over due to getting lost).



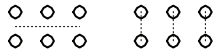
The gaze is **commuting between** both of the detected shapes back and forth through the space where I am either drawing a straight dashed line as if I am measuring the distance between the parts or a vertical dashed line in the middle of the parts as if I am mirroring the parts along it.



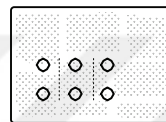
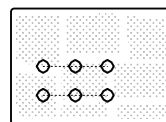
The process of commuting back and forth, establishing the relationships (as I called), continues until **B1** all the possible ways are exhausted. Once again the eye continues to **move through** the picture-plane. Now the gaze **distinguishes** repetitions of these two pre-defined shapes with the space in between on both horizontal and vertical directions throughout the picture-plane. It feels like constructing; the repetitions articulated successively on both horizontal and vertical directions are constructing an infrastructure where the eye can trace. An erratic and hasty **follow up** **B2** is initiated this time through the infrastructure.



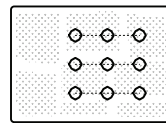
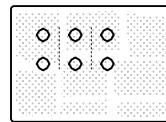
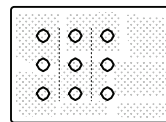
The infrastructure is multi-layered in terms of being formed out of pre-defined shapes with the space in between, horizontal and vertical lines drawn through that space and the repetitions of all these on both horizontal and vertical directions which results in a visual two-way constant **shift** from one direction to another.



The shift between directions in addition to the shift from one relationship to another between two shapes interact and fuse into each other.



The eye is in the need of reaching a balance; a coherence. As my eyes **go through** the pattern in order to tie these ever-changing directions and relationships in a meaningful way, various types of structure-schemas composed of these dynamic relationships are drawn and erased erratically and simultaneously.



As the dissection of the narration indicates, the narration of the plastic experience exhibits a great amount of variants of seeing not only in terms of receiving what is there, but also constructing and giving the meanings of the seen. At a very basic level, the relationship established between the gaze and the pattern throughout the narration could be categorized as follows: the encounter(A), the movement(B) and the halt(C). The experience begins with the encounter of the gaze and the picture, continues with descriptions of different modes of eye movements and at a specific point, it is halted in the narration. Therefore, these three are defined in the present

study as the functions of a plastic experience. The eye movements have acquired different meanings with the help of a great variety of phrases used to describe in the text. Although some different phrases point exactly to the same eye movements (i.e. wandering around, roaming about, move through, go through), the majority designates distinct movement qualities. Thus, the function of eye movements are divided into five subfunctions (B1, B2, B3, B4, B5). The reason of calling certain phrases of eye movements, the encounter and the halt as functions is the way they are described in the narration. They are always followed by a description of their effects on the image in memory which reminds the input-output relationship of a function. Apart from this, there are other phrases, which also followed by certain effects described on the mental image in the text, does not fall under the category of eye movements. Helmholtz(1962) asserted in the nineteenth century that a person's view is influenced by unconscious judgements based on facts available and inferences drawn from the observer's knowledge. The phrases of detect, recognize, distinguish indicates functions (by the reason of having outputs), yet they differentiate from eye movement functions by being related to the judgements, inferences and observer's knowledge. In the dissection of the narration, those functions are designated by geometric forms. The following chapter illustrates a study aiming to obtain visible outcomes out of similar kind of encounter experiences.

## 5. MULTIPLYING THE PLASTIC EXPERIENCE

### 5.1 Introduction

The narration of the plastic experience aroused curiosity towards the character of the patterns of perception in looking at a picture. Renaissance humanist Leonardo da Vinci defined the relation between the ability to see the world and to think as one and the same: to visualize was to think (Johnson-Laird, 1998, p. 441). How does a person visualize and experience this forming activity? With the aim of revealing and obtaining visible outcomes out of these processes, a study was carried out. The study consists in drawings of a group of subjects based on what they have seen right after being shown the digital representation of a Seljuk pattern (Figure 2.1) Prior to the study, subjects were informed about the experiment and what they were expected to do only by a paragraph (given below) shown on the screen. Except this paragraph, no other information was provided about the study in advance.

“The moment you are done with reading this paragraph, a photograph taken from a Seljuk building’s facade will appear on the screen. What you are asked to do is to look at the Seljuk pattern at the center of the photograph. The photograph will remain on the screen for a certain amount of time and right after you should draw what you have seen on the paper in front of you. This process of looking and drawing will be repeated for five times.”

The 25 participants were from different backgrounds; architecture, art history, urbanism and industrial design. After the investigation of the outcomes of the experiment, it has been observed that different backgrounds yield to different ways of seeing and drawing (see Appendix for study outcomes). It was found that the participants from architecture background were more comfortable externalizing their processes through drawing. Their drawings were easier to read and the formation of the perceptual patterns were more explicit than the participants from other backgrounds. Therefore, out of 25 participants only the datas of 10 participants, from architecture background, has been dissected and presented in this study.

In the study the same photograph was shown to the subjects for increasing amount of

times. The first time the photograph appeared on the screen, it remained only for two seconds. The durations were increased by 2 seconds at each time, therefore, the durations were as follows; 4, 6, 8 and 10 seconds. There were approximately 20-sec interval between durations which was for the subjects to draw what they have seen.

The study aims to mimic an ordinary case of looking at a picture. The reading process of a picture, the repetition of organization of figures and backgrounds progressively, reaches to a point of saturation where “the whole visual field is perceived as a formed, ordered unit - the plastic image” (Kandinsky, 2013, p. 25). And this happens within a very small amount of time. The short presentation time of the study ensured that the study is over before the visual experience of the subjects become complete and also stimulated a somewhat more focused observation might prevent subjects from inferring their thoughts. Furthermore, the entire process was divided into parts by asking participants to draw what they have seen so as to reveal the processes of plastic experience in the form of visible outcomes; the drawings.

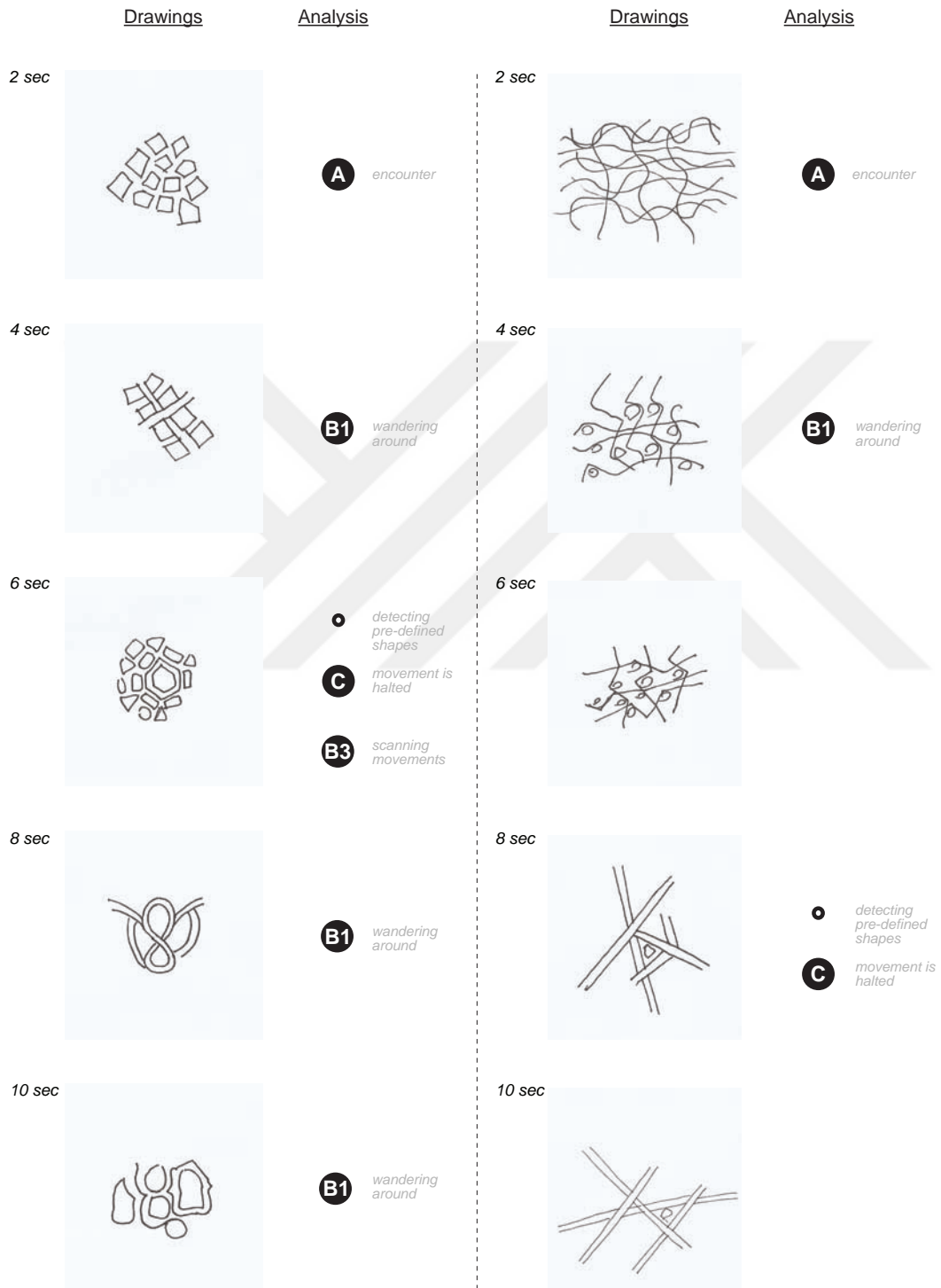
The subjects are asked to draw right after they have been shown the photograph to avoid “subjects may try to infer their thoughts as opposed to recall them from memory” (Ericsson & Simon, 1993, p. 429). One of the purposes of the study is to explore the formative quality and dynamic processes of reasoning behind the plastic experience. What kind of reasoning does plastic experience represent? What are the operations employed during the formation of simultaneously appearing and disappearing ever-changing shapes and relationships in a mental picture?

Forms of processing in imagery has been a widely investigated topic by researchers. Thompson and Klatzky (1978) provided evidence that people are capable of mentally combining the separately presented parts of geometric forms to make a whole figure (p.262). In addition to simply combining, it has been illustrated in Finke and Slayton’s (1988) study that people can make unexpected visual discoveries in imagery when mentally assembling or transforming a set of basic parts (p.255). Based on experiments, Gottschaldt (1926) reported that subjects were not able to detect a part which does not match their initial perceptual organization of the images presented (p. 132). Inspired on the work of Gottschaldt, Reed (1975) designed an experiment which two patterns were presented sequentially and required subjects to indicate whether the first pattern was a part of the second pattern (p. 570). In support of Gottschaldt’s argument, Reed’s experiment (1975) suggested that the subjects often responded on the basis of their initial perceptual organization without searching for the part (p. 574). Verstijnen (1998) argued that the “mental imagery literature can be reconciled on the

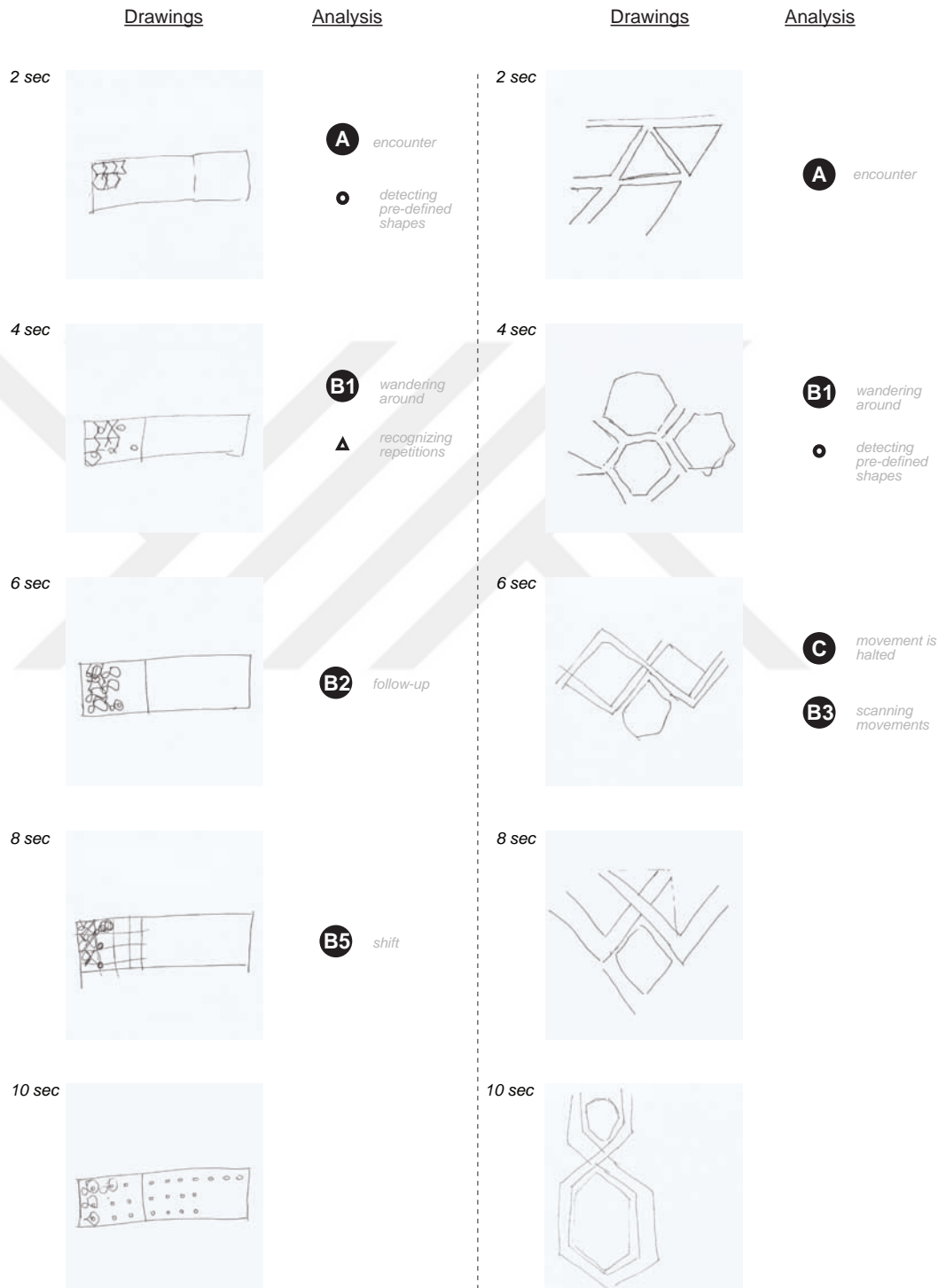
assumption that two forms of processing in imagery have to be distinguished, viz. restructuring and combining” (p. 525). Verstijnen (1998) took Reed's experiment (1975) one step further and made a distinction between parts to be detected as existing and novel parts, and the half the group of subjects were allowed to sketch and the other half denied. The experiment results illustrated that the sketching enhances the performance of restructuring task, which was considered as a more difficult task to perform in mental imagery than the combining (Verstijnen & van Leeuwen & Goldschmidt, 1998, p. 527). In the light of this information, in the experiment of the present study, drawing was chosen as a tool to interact with imagery. And this was relevant to the issue that the plastic experience is a creative process consists of rich combinations of processing forms of mental imagery such as combining, discovering and restructuring. The drawings of the subjects were dissected based on the findings of the narration's dissection. The dissections are presented in the following section.

## **5.2 Dissecting the Experiment Results**

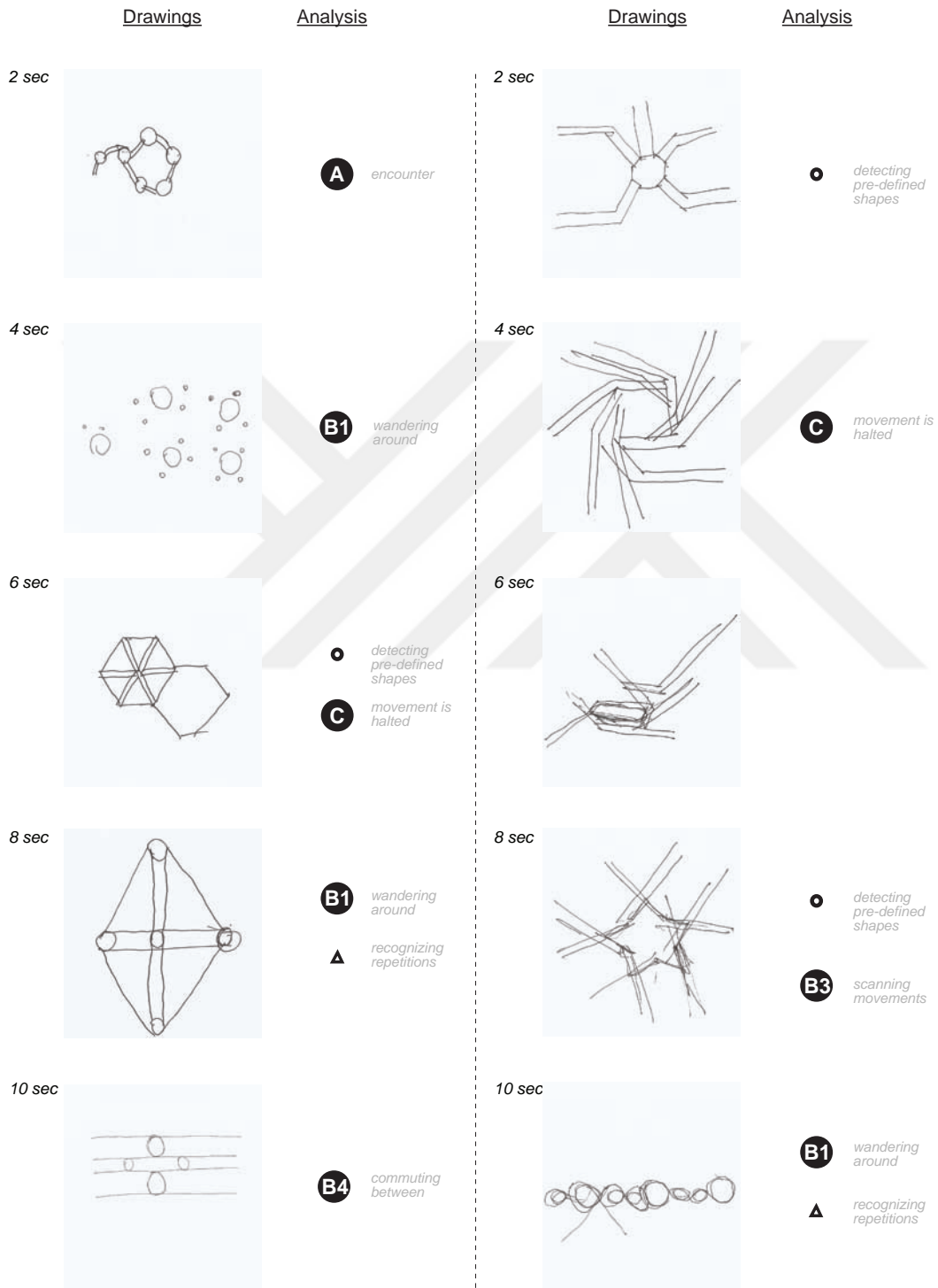
The method for dissecting the study results is based on searching for correspondences between the findings of the dissection of the narration and the results of the study. For each participant, we first encoded all the visuals into the functions of the plastic experience. A visual usually included several categories. We matched each visual with one or more than one function of the plastic experience. The method for matching relies on visual interpretation of the drawings. As a result of this dissection, we found that the participant's encounter experiences with the image consist of blocks of contiguous functions of the plastic experience. And the arrangement of the functions is particular with each participant.



**Figure 5.1** : Dissection of study results (1st and 2nd participant).



**Figure 5.2 :** Dissection of study results (3rd and 4th participant).



**Figure 5.3** : Dissection of study results (5th and 6th participant).

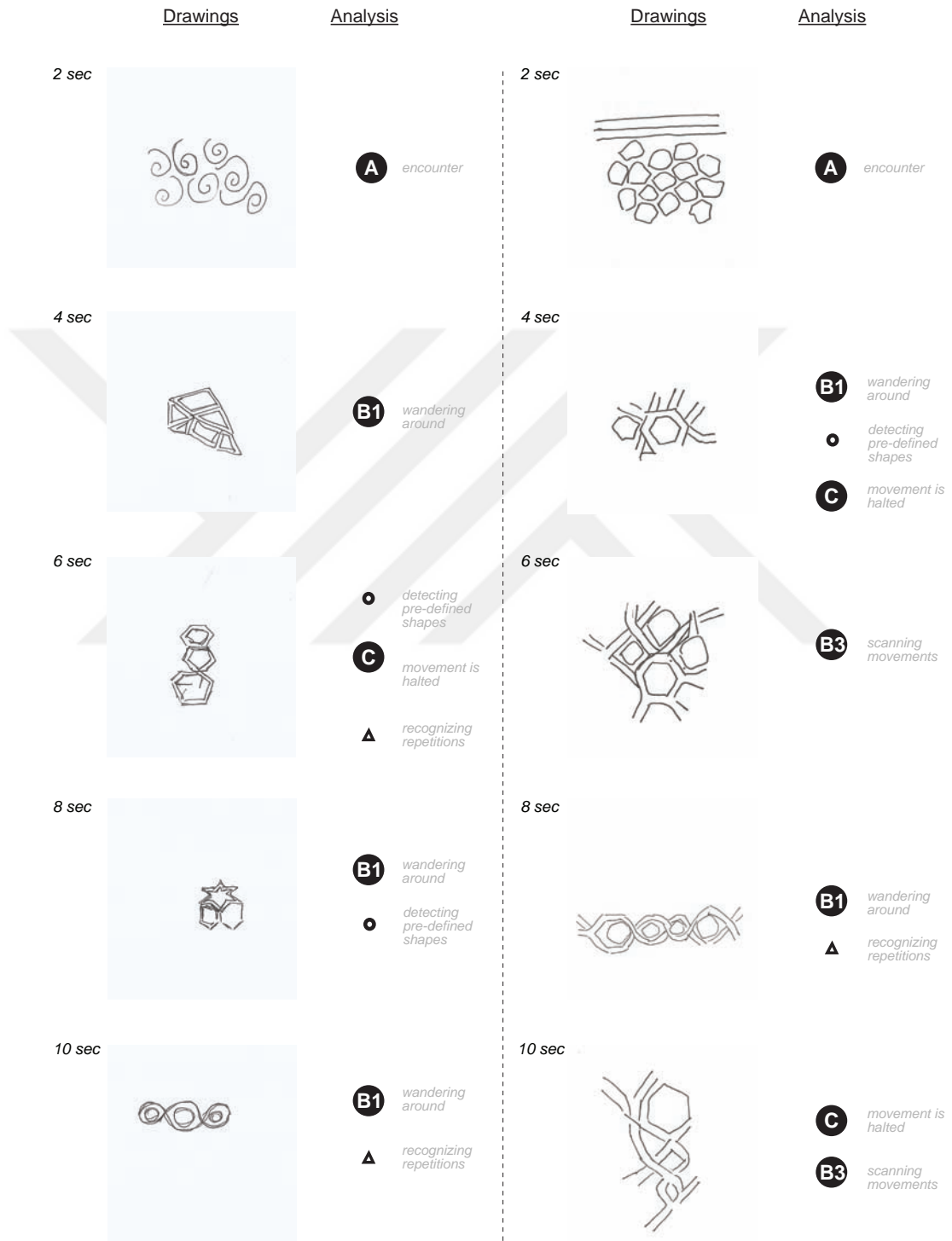
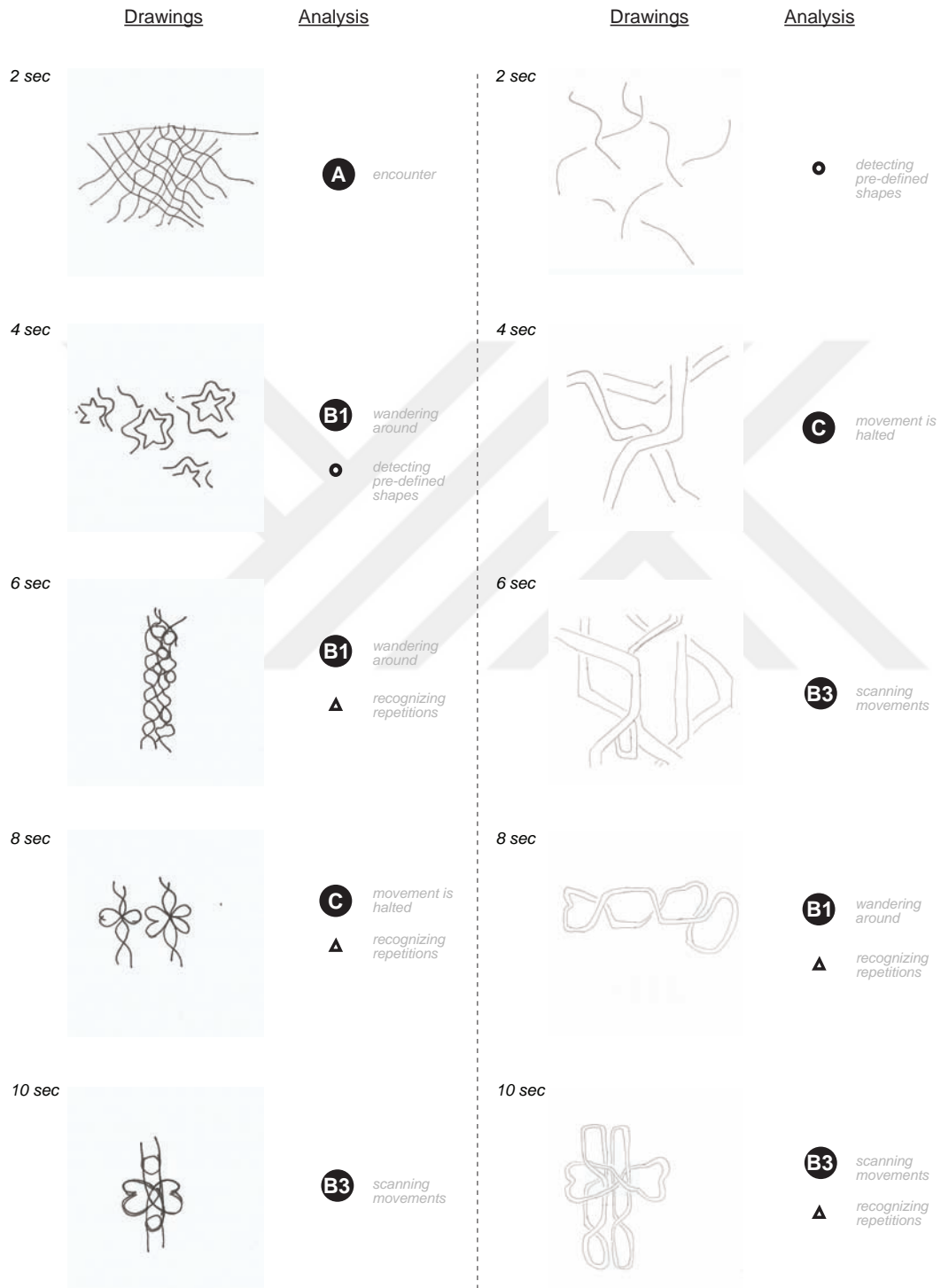


Figure 5.4 : Dissection of study results (7th and 8th participant).



**Figure 5.5 :** Dissection of study results (9th and 10th participant).

## 6. CONCLUSION

Looking at a landscape, at people on the street, or at any image, one constructs the meanings, which is a unique composition of the things seen. And this gives rise to both one's own spatial position and attitudes toward things; how we read and make sense of our surroundings based on political, social, and cultural aspects of the period lived in. As in the Zumthor's example mentioned in the introduction, although it is still the same person under same political, social, and cultural circumstances, the small change that he created in his perspective of perceiving the outside world gives rise to a tremendous difference. Facing a design problem, designer creates a dense and ambiguous problem space requires the designer to construct her design world to resolve itself. Highly personal and distinct design worlds entail how we perceive our surroundings. To grasp spatial relationships among the dense and ambiguous dimensions of problem spaces requires new ways of seeing. As the new ways of seeing do not fit any longer into the old frame of reference, "a fundamental revolution of the traditional forms of representation is unavoidable" (Kepes, 1969, p. 200).

A research is a place to generate new ideas, ask questions, develop curiosities, provoke thoughts, create a problem space and set the dimensions of it, search within it, in its very essence it is a plan for the making of something new. This research study has been conducted as if it is a design problem. Chapters are organized as to provide insights into how the process, began with a curiosity developed while looking at a digital representation of a Seljuk pattern, had been experienced by the author. The process, consists of defining, redefining, changing, deepening the initial research question, translated into the study as appeared as successive thoughts in author's mind which all together made this study come into existence. The inherent forming nature of design processes through defining, redefining and changing the problem initiated novel and emergent forms and methods throughout the study. And the narration is one of them. The only aim of narrating was to have a deeper understanding of the plastic experience. Yet, at the end it enabled us to define the seeing functions of a plastic experience.

A designer's seeing-moving-seeing has been regarded as a reflective conversation with the materials of a situation in the course of actual designing (Schön, 1992, p. 5).

Renaissance humanist Leonardo da Vinci defined the relation between the ability to see the world and to think as one and the same: to visualize was to think (Johnson-Laird, 1998, p. 441). Seeing, in several senses of the word, has a fundamental importance in understanding the inherent nature of design processes. As the author went through the narration for several times, she realized that the text is full of repeating phrases and structured with very detailed descriptions of eye movements. In order to reveal these repeating structures, the narration was dissected. Researchers in the field of architectural design typically follow a linear trajectory to analyze verbal protocols roughly consists of applying formal or informal protocol analysis to the process of designing, decomposing the entire process into its smallest components through analyzing words, phrases and sentences, and analyzing interconnectivity among segments in order to arrive at generalizable insights. Goldschmidt brought the terminology of arguments and moves to the literature that she used to parse the protocols. While moves are defined as the basic coherent operations detectable in designing, the arguments stands for the smallest sensible statements which go into the making of moves (Goldschmidt, 1991, p.125). Following the footsteps of Goldschmidt, Suwa and Tversky (1997) divided the entire encoded protocol into segments defined as one coherent statement about a single item/space/topic (p. 391). The narration in the present study, relies on a plastic experience of the author in looking at an image, differs from the verbal protocols in that its introspective quality. Therefore analyzing the narration required a distinct approach.

In dissecting the narration, the first step was to determine and then analyze the repeating phrases and words. This analysis suggests three variants of seeing functions could be categorized as follows: the encounter(A), the movement(B) and the halt(C). The encounter(A) function denotes the very first moment of the encounter with the image. The descriptions of different modes of eye movements correspond to the movement(B) function. The descriptions of eye movements all together constitute the follow-up of the gaze which is halted at a specific point in the narration. We encoded this specific point as halt(C) function. Although the encounter(A) and the halt(C) functions mentioned only for once, the movement(B) function contains a great amount of variants throughout the narration. Some of these variants point exactly to the same eye movements (i.e. wandering around, roaming about, move through, go through). After reviewing all the words and phrases fit into the movement(B) function, we distinguished subclasses of it. In cases where the eye movement is described as a movement from one spot to another with no certain destination in mind, we encoded the phrases and words as B1. There are four other subclasses of movement(B)

function as follows: B2, B3, B4, B5. Those four have only one type of correspondence for each in the narration and designate distinct movement qualities both from each other and B1. The phrases and words correspond to the descriptions of eye movements, the encounter and the halt are always followed by a sentence. These sentences explicate the impacts of the phases and words on 'simultaneously appearing and disappearing ever-changing shapes and relationships in a mental picture'. Since this reminds input-output relationship of a function, those phrases and words are designated as functions. Apart from this, there are other phrases, which also followed by certain effects described on the mental image in the text, does not fall under the category of eye movements. Helmholtz(1962) asserted in the nineteenth century that a person's view is influenced by unconscious judgements based on facts available and inferences drawn from the observer's knowledge. The phrases of detect, recognize, distinguish indicates functions (by the reason of having outputs), yet they differentiate from eye movement functions by being related to the judgements, inferences and observer's knowledge.

The present research suggests a shift towards a designerly way of conducting a research which is distinct from scientific activities. The study is based on personal experiences, views and speculations led to devising methods which are obviously arbitrary and subjective, but it serves the purposes fairly well. The research asked many questions. This was a rather rough examination of those questions and the relationships among the sections have not been established and analyzed in detail yet. Examining the visual cues regarding the perception of the Seljuk pattern revealed in the course of visual deconstruction of the pattern in the light of functions of seeing obtained from narration of the plastic experience is one of the future plan of this study.



## REFERENCES

- Akın, Ö.** (1986). *Psychology of architectural design*. London: Pion Limited.
- Arnheim, R.** (1969). *Visual thinking*. Berkeley: University of California Press.
- Bakırer, Ö.** (1981). *Selçuklu Öncesi ve Selçuklu Dönemi Anadolu Mimarisinde Tuğla Kullanımı* [The use of brick in Anatolian architecture in pre-Seljuk and Seljuk era]. Ankara, Turkey: ODTÜ.
- Broug, E.** (2008). *Islamic geometric patterns*. London, Thames & Hudson.
- Broug, E.** (2013). *Islamic geometric design*. London, Thames & Hudson.
- Buswell, G. T.** (1935). *How people look at pictures*. Chicago, University of Chicago Press.
- Critchlow, K.** (1976). *Islamic patterns: An analytical and cosmological approach*. Schocken.
- Cross, N.** (1982). Designerly ways of knowing. *Design Studies*, 3(4), 221-227.
- Ericsson, K. A. & Simon, H. A.** (1993). *Protocol analysis: Verbal reports as data*. Cambridge, MIT Press.
- Finke, R. A. & Slayton, K.** (1988). Explorations of creative visual synthesis in mental imagery. *Memory and Cognition*, 16(3), 252-257.
- Goldschmidt, G.** (1991). The dialectics of sketching. *Creativity Research Journal*, 4, 123-143.
- Goodyear, A. C.** (2004). Gyorgy Kepes, Billy Klüver, and American Art of the 1960s: Defining attitudes toward science and technology. *Science in Context*, 17(4), 611–635.
- Gottschaldt, K. (1926).** Ueber den Einfluss gehaufter Einprägung auf die Wahrnehmung von Figuren: I. Ueber den Einfluss gehaufter Einprägung von Figuren auf ihre Sichtbarkeit in umfassenden Konfigurationen. *Psychologische Forschung*, 8, 261-318 (or see translation, Gestalt factors in repetition. In W. D. Ellis (Ed.), A source book of *Gestalt psychology*. New York: Humanities Press, 1938, pp.109-135).
- Helmholtz, H.** (1962). *Treatise on Physiological Optics*. New York, Dover.
- Johnson-Laird, P. N.** (1998). Imagery, visualization, and thinking. In J. Hochberg (Ed.), *Perception and Cognition at the Century's End* (pp. 441-467). San Diego, CA: Academic Press.
- Kandinsky, W.** (1928). *Point and line to plane*. New York, D. Publications.
- Kepes, G.** (1969). *Language of vision*. Chicago, P. Theobald.

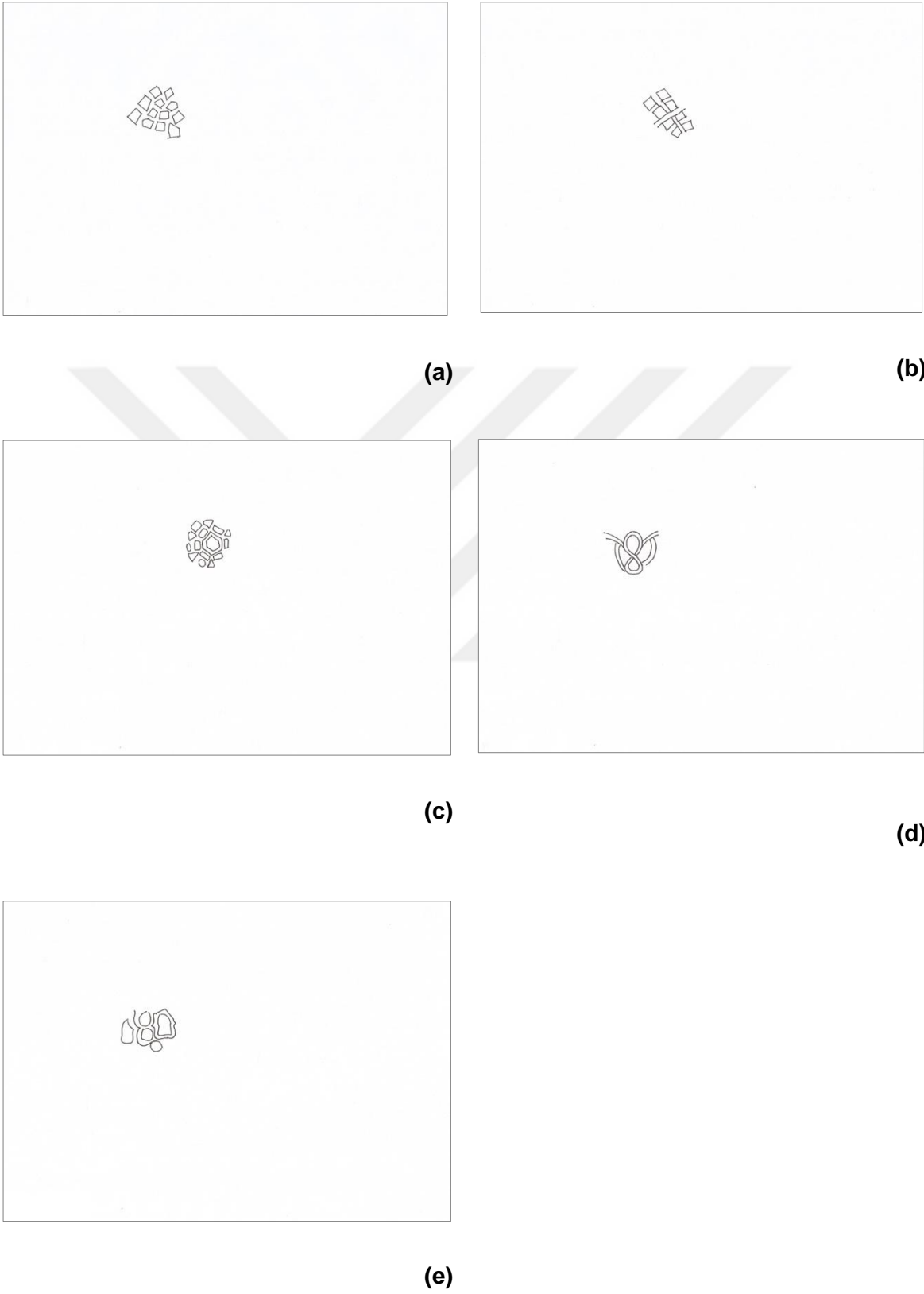
- Lawson, B.** (1980). *How designers think*. Architectural Press, London.
- Newell, A. & Simon, H. A.** (1972). *Human problem solving*. Englewood Cliffs, NJ: Prentice Hall.
- Ögel, S.** (1986). *Anadolu selçuklu sanatı üzerine görüşler*. İstanbul, Matbaa Teknisyenleri.
- Reed, S. K. & Johnsen, J. A.** (1975). Detection of parts in patterns and images. *Memory & Cognition*, 3, 569-575.
- Selz, P.** (1957). The aesthetic theories of Kandinsky and their relationship to the origin of non-objective painting. *The Art Bulletin*, 39(2), 127-136.
- Schön, D. A.** (1992). Designing as reflective conversation with the materials of a design situation. *Knowledge Based Systems*, 5(1), 3-14.
- Suwa, M. & Tversky, B.** (1997). What do architects and students perceive in their design sketches? A protocol analysis. *Design Studies*, 18, 385-403.
- Tan, B. & Rahaman, H.** (2009). Virtual heritage: reality and criticism, *CAAD futures 2009 Joining Languages, Cultures and Visions*.
- Thompson, A. L. & Klatzky, R. L.** (1978). Studies of visual synthesis: Integration of fragments into forms. *Journal of Experimental Psychology & Performance*, 4, 244-263.
- Verstijnen, I. M., van Leeuwen, C., Goldschmidt, G., Hamel, R., Hennessey, J. M.** (1998). Sketching and creative discovery. *Design Studies*, 19, 519-546.
- Zumthor, P.** (2006). *Atmospheres: architectural environments, surrounding objects*. Basel: Birkhäuser.

## **APPENDICES**

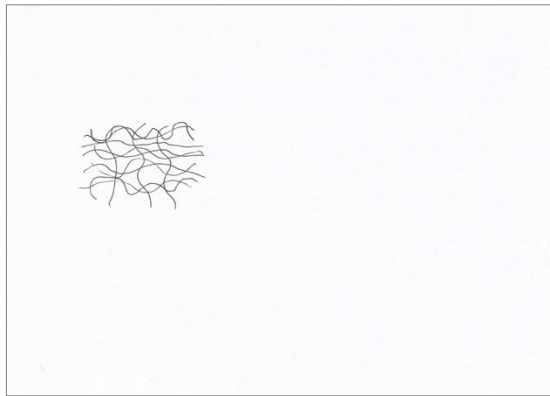
### **APPENDIX A: Visuals Produced In the Participatory Study**



**APPENDIX A**

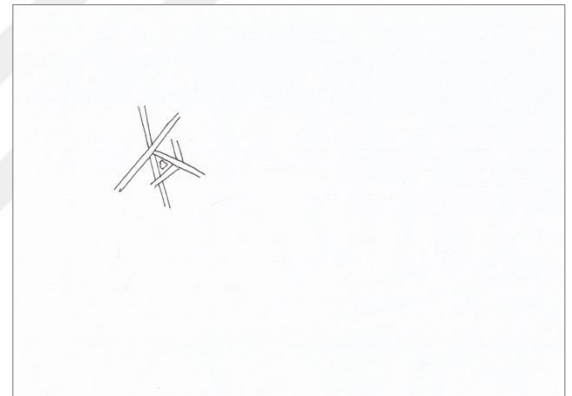


**Figure A.1** : Drawing of 1<sup>st</sup> Participant at: (a)2<sup>nd</sup>. (b)4<sup>th</sup>. (c)6<sup>th</sup>. (d)8<sup>th</sup>. (e)10<sup>th</sup> second.



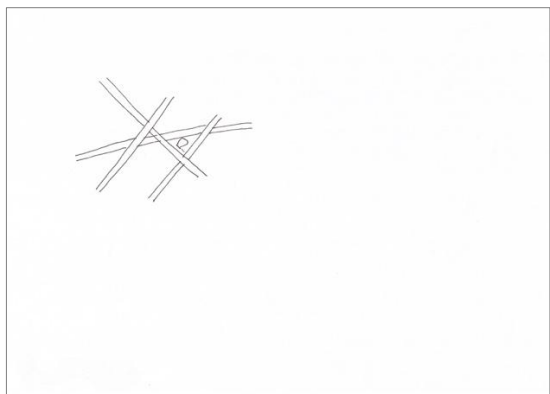
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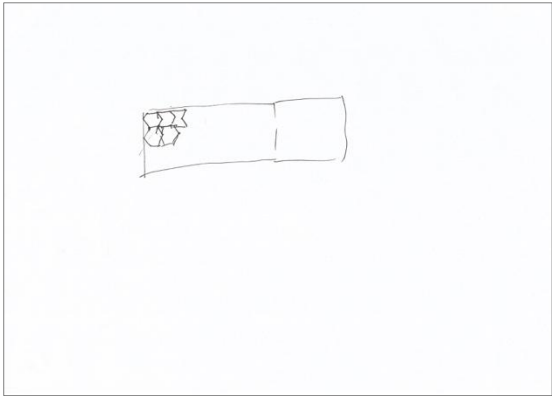
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(d)

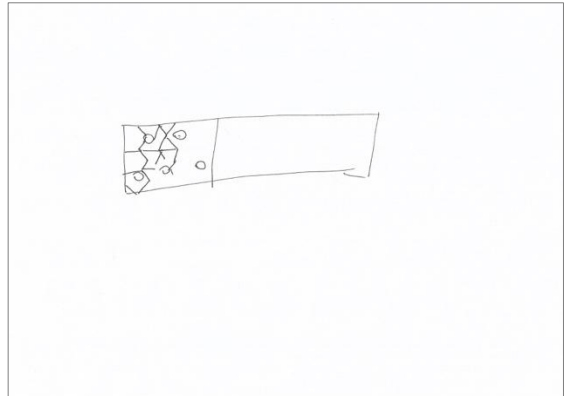


(e)

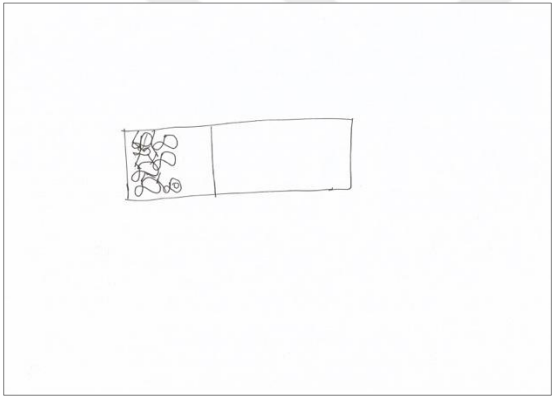
**Figure A.2** : Drawing of 2<sup>nd</sup> Participant at: (a)2<sup>nd</sup>. (b)4<sup>th</sup>. (c)6<sup>th</sup>. (d)8<sup>th</sup>. (e)10<sup>th</sup> second.



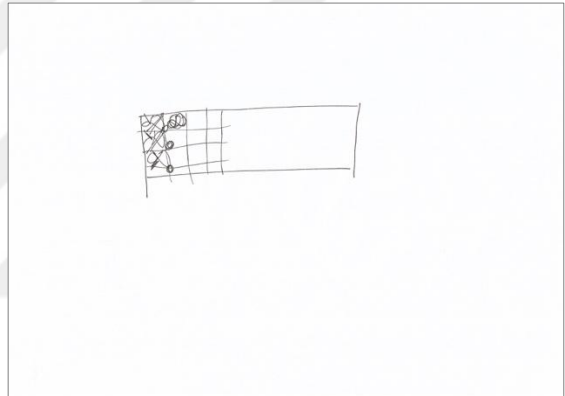
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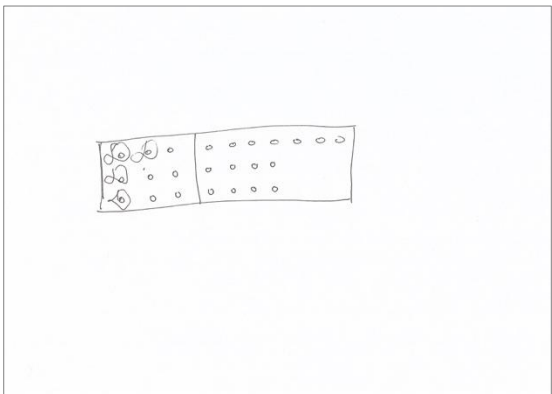
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(c)

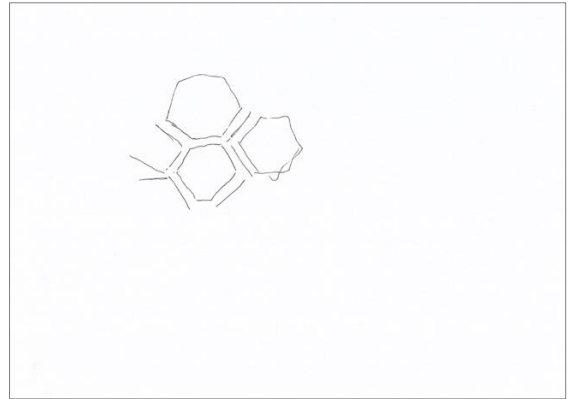


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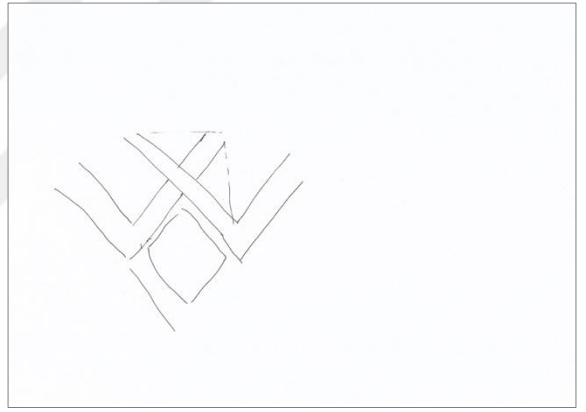
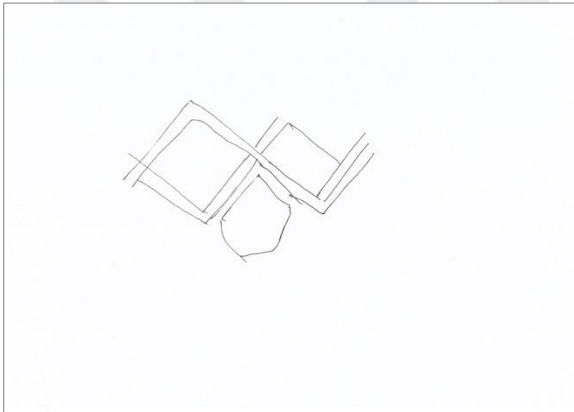
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**Figure A.3** : Drawing of 3<sup>rd</sup> Participant at: (a)2<sup>nd</sup>. (b)4<sup>th</sup>. (c)6<sup>th</sup>. (d)8<sup>th</sup>. (e)10<sup>th</sup> second.



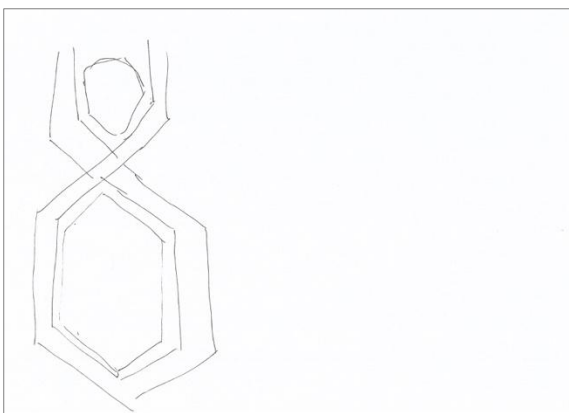
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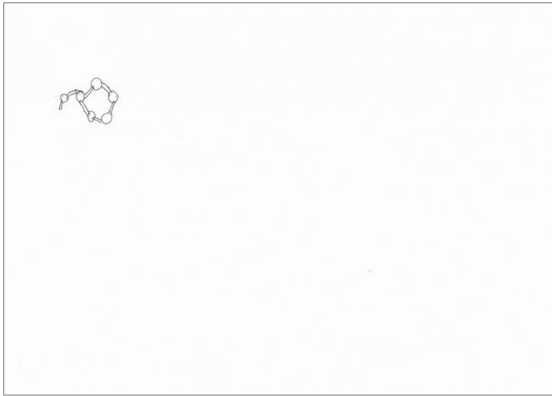
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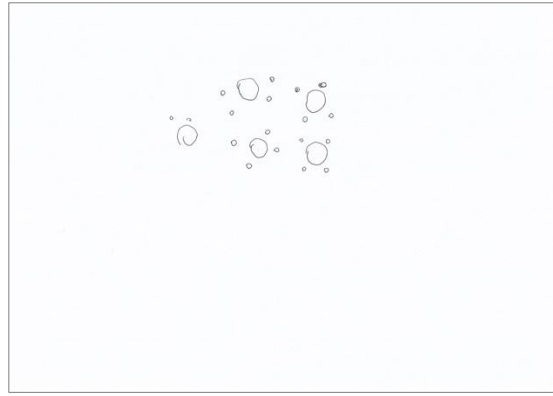


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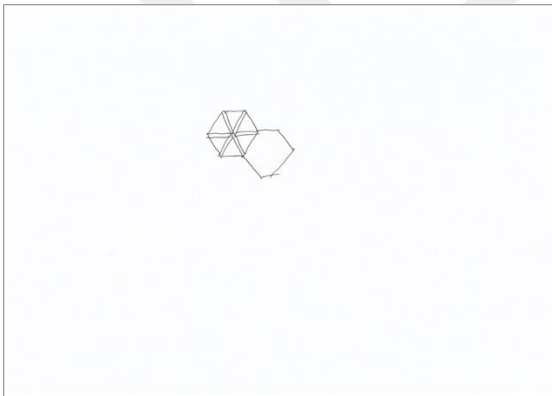
**Figure A.4** : Drawing of 4<sup>th</sup> Participant at: (a)2<sup>nd</sup>. (b)4<sup>th</sup>. (c)6<sup>th</sup>. (d)8<sup>th</sup>. (e)10<sup>th</sup> second.



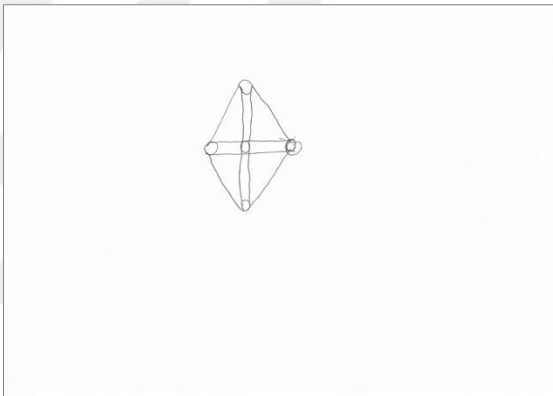
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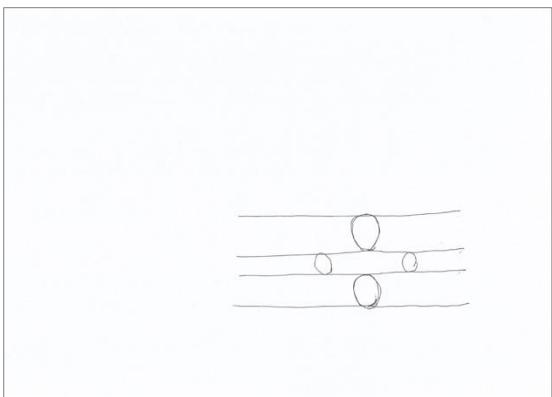
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(c)

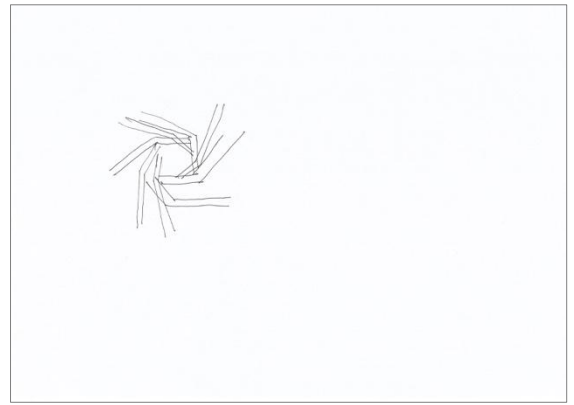
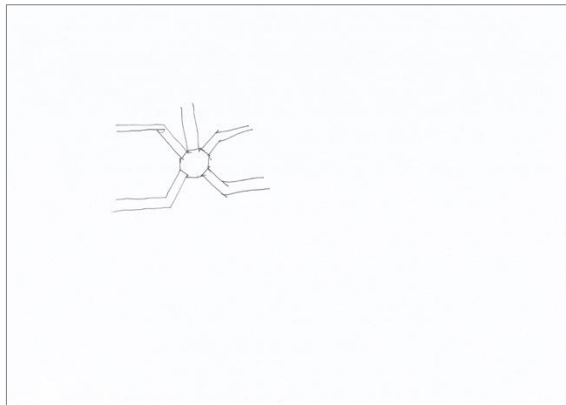


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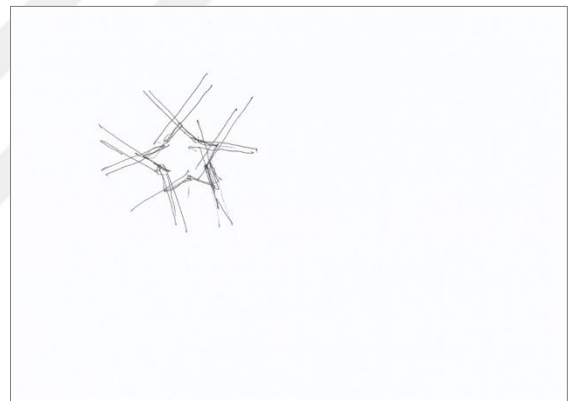
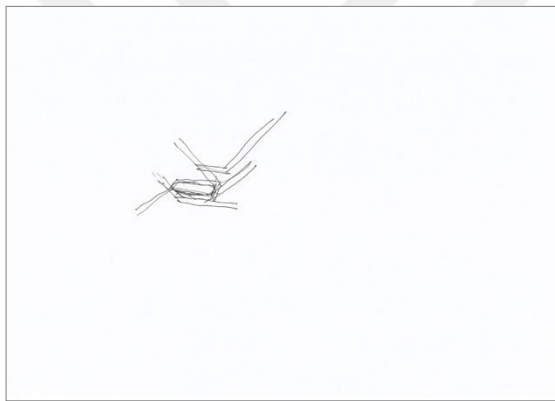
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**Figure A.5** : Drawing of 5<sup>th</sup> Participant at: (a)2<sup>nd</sup>. (b)4<sup>th</sup>. (c)6<sup>th</sup>. (d)8<sup>th</sup>. (e)10<sup>th</sup> second.



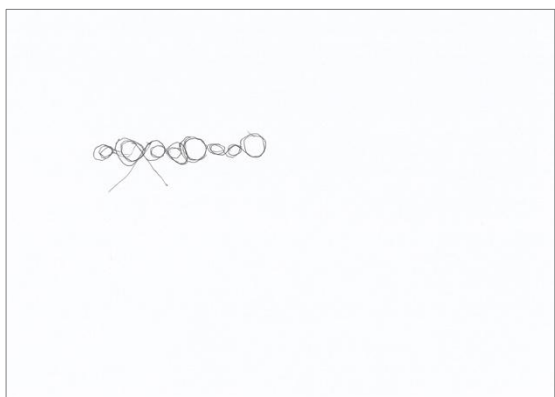
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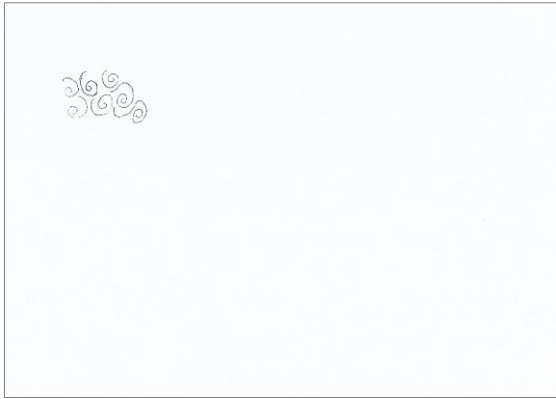
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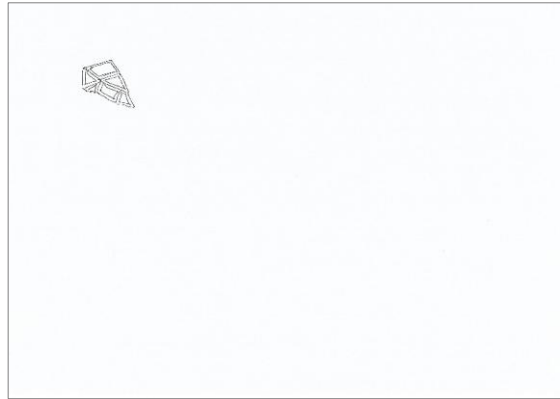


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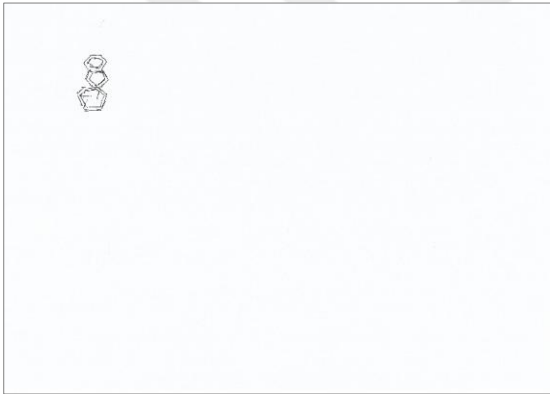
**Figure A.6** : Drawing of 6<sup>th</sup> Participant at: (a)2<sup>nd</sup>. (b)4<sup>th</sup>. (c)6<sup>th</sup>. (d)8<sup>th</sup>. (e)10<sup>th</sup> second.



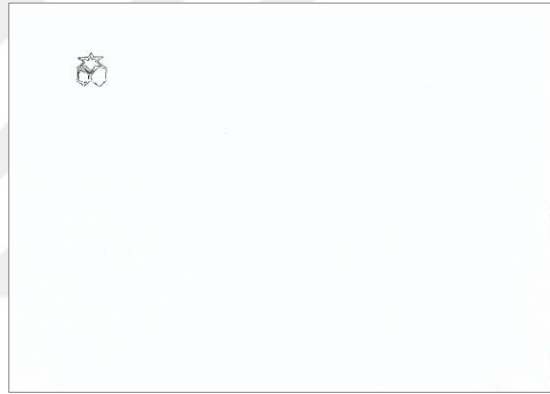
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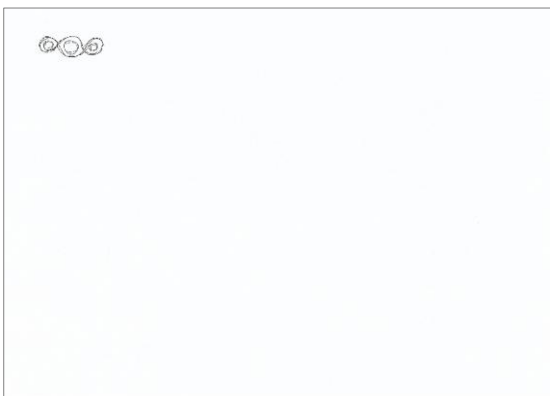
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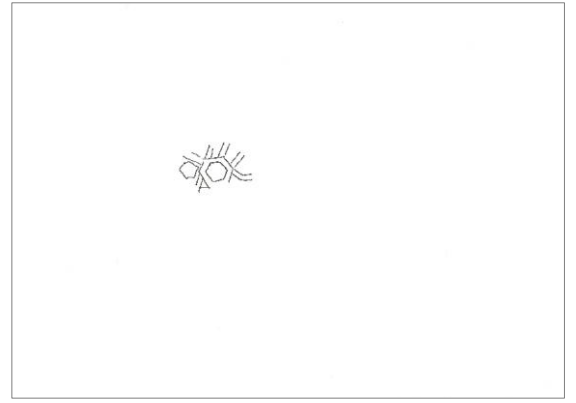
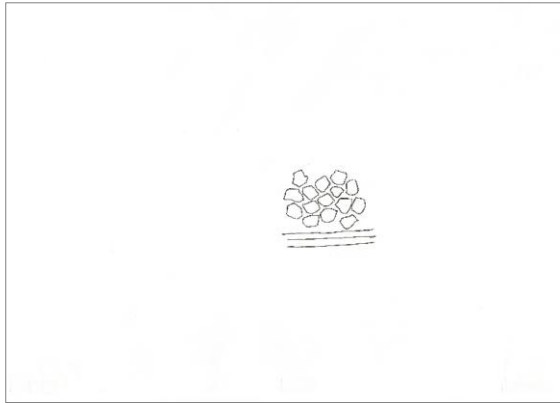


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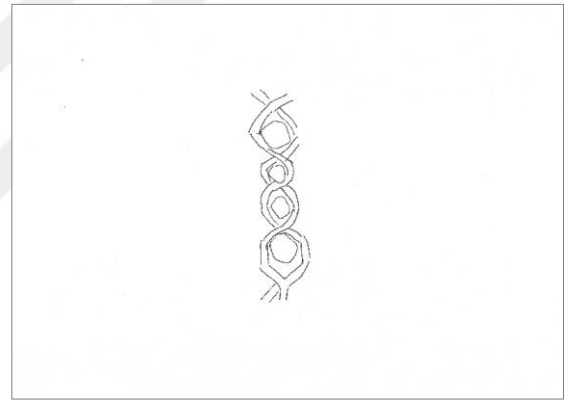
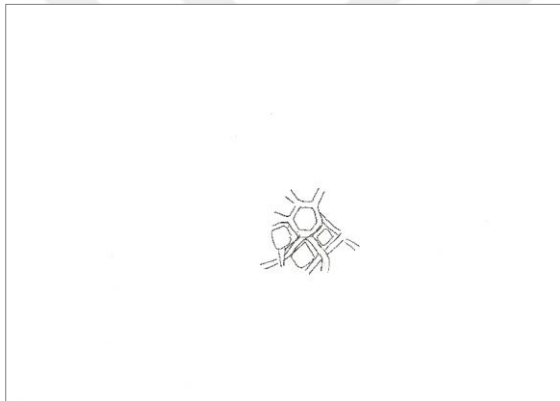
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**Figure A.7** : Drawing of 7<sup>th</sup> Participant at: (a)2<sup>nd</sup>. (b)4<sup>th</sup>. (c)6<sup>th</sup>. (d)8<sup>th</sup>. (e)10<sup>th</sup> second.



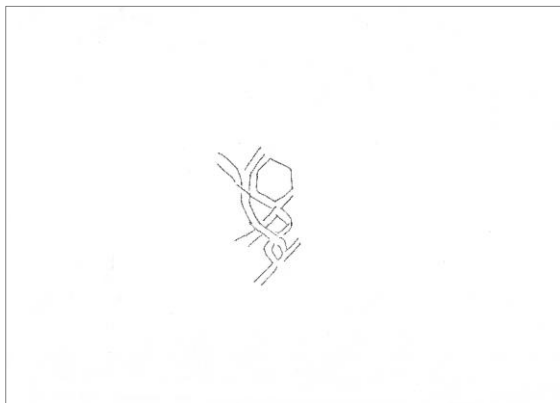
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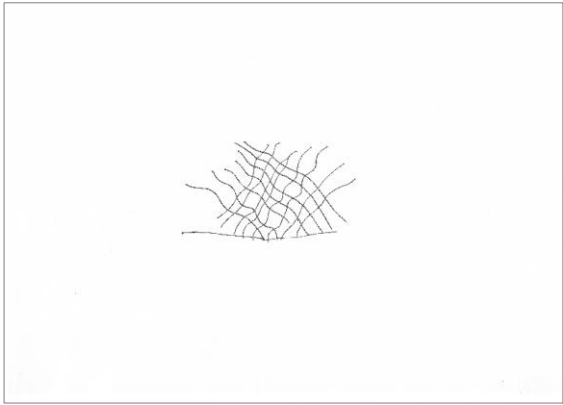
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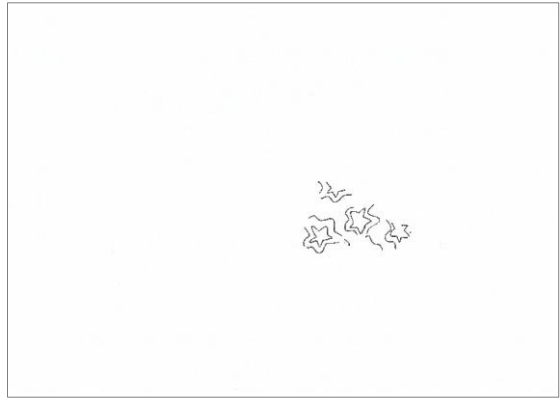


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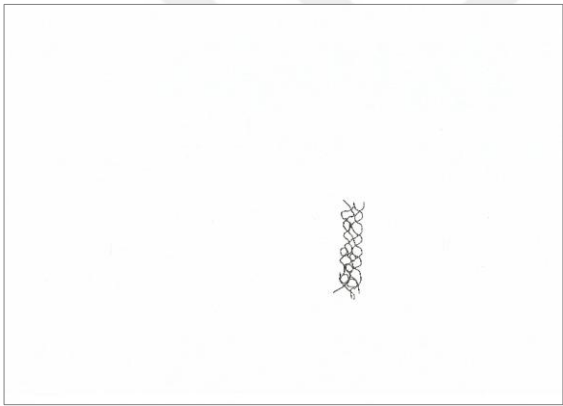
**Figure A.8** : Drawing of 8<sup>th</sup> Participant at: (a)2<sup>nd</sup>. (b)4<sup>th</sup>. (c)6<sup>th</sup>. (d)8<sup>th</sup>. (e)10<sup>th</sup> second.



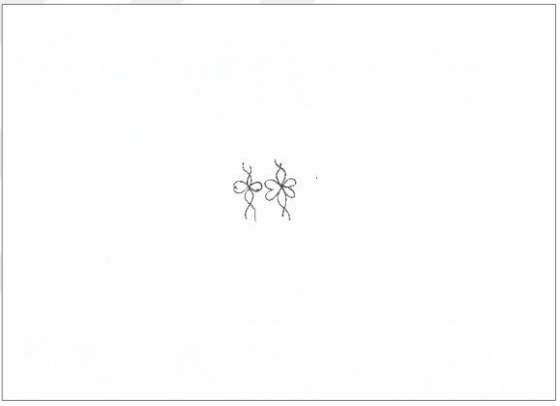
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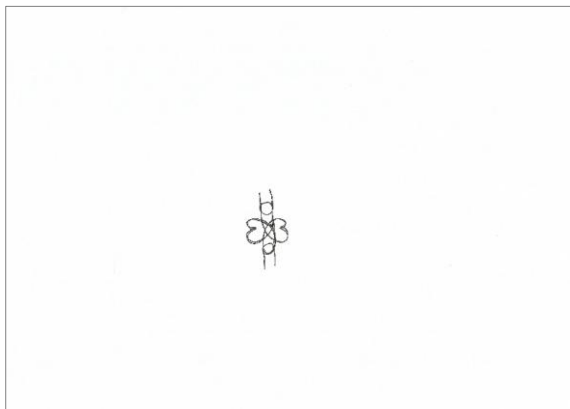
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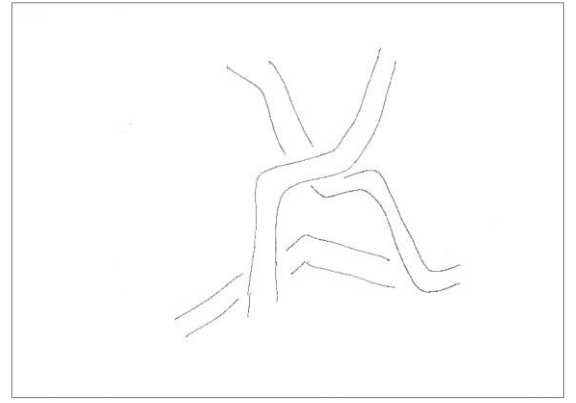
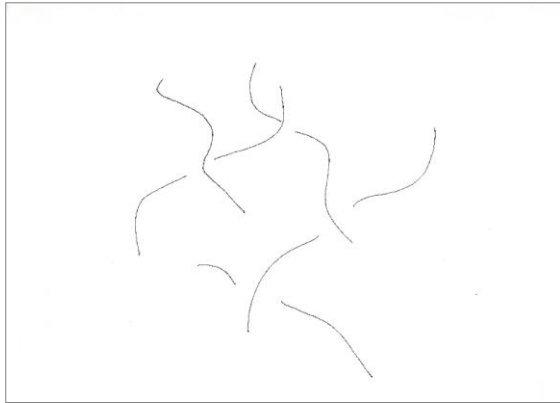


(d)



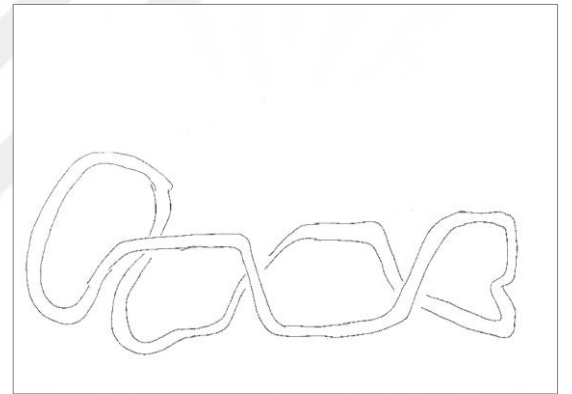
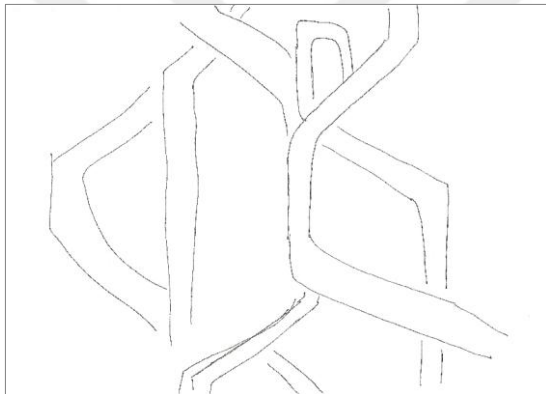
(e)

**Figure A.9** : Drawing of 9<sup>th</sup> Participant at: (a)2<sup>nd</sup>. (b)4<sup>th</sup>. (c)6<sup>th</sup>. (d)8<sup>th</sup>. (e)10<sup>th</sup> second.



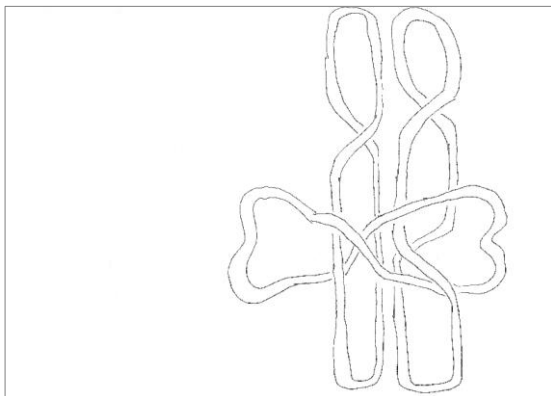
(a)

(b)



(c)

(d)

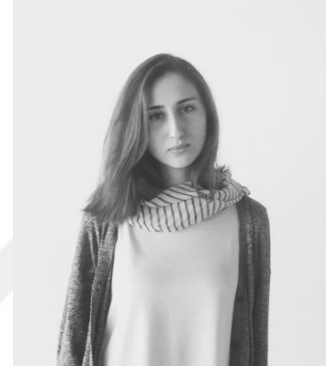


(e)

**Figure A.10** : Drawing of 10<sup>th</sup> Participant at: (a)2<sup>nd</sup>. (b)4<sup>th</sup>. (c)6<sup>th</sup>. (d)8<sup>th</sup>. (e)10<sup>th</sup> second.



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