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A Comparative Study of Type Design Engineering of the Characters "H" and "B" in Lotus and Adobe Arabic Font Based on Basic Design and Principles of Iranian Calligraphy

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Abstract: Throughout the history of graphics, text as a visual communication tool has experienced many structural changes to keep pace with technology. When the printing press was invented, calligraphy made itself compatible with its technical requirements and was replaced by typing in the field of communications. In the present era with the advent of the computer, writing also needs to keep pace with new technology. In the current srudy such adaptation means creating geometry and more formal order in Persian writing characters in order to create a form more consistent with the performance of computers. Persian types, whether when they were used in printing machines or today in computers, lack a repeating geometric order in accordance with applicable tools (computers and printers), so that for example, repeating angles in most of the letters are variable and this irregular geometry in Persian writing causes chaos in the final product. To verify this issue, two kinds of typing, i.e., Lotus and Adobe Arabic are analyzed in the current study in terms of recurring angles in all of their characters. The reason for this choice is that both types have been designed based on the Badr typing yet the first one is more calligraphic and the second is more geometric and mostly bears the fundamental principles of the visual arts. Therefore, it could be said that they have two quite different aspects. The real question is: is it is possible to systematize main angles in Persian writing letters? And whether all or most of these angles are repeated in other letters? The study methodology was descriptive-analytic and its approach was Gestalt psychology with an emphasis on art theory and visual perception proposed by Rudolf Arnheim. The objective of this study were to review the necessity of the existence of recurring (i.e., repeating) angles in the series of the characters of two above mentioned typing and also finding the repetition of angles in the geometric order of typing and typing family. The results show that the existence of similarity in the angles in all letters of a typing can lead to the formation of a geometrical order in the form of characters and also creation of different characters in different typing kinds.

Key words: Visual perception, letters design, geometrical order, character's angles, consistency with computer

INTRODUCTION

Technology and variety of communication media are increasingly growing to keep pace with this trend, developing countries require comprehensively improving communication means. It is necessary that writing as a critical means moves along with technology development over time and even with mental and social changes resulted from technology. Substitution of calligraphy by press machine and printing machine by computer is of the most important signs of changing communication way. This replacement in technology led to change in attitude and even life philosophy in communities. Developed nations in both substitutions, sought for keeping writing letters with new tools. Therefore, some aesthetic aspects underwent proper adjustments (Nikomaram and Hamooni, 2010).

Transforming writing form led to adjustments occurrence in type principles comparing calligraphy principles. In Latin writing, due to the old history of using printing machine, changing letters along with type basic design continually happened over centuries (from 15-21) still on the way. This process continues despite computer emerging; as in previous tool (press), changes in form and principles in Latin alphabet were consistent and correctly implemented the same procedure was followed, facing computer for the new tools. While, adjustments in Persian and Arabic writing were shorter and lighter in terms of time and quality, respectively comparing Latin. In other words, the appropriate principles were not yet achieved that a newer tool, the computer, emerged which made the conditions worse. Indeed, Persian writing follows Arabic writing and according to the present study it is still lagging behind.

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Investigating Persian and Arabic characters shows that characters changed in form largely committed to calligraphy form. However, the characters, together in a type family, lack the order in sentence structures and compounds and cause visual disturbance and eye fed up in writing. As earlier mentioned, Persian letters are still based on free, non-geometric calligraphic movements whereas, press and computer not only require strong and firm geometry but also need beautiful and delicate forms, i.e., what existed in Latin letters (Ayatollahi, 2006).

Some scholars claim Persian and Arabic letters unbridle and uncontrollable such that geometric principles may not be applied in. Lack of system may be rooted in Persian and Arabic strong calligraphy history and their attached form. Some also tried to adjust Persian characters like separating connections or filling the gaps, etc., in order to be similar to Latin letters. However both perspectives merely topped evolution of Persian typography (Edondis, 1992).

In this study, analyzing different basic design-oriented types led to extracting font character and identity as well as obtaining visual disorders which is functionally important. The analyses conducted based on visual art alphabet approach known for graphic designers. Data extracting based on visual elements ended in psychological discussions and systematic geometric rules in next levels through gestalt approach. However, the present study focuses on angle system in Lotus and Adobe Arabic font as seen in the following to properly understand identity and character analysis of the two mentioned fonts, more analytical exercises are used.

It is assumed that forming repeated and ordered angles in Persian fonts produces visual order and more synchronization of letters with press and computer tools. The purpose of this research is to study joint angles and the visual role playing in the geometry of letter's typography as forming repeating angles in Persian writing is effective in creating visual order and higher letter synchronization with tools.

This study is significant in term of the necessity of visual order and a font which is typography basic in Persian graphic such that visual order in letters may also occur in typography. This order is important for graphic designers as the work producers and for the audience since it causes visual order and speed in reading message (Halimi, 2002).

MATERIALS AND METHODS

This is a descriptive-analytical study with Gestalt psychology approach based on Rudolf Arnheim theory. Psychological look into art was defined by Gestalt theory and improved by Arnheim through matching with the basic of visual art. Though, analyses concern letter's structure and form; results of this structural view are analyzed based on Arnheim theory approach. In addition, identity differences of these two fonts are also summarized based on appearance, visual and geometric analyses following geometric analysis.

Persian writing fonts are geometrically analyzed by consistently formulated tests. These experimental series embrace wide visual discussions in type area however, only some part of it, i.e., testing angles is regarded here. Geometric analyzing of Lotus and Adobe Arabic fonts by critical and functional angles and repeating the angles in other letters it is focused to discusssystematization of the detached characters "ح and ب" (H and B) studying angle order and order repetition of other character's contribution in Lotus and Adobe Arabic fonts. These characters were selected due to major structural differences. "ح" is of characters with curve whereas, "ب" is mainly formed by horizontal line. Curve and horizontal lines make most frequent lines of Persian writing character's structure.

Theory of the research: "Gestalt school of psychology emerged in early 20th in Germany. This period coincided with modern art pinnacle in Europe including Germany and Bauhaus school where the artists were fascinated in interesting findings of the founders-Max Wertheimer, Kurt Kuffka and Wolfgang Kohler-in the area of visual perception experiences".

The book of "Art and visual perception, psychology of the creative eye" by "Rudolf Arnheim", concentrated on visual perception is recently published based on Gestalt theory in art. Arnheim in art and visual perception, states the origins and purposes of its theory "principles of psychological thinking and most experiments referred in the following are rooted in Gestalt theory. Gestalt means form or shape it was used for referring to a set of scientific maxims since the beginning of the present century which were mainly established based on perception psychology experiences" (Arnheim, 2013).

Arnheim utilized basic of visual artas a mean of visual perception to keep track of its theory. He extracted and analyzed his visual perceptions through basic design. He says "an artist benefits the particular issues such as form and color to perceive the general meaning of a particular case. It should be turned into a set of terms by the aid of perception analysis. Fortunately, perceptional analysis is largely flexible (Arnheim, 2013).

He presented its visual perception experiences based on several experiments carried out in different schools and universities like new school of New York social studies and Harvard University. He experimented based on visual and environmental studies and art psychology.

Gestalt emphasized on art psychology and work creation and perception from a new perspective (psychology) hence, Arnheim, according to this emphasis and using proper means-visual elements and relations governing the work-founded the theory of visual perception and its contribution in understanding and creating the visual work.

Case studies: "Lotus" font was designed in "Linotype" type design studio in 1978. "Badr" font is a calligraphic font in Arabic styles. It has a high linear value (Linear value is referred to thickness differences of the line forming characters) widest (main thickness) numerical ratio to the narrowest is 12-1. Numerical height and low in font's main line is totally balanced and properly distributed. Cross section of the main line at the beginning, coincides with a character's cut cross section >60° and turns into a circle at the end. This pooled presentation of main line cross-section shows full slow, rotation in font designing that enhances font's softness, flexibility and strength. The font includes bold and regular (Selentic, 2013).

Adobe Arabic font was designed, 26 years later by "Tim Hallowy" in 2004-2005. This font was also designed based on Badr and has a linear value in appearance however, linear value adjustments were very slow and showed low linear value. The widest line thickness in character's main line was about 3 times to the narrowest (ending of characters). Main line cross section in characters is sharp coinciding with a font cross section by an angle of 60°. These are main line characteristics of font structure appearing in all letters in other word are of font's visual indicators. This font is totally consistent with classic and modern English types. The family includes italic, bold, regular and bold italic…making styles and text selection simple. For ease of virtual matching, images of two fonts placed together. Consider that images in right are Lotus and in left are Adobe Arabic. It is worth to notify that designing history obtained from linotype website and other references.

Why Lotus and Adobe Arabic fonts: Adobe Arabic was designed following Lotus and is much more regular and more geometric than Lotus. These were studied since Adobe Arabic is more consistent with geometric principles and basic of visual art along with Lotus, the older font maintained the calligraphic roots. Further, they represent two different personalities due to the appearance.

Visual analysis of "ح" (H): To visually analyze the letter, a quadrilateral box inscribed on each character then, the important angles hidden in character's structure are extracted in relation to two vertical and horizontal lines in character's contour. Extracted angles are grouped. For instance, angles of horizontal characters are in one class and curve characters categorized in another class as curved character angles show no coincidence with vertical and horizontal structures and must be studied with similar letters.

Finally, onceangles are classified based on structure, angle variety and frequency of each class is investigated as a result, some additional angles capable of approaching to frequent (repeating) angles such that characters are intact will be identified and corrected if necessary. This research only presents table and frequent angle detection level.

External angles: One of the issues to be studied in Adobe Arabic font comparing Lotus font is character's external angles, i.e., angles in negative area. The first understudied character is "ح".

According to Fig. 1, curved angles in Lotus are closely similar to angles in Adobe Arabic however in the crown (peak) section there are large differences seen in angles and negative areas as well as appearance. Angle difference was about 10° at the two ends of crown curve. Aperture openness and the amount of negative area are different influencing visual weight, font tone and linear value (Fig. 1).

Taking a close look at angles of character's negative space in Adobe Arabic and acute angles smaller than 90° at curve's endings, show strong curves in positive space. Because of closeness of acute angles in the negative space and negligible differences (about 1° and 2°) it may conclude that positive space curves are regularly placed at the endings of the assumed 90° axis (Fig. 2).

Analayzing font's negative space is of the functional experineces of character's identification and analysis which influences extracting content, character's tone and font from form (shape). Both characters are within visual range. Comparison at the first galance reveals contract curves in Adobe Arabic comparing Lotus hence, Adobe Arabic is more introverted than Lotus (Fig. 3 and 4).

The head of the letter: As known, "ح" is of large-head width of charcater head in understudied samples is almost close however, Lotus is more wider and is gently drawn along the horizon.

Curved structure: In comparing main circles of Lotus and Adobe Arabic, it may be stated that Lotus is not based on circle and curve with equal radiuses; rather it is based on an oval along horizontal axis. While, Adobe Arabic curves

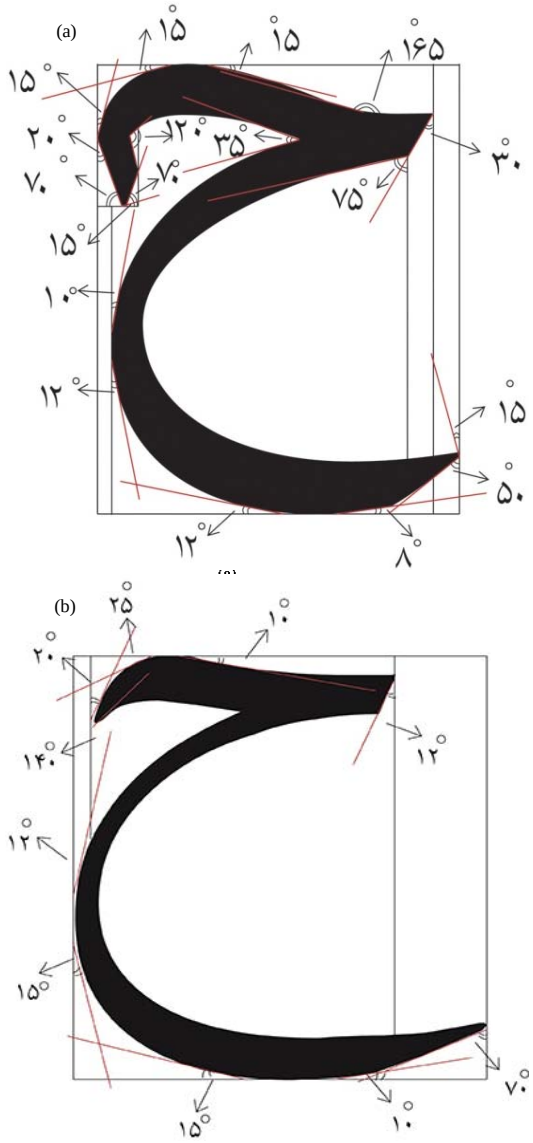

Fig. 1: External angles in Lotus and Adobe Arabic (researchers)

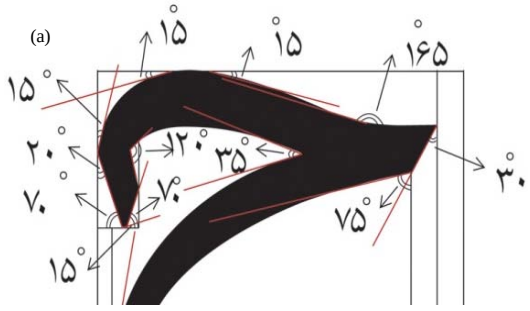

Fig. 2: Continue

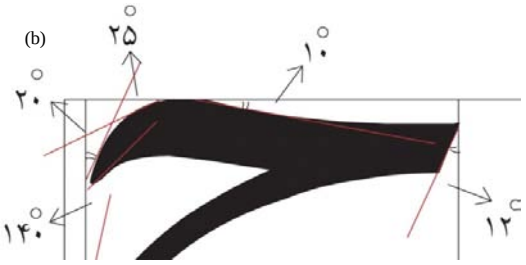

Fig. 2: Angles of crown width in "ح" for Lotus and Adobe Arabic (researchers)

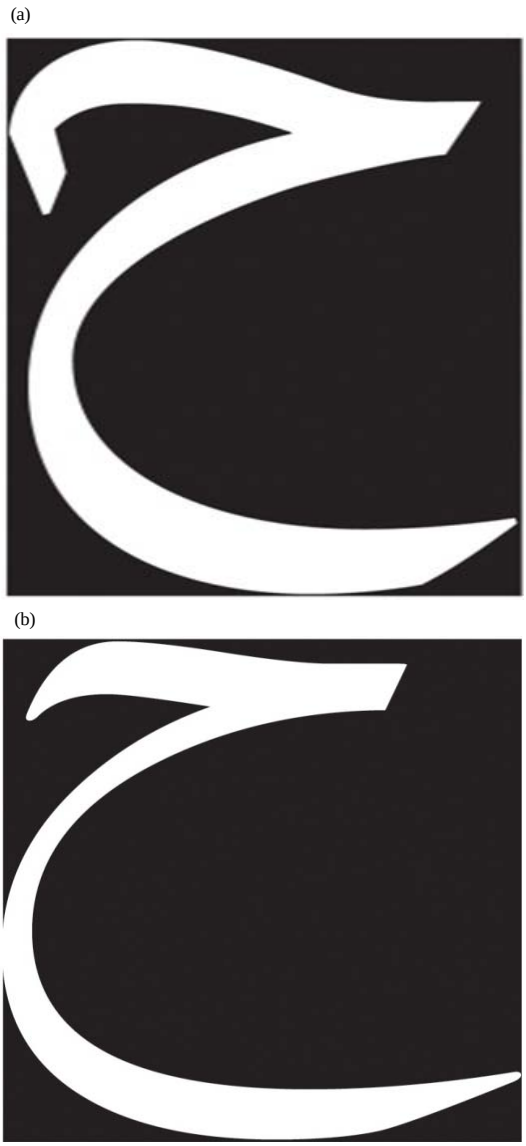

Fig. 3: Negative space over "ح" in Lotus and Adobe Arabic at font size 50 (researchers)

Fig. 4: Comparing the length of width for "ح" in Lotus and Adobe Arabic (researchers)

are based on perfect circle. Therefore, it expressed that the dominant axis in Adobe Arabic is close to vertical axis whereas in Lotus, it approaches to the horizontal line (Fig. 5).

Directions: Letter in both fonts shares similar and common directions and visual movements. Movement direction is right to left which is reading direction in Persian writing (Fig. 6).

Visual analysis of "ب" (B): Following a curved letter analysis, it is the time to study a horizontal letter. Investigating a horizontal letter like "ب" may provide effective solutions for detecting level and contour in type designing. The critical visual line in "ب" structure is the horizontal line.

Outside angles: In this character, negative space angles are close together in many cases however in general, the scope and level of extension on base line are the determining factors (Fig. 7). The height of vertical lines on both sides of the horizontal line in proportion with horizontal extension is higher in Adobe Arabic than Lotus; thus, the horizontal character is more similar to the curved surface and seems smaller along the horizon while, Lotus, due to smaller height of vertical lines, appears longer. Besides the height of character's vertical line, horizontal line of "ب" in Lotus is longer than Adobe Arabic. According to matching "ب" in both fonts it may be expressed that Lotus in term of appearance is horizontally longer whereas Adobe Arabic is vertically longer as a result, Adobe Arabic seems more static than Lotus (Fig. 8).

Horizontal, vertical and curve structure: Considering line connections in letters like "ب" composing of two

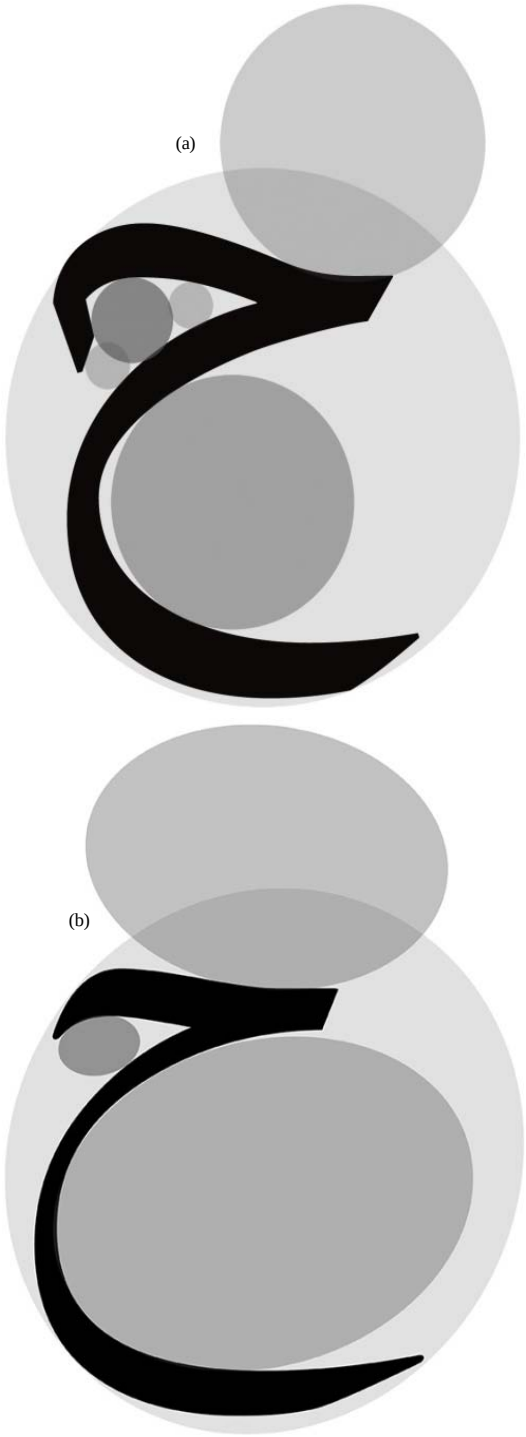

Fig. 5: Circles creating the curves in "ح" for Lotus and Adobe Arabic (researchers)

horizontal and vertical visual lines demonstrates the difference of character's initial and ending section. In the initial, the vertical angled line is connected to the

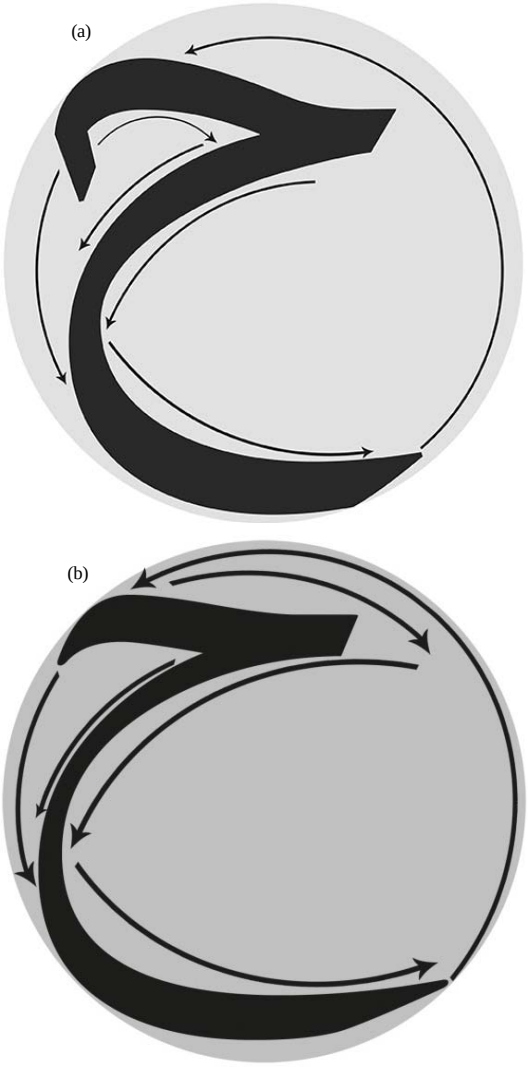

Fig. 6: Visual rotation of "ح" in Lotus and Adobe Arabic (researchers)

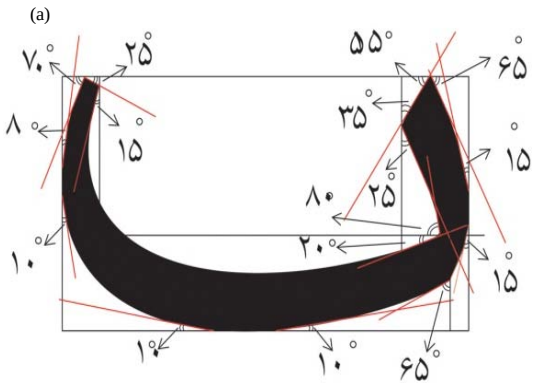

Fig. 7: Continue

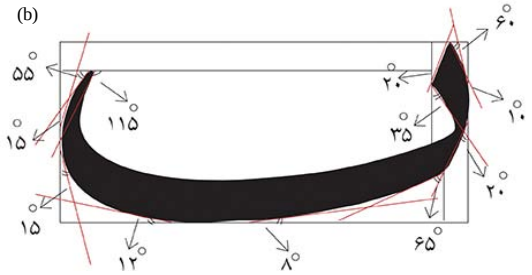

Fig. 7: Angles of "ب" in Lotus and Adobe Arabic (researchers)

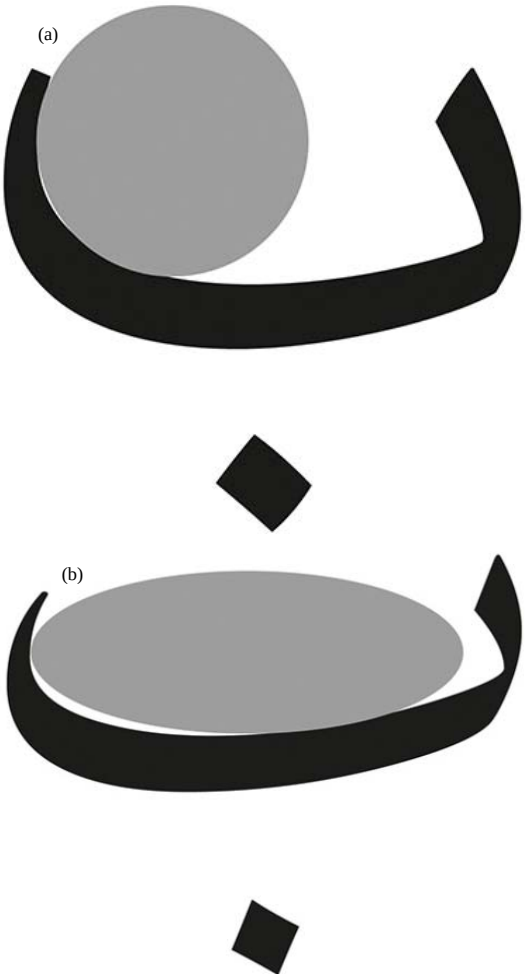

Fig. 8: Comparing "ب" length in Lotus and Adobe Arabic (researchers)

horizontal line and detaches in circle movement at the ending. Both fonts share similar attachment and detaching. However, connection angle acceleration at the initial is stronger in Adobe Arabic than Lotus meaning

that it is more sharply attaching to the horizontal line and is suddenly detached at ending from the horizontal line in a form of full circle while, ending detachment in Lotus is more gentle (Fig. 8). In order to numerically compare angles, outside angles in "د, ط, ع, ص" are studied in both fonts (Fig. 9).

RESULTS AND DISCUSSION

Directions: Vertical movement directions at the beginning of "ب" character is closer to the vertical axis in Lotus type comparing Adobe Arabic and in horizontal movement gets closer to the horizontal line. In this letter, more

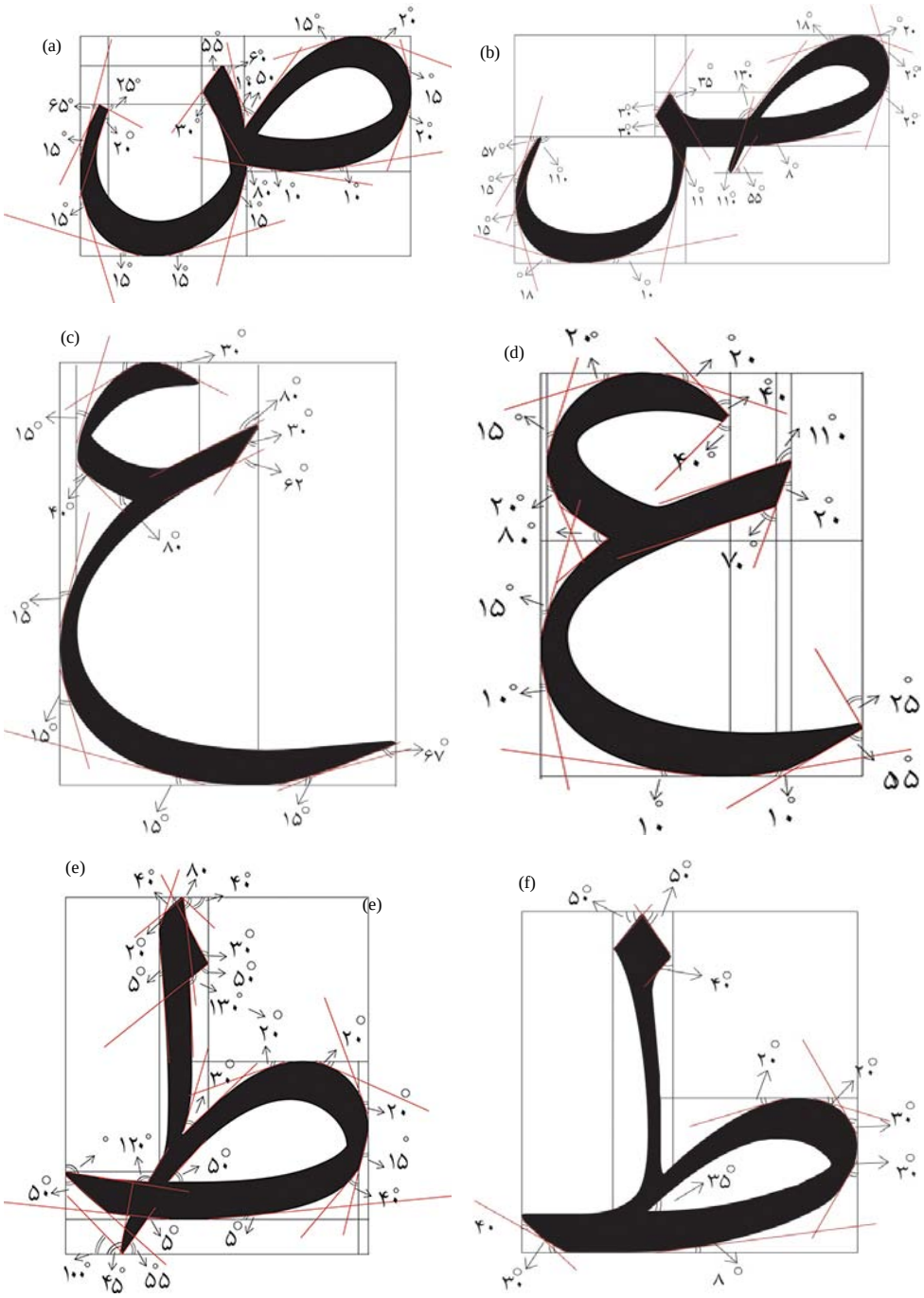

Fig. 9: Continue

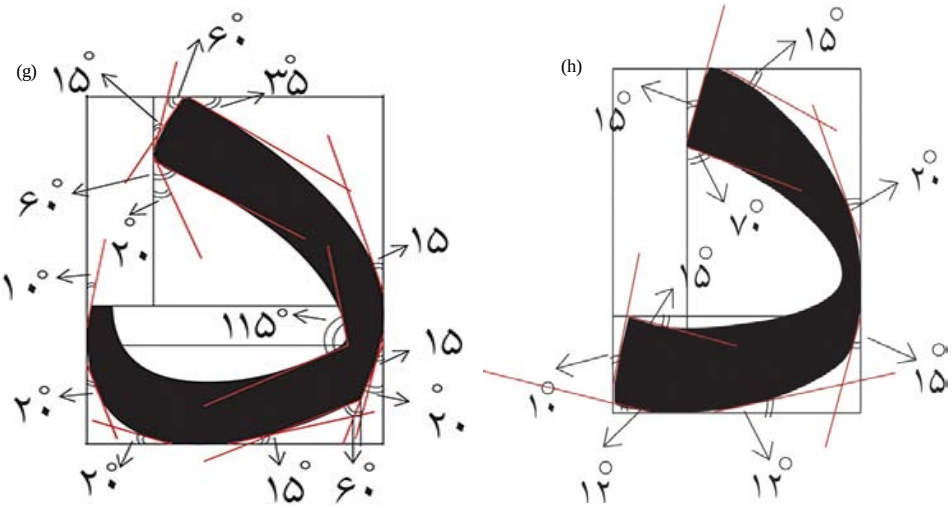

Fig. 9: Numerical comparison in Lotus and Adobe Arabic (researchers)

Table 1: Character's angles in Lotus (researchers)

Character's	5	8	10	12	15	18	20	25	30	35	40	50	55	57	60	62	65	67	70	80	85	90	110	115	130	140
الف	2		1													1	1				1	1				
ب		1	1	1	2		2			1			1		1		1							1		
ح			2	2	2		1	1											1							1
د			1	2	4		1							2					1							
ر					2	1	1		1				1	1									1			
س			3		2	1			5					1					1				1			
ص		1	2		2	2		3	2	1			1										2		1	
ط		1					2		3	1	2	2														
ع					5				2		1							1		2						
ک		1		2	2		2	2					3	1		1	1							1		
تعداد دفعات تکرار	2	4	10	7	21	4	9	6	13	3	3	2	6	5	1	2	3	1	3	2	1	1	4	2	1	1

vertical and horizontal lines exist for Lotus comparing Adobe Arabic whereas in Adobe Arabic in spite of vertical and horizontal lines, the angles are more acute and character's general character gets away from vertical and horizontal lines.

Table 1 represents extracted angles in all Lotus characters. It is observed that angles are similar (close) in size. The value in different angles is within 2°-5°; only in one angle which is the most obtuse angle on the head of "ح" the difference between two fonts is 25°. The widest (obtuse) angle in Adobe Arabic and Lotus is 165° and 140°, respectively. Since, the angles are mainly extracted from negative spaces therefore in positive space and main structure, Adobe has more acute angles than Lotus. Thus, the higher length hypothesis of Lotus along the horizontal line in consistent to Adobe Arabic in addition to negative space or circles is maintained comparing Lotus.

Adobe font is more accelerated and impatient comparing Lotus, meaning that visually invites the audience to quickly read the text and hastily finish it whereas, Lotus offers more calmness and is more appropriate for the texts with quiet contents requiring more concentration.

Upper row shows all existing angles in Adobe Arabic regardless of repetition times. As seen, some angles formed just once and some more than once. In the last row the number of angle repetition in all characters are illustrated (the most frequent) (Table 2 and 3).

Adobe Arabic inherently owns a relatively heavy visual weight, i.e., even is heavier than itself in intermediate weight this feature is intensified by sharp angles. It has a visual, formal, serious and a bit rough tone. But since in Adobe Arabic design, the contour prioritizes surface it more focuses on vertical axis hence, it is viewed an active, lively font. However, it benefits a specific order and system which is somehow controlled by sharp, angled cutting. Adobe Arabic is introverted, contracted and a little hasty. It is more violent and difficult; evokes bass and finally has more fragile and less flexible angles.

Linear value performance in Lotus is higher than Adobe Arabic. It is average weight in term of visual structure weight which seems light relating to the horizontal length. In this regard, Lotus is more active and fluid than Adobe Arabic. It may be stated that Lotus is

Table 2: Character's angles in Adobe Arabic (researchers)

Character's	5	8	10	12	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	95	100	110	115	120	130	165
الف	5							3				2							1	1						
ب		1	3		3	1	2		1				1		2	1										
ح		1	1	2	5	1		1	1			1				2	1							1		1
د			1		4	4			1					2									1			
ر			2		1	2		2					1	2		1							1		1	
س	1		5		3	2	1	2			1		1	2			2	3								
ص			3		6	3	1	1				1	1	1	1											
ط	3				1	4		2		3	1	2	1					1			1			1	1	
ع			3		2	4	1			1			1			1		1				1				
ک	1		4		3	2	1	1			1				1	1	1					1				
تعداد دفعات تکرار	10	2	22	2	28	23	6	12	3	4	3	6	6	7	4	6	4	5	1	1	1	2		2	2	1

Table 3: Comparison of Lotus and Adobe Arabic in terms of form and character

Indicators	Lotus	Adobe arabic
Weight variation	Limited	Diverse
Visual weight	Light	Heavy
Dominant curve in curved letters	Oval	Circle
Linear value	Exists	Exists
Cross section	Circle with diagonal connections	Circle with sharp and tight connections
Letter extension	Extension along horizontal axis	extension along vertical axis
Statistics	Fixed along horizon, inactive	Fixed along vertical, strong
Tone of voice	Strong, gentle tone of voice without stress	Firm and decisive tone and warning
Visual character	Flexible, rational and serious (strict)	Firm, strict and serious (a little violent)

more playful and alive thus, it is more delicate and less violent. Lotus associated tone (voice) is soprano and reveals a more flexible and gentle character. It is broader, more extended, extroverted and more patient.

Though, the present research merely provided two samples it investigated in various forms including angles, circles, negative space, grid, proportions, visual rotation, bases, etc. Thus, visual indicators and the regularity and order are figured out by angle frequency and variety.

CONCLUSION

The result of studying angles and character analysis of two fonts are presented in the following. It is worth to notify that considering the order and frequency of joint (or neighbor) angles is highly effective in font letter design and its consistency with technologies such as computer and press such that by concentrating on angle's order (regularity) a critical step in shape geometrical order, letter character and visual regularity required for the graphic designer as well as the audience in reading will be achieved. Obtaining a systemic font is critically significant both for the involved graphic designer and for the audience as information receiver through font in reading time then most important effect may be preventing visual burnout within reading.

Adobe Arabic analysis demonstrates more systemic regulations than Lotus which rooted in the discipline need of Arabic and Persian fonts. Frequency of joint angles in Adobe Arabic as well as its geometric order comparing other Persian and Arabic fonts is significant which embraces research main hypothesis. Further, it is seen that angle's frequency and order in Adobe Arabic is more than Lotus. Moreover, it owns higher geometric regularity than Lotus indicating that the need to regularity and geometry increased over time.

Comparative studying of the two font's characters shows that this comparison is totally based on visual shape and form; in addition, content and meaning were extracted through studying a form based on Arnheim visual perception theory.

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