

# IMAGE MAKING OF THE LETTERFORMS

## INSPIRATION FROM INDIAN IMAGE MAKING FOR FONT DESIGN

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Design field, being interdisciplinary in nature, has some roots in ‘art practices’. Study of the medieval Indian art and crafts through the design perspective may open lot more opportunities to relocate the design practice in Indian context.

This work can be described as cross-pollination between Indian image making tradition and Typeface design, where the first is providing a structural tool for the experimentation in the other. This paper is divided in two parts. The first part presents a need for new approach in Devanagari type face design. Second part is the experimentation in font design based on Image making process in Indian tradition. The experiment generated a new font in which a spine for each letterform is designed based on a combination of regular horizontal grid and newly introduced angular grid.

*Keywords:* Indian aesthetics, Typeface design, Image making, Art and design.

### 1. INTRODUCTION

Contemporary design arrived in India in the later half of the twentieth century. It has been heavily influenced and benefited by European design theory and practice. As a result, it has inherited relation to the modern art, following the trends of modernism and post modernism. But on the broader scenario of design needs of India, this well equipped modern design was not emergence but the replacement of traditional indigenous design practices mainly covered under art and craft. The reason is not just the cultural dominance but mainly the decline of art and craft practices in India due to lack of political support and social negligence. Art historians discuss about the glory of Indian art before seventeenth century and its foundationally sound philosophical semiotic system. But history stops at the fact finding and never encourages the subject to face its present form shoulder to shoulder. The wider aim of our research is to conduct a synchronic study of Ancient Indian art in order to check its relevance for current design scenario.

The grids used in various channels of traditional Indian art and its philosophical significance in Indian culture, elaborately discussed by Kapila Vatsyayan [1], is a potential area from a design perspective. In our study, we have focused on the grids used in Indian art practices and the way they can be implemented to extract the organizational principle for visual design.

Alice Boner has proposed a use of the radial grid in the frescos and sculptures from Medieval Indian art. This is a grid used in the narrative panels which allows different forms to interact with each other. Although this kind of grid was discussed precisely and validated through series of images and also demonstrated by her work [2] it has never been tested in any other context, especially the contemporary one. This experiment is an exploration of this angular grid in the domain of type design.

In this paper, we will discuss the angular grid in image making from medieval Indian art and its application in the digital process of type design. We believe that this exploration will point to a newer direction for further experimentation in Devanagari type design. At least it will give enough food for thought for type designers and might offer a potentially new methodology for type design.

## 2. DEVANAGARI LETTERFORMS-BACKGROUND

Early version of Devanagari script was developed from *Nagari* script and can be dated to eleventh century A.D. The emergence of the letterforms, whether arbitrary or not, is not the subject of discussion here. As designers, we are more interested in the formal aspect of letters and not in a historical, ontological or an archaeological one.

Before talking about the letters as a visual form, it is essential to understand the letterform within the culture of its user. Script is an important part of visual semiotic system of any culture. As said by Ahn Sang-Soo [3], a well known Korean designer:

*'Letter is vessel of culture. Letter is seed of culture  
In the centre of cultural identity there is letter.'*

### 2.1. Akshar: letterforms in Indian tradition

The formation and reformation of Devanagari letterforms happened from eighth century to twelfth century. This was the period of many scholarly treatises on visual arts and image making. Many of the texts are well studied by the scholars. Unfortunately there is no mention about the formal aspects of the letterforms in any literature. But it is little hard to believe that there was no thought given to the form of individual letters, especially when in India letters are given the same divine status as that of images of deities.

In India, letterforms are not just the vessel to carry the representation of a sound but it withholds a specific idea. In Sanskrit, the letterform is called "*Akshara*" — which means imperishable, that which can not be destroyed. Every single letter, considered as seed syllable, is the basic semantic unit and words derive their meanings from the combination of the meanings of constituent letters [4].

Each letter is assigned positive, negative or neutral type of energy. They have their corresponding planets, zodiac signs, colors etc. They are treated as independent entities very much like human beings. The practice of worshipping letters of the alphabet as mother goddesses known as *Saptamatrikas* is found all over India. They play a major role in tantric practices. Each letter and formation of letterforms is believed to contain different powers. Thus all three types of representations- anthropomorphic form as deity, geometric form as *yantra* or *mandala* and constructed symbol as a letterform are well thought in tradition and practiced for perfection to reflect the culture [5].

### 2.2. With reference to Roman letterforms

The reason to show the contrast between Roman script and Devanagari is to understand the complications of Devanagari type design and problems one has to face while adopting the technology evolved for Roman typography.

Devanagari, used in a large part of India, is formally different and complex than the Roman script. In Devanagari, a vowel (*swara*) following a consonant (*vyanjana*) combines with it in the form of *matra*. Actually a consonant only gets completed after combining with a vowel. *Matra* gets attached to a consonant before, after, above or below. In cases like *rafar*, a consonant combines with another consonant in the form of *matra*.

Another significant difference is the fusion of letterforms, known as conjuncts (*jodakshara*). Two or more consonants fused together, either vertically or horizontally, creates a conjunct. In few cases a separate graphical symbol is used to represent a conjunct. With *matras* and conjuncts Devanagari typography becomes more complex.

Before the age of digital printing, the compositing was manual hence painstaking but totally possible to adopt for Devanagari script. Digital technology poses lot more challenges for this type of multilayering. The technological shortcomings are:

1. All conjuncts and *matra*-consonants which conceived as a single unit by any native speaker has to break down as separate glyphs

2. Vertical conjuncts are difficult to manage and many times they are compromised to reform into horizontal formation. There are many experiments with script reformation suitable for Roman style of writing [6]
3. Position of *matra* and/ or its form can not be altered as per the width of letterforms.

### 2.3. A new approach

From prior discussions on the philosophy behind letterforms in India and the problems in digital Devanagari typography indicate a need to take different approach towards Devanagari type design. We do not claim here to give complete solution to all the problems listed above. This paper is just a demonstration of a step towards different approach of Devanagari type design.

Grid is an important tool in the image creation [7]. India had a long tradition of image making based on grids [8]. Here we propose to examine the grids in image making traditions in India to construct alternative approach for Devanagari type design.

## 3. GRIDS USED IN IMAGE MAKING AND TYPE DESIGN

### 3.1. Grid used in contemporary Devanagari type design

The literature available on the anatomy of Devanagari typefaces is meagre as compare to the Latin script. An article, Anatomy of Devanagari Typefaces [9], gives a summarised and consolidated knowledge of the various structural guidelines defined by the scholars in Devanagari. The guidelines defined by Mukund Gokhale (Figure 1) illustrate the sample grid in Devanagari type design [10]. The grid follows the nomenclature of image making as shirorekha (head line), nabhirekha (naval line), janurekha (knee line) etc.

The typeface design mainly uses horizontal grid lines. It creates the level references for the designer. It has control over the lengths and heights but it does not guide the form of curvature. The system follows the top alignment and the words are composed by the top bar which holds the letters together to form a word. Most of the letters contains the full or half vertical bar [6]. Thus Devanagari typeface has dominance of vertical and horizontal elements. Being in this structural framework, the designer can vary the lengths of these vertical and horizontal strokes to vary the letterform. (Note: The addition of any stylistic elements is not considered here, since we are talking about the basic structure of the letterform.)

### 3.2. Grids in Indian image making

There are different types of grids in Indian traditional arts. It is in use for space creation and process initiation in many rituals. We may find the references of grid like in a verse from the text Shilparatnakarakosha where it is mentioned that the grid of various lines and the centre point is very much essential to start an image making process [11]. The grid in ancient art is called as panjara or

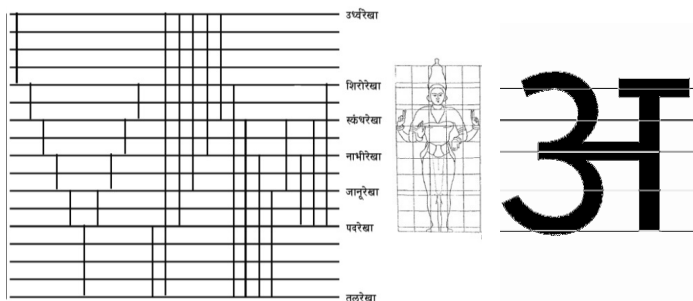
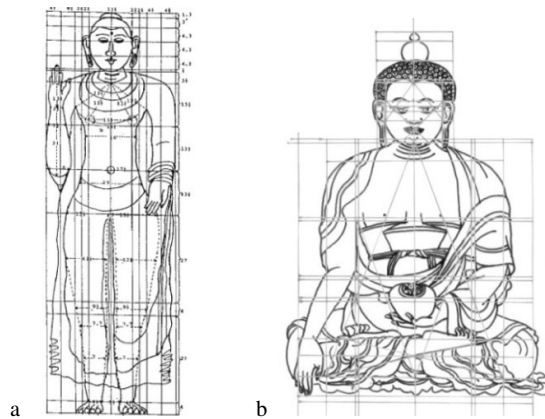


Figure 1. Grid in Devanagari type design with sample of deity image and a letterform.



**Figure 2.** Image making based on ritualistic grids (Source: a. Redrawn from *The theory of Chitrasutras in Indian painting* by Nardi, Isabella, b. Redrawn from a traditional Tanka image).

khila-panjara. The lines of the panjara guide the position and movement of the figures and can be compared to a skeleton in the body [8]. After finalising the outer cage of total body the markings are done on the vertical axis for head, feet and navel. Then further levels for shoulder, genitals and knees are marked according to the described proportions. Similarly widths of head, shoulder, chest, waist, hip and feet are measured and marked [12]. Thus a skeleton made up with horizontal and vertical lines is created as per the required proportions and finally the image is fleshed onto the skeletal frame as shown in Figure 2.

Alice Boner had discovered two types of grid evident in Indian art—one with rectangular compositional skeleton with vertical and horizontal lines and other with circular compositional skeleton with oblique lines [13]. We will consider here a basic form of radial grid—angular grid. Angular grid is a directional grid. The manner in which angular grid assists the image making is not through any kind of prescriptive proportions but by adding the directional guidelines to create the graphics. It channelizes the angular forces to achieve the aesthetic rhythm. Hence it is used mainly in narrative panels to show the interaction among the various forms. A conference paper, *Diagonal grid in graphic design* [14], had explained the difference between Cartesian grid and Angular grid in image making tradition. It also had discussed the advantages of Angular grid over Cartesian grid. Here we are extending the concept of angular grid to the typeface design.

#### 4. ANGULAR GRID FOR TYPE DESIGN

Angular grids used in narrative panels provide a structure to create images interacting with each other. This inspires the employment of an angular grid in the font design process to make coherent letterforms. Cartesian grid is more rigid and hence can be used for steady and static layouts. Angular grid gives more freedom to achieve fluid and dynamic layouts. It readily allows the interaction within the different elements of the visual. It is more useful to create flow or force in the homogeneous systems. Using angular grid for type design will help to achieve the consistency within the set letterforms.

There are many factors which help to bring the family resemblance among the different letterforms. The type of ending, serifs, stroke contrast, stress angle, etc. are the features defining the character whereas grid, shown in Figure 1, defines a form on the structural level. It is easier to bring the resemblance in the graphical group [15] of letterforms sharing common structural features. But, only Cartesian grid is not enough to bring the structural resemblance in the letterforms which belong to different graphical groups. Here we are proposing angular grid from image making to resolve this difficulty.

#### 4.1. Angular grid- a structural tool for type design

The purpose of this dialogue about the image making process in the context of type design is to check the possibility for the exchange of any tool, method or methodology across the two processes.

We are proposing the use of angular grid as a structural tool for type design. Radial grid decoded by Alice Boner in medieval sculptures is much complex and to reach up to an application of such level one need to go through small steps. The experiment proposed here is the first step towards it. Considering the possible results which a radial grid may give this experiment might look a primary one but it's very valuable to create the methodological foundation for any further experimentation. In this exploration, we are treating the letterforms as images in action interacting with each other, and not as static isolated forms.

#### 4.2. Proposed advantages of angular grid for type design

The basic need for using the angular grid in type design is already discussed above. For the authors, the curiosity for the outcome of this idea of 'making a font with angular grid' was a great push to carry out this trial. But keeping our subjectivity apart, following are the advantages we are foreseeing for the type design.

1. The font in a text will look more coherent and the navigation through the text line will become more streamlined
2. With one parent font by changing the angle of angular grid new set of fonts can be derived
3. It can provide a framework for a designer to design a font and create variations within a same font
4. The angular grid can act as a mediator to enhance the interaction among the text and images in the graphic layout
5. If technology permits the online variation in the font, based on the angular grid, the text can be made more humanistic with slight online angular variations
6. If the same grid is used for various scripts, it will give uniformity in multilingual texts
7. Each typeface based on different angular grid carries different expression/ emotion.
8. The typeface created with an angular grid will have advantage if the same angular grid is used in the page layout.

#### 4.3. New challenge- New opportunity

It is not simple or obvious to implement this angular grid in type design. It creates ambiguity which leads us to explore and exploit the possible ways of using it for our benefit. The traditional approach would require angular channels to be marked on the paper and the letterforms following the directional guidelines for the form creation. Digital technology on the other hand provides an interesting tool. The curves created by Bezier technology are defined by the coordinates and the angle of tangents to that point. Where coordinates can be controlled by Cartesian grid, tangents can be managed by the angular grid. It is similar to the space-time grids discussed by Alice Boner [13]. In a way, it is easy to adopt this tool with digital technology.

### 5. TYPE DESIGN IN THE DIGITAL AGE

Digital technology brought a paradigm shift to overall thinking of twenty first century. Typography and type design is affected and altered as per the new tools provided by digital technology. With the advance of computers printing process got the new edge. At the same time, completely new medium of display screens was evolved. There was a drastic difference in the resolution of the two mediums which leads to two separate set of fonts- printing fonts and on-screen fonts. There are different technologies which resulted in different types of fonts like bitmap, Open type, True type.

The experiment in digital typography which is of our interest is METAFONT, a system developed by Donald Knuth. Although he has been critiqued for his philosophical positioning [16], the basic

principle behind his work — ‘it is possible to give a mathematical definition of a letter’ [17], contributes to theoretical background of our experiment. What is proposed by METAFONT is the accurate digital reproduction of any existing font by mathematically defining its parameters. It can also offer to give variations in the font by changing the parameters or even combination of two fonts. Though we don’t agree to go that far, this provides us sufficient hints for a type design in which we are trying to introduce a parameter which can be controlled by mathematics.

Similar to Knuth, instead of describing the boundary of the character we design the spine of the letter which can be the curve travelled by the center of the pen [18]. The variations in the pen’s shape will produce variety of fonts from the same spine.

### 5.1. Active role of Bezier handles in type design

The traditional process of type design starts with drawing the letterforms on paper with the help of horizontal grid lines for indicating the levels. These drawings are then converted to digital vector format by scanning and tracing. Drawing a line with hand is a continuous process where as the vector graphic treats the lines as the discrete data with coordinate points and tangents at those points. The curvatures of the line get defined by the controlling handles of the Bezier curves. The programming applications developed by Donald Knuth demonstrated a new direction towards mathematical typography. It is a tool to render a font with a spine defined mathematically. We intend to add a constraint on the tangents in the mathematical equations which leads to the letterform.

## 6. TYPE DESIGN EXPERIMENT

We have created the foundation to support the intended experimentation in type design. While creating a letterform, the spine based approach is taken. Assuming that the essence of the letterform is in the spine and is enough for its existence, the spine is designed. With this spine a variety of fonts can be generated adding different variables to the flesh.

The type design experiment we are going to explain here is based on the controllers of Bezier curves. We are using the Bezier handles with angular grid to control the form of alphabets. All the Bezier controllers are aligned to the angular grid, if not to the standard Cartesian grid. The output is not a typeface but a spinal skeleton for the typeface. This skeleton can be developed fleshing out in different styles.

### 6.1. Propositions and Hypothesis

The proposition of this exploration — “It is possible to create a readable font with the restriction on the angles of tangents of the Bezier curves and such a font has a visual consistency and coherence.”

With this main proposition, if proven, there is a list of hypothesis which can be tested in the future work.

1. The spine made with this angular grid can be computerized and by varying the angles the system can create the new set of typeface.
2. The typeface created with an angular grid has an advantage if the layout using that typeface has the similar angular grid.
3. If the same grid is used for various scripts, it will give uniformity in multilingual texts and multicultural displays.
4. Each typeface based on different angular grid carries different expression/ emotion.

Restriction on the Bezier curves is not the necessary condition to create a readable typeface hence we have converted our basic proposition into a null hypothesis:

**“It is impossible to create a readable and coherent font with the restriction on the angles of tangents of the Bezier curves”**

## 6.2. Process of type design

The stepwise process followed for this experiment is given below.

Step 1: Drawing the letterforms of size equivalent to 14 points for visual reference.

Step 2: Preparing the grid in Adobe illustrator

Step 3: Drawing the letterform one by one, directly in Adobe illustrator

Step 4: Transferring the spine based letterforms to Fontlab Studio 5 with 1000 UPM size

Step 5: Uniform stroke thickness is added to each glyph

Step 6: Fine tuning and Kerning

## 6.3. Grid used

The basic grid: The space is marked first with two concentric circles with the difference of 20 points in their radii. This circular marking creates the enclosure and prepares the space to hold the form of a letter we are going to create. The primary grid used here is the basic traditional grid of *shirorekha*, *skandharekha*, *nabhirekha*, *janurekha* and *padarekha* which divides the central space in four horizontal parts. Each part is of 50 points thick (Ref. Fig. 3).

The angular grid: Another grid at an angle of 30–120 degrees is drawn over the basic grid. (Refer Figure 3) This is the secondary grid which contributes to the curvatures. The letterforms are drawn on this grid. Angles of Bezier tangents follow the angular grid if not the basic Cartesian grid. Each letterform has few key nodes based on the angular grid making the form of that letter dependent of the angular grid. Figure 4 illustrates the way Bezier controllers are aligned to angular grid for letter ‘ksh’.

## 6.4. Designed type face

The spine of the letterform was designed based on the grid and then it has given a uniform thickness (Figure 5). All required glyphs are made and put for testing. A document was created with running text with different point size from 6 to 14. It was given to 20 native speakers to read. It was observed that all can read it with normal reading speed without any confusion. A sample of running text with 9 point size, shown in Figure 5, shows that the output of our experiment is readable coherent font.

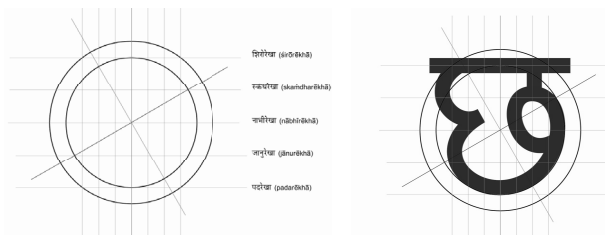


Figure 3. a. Basic grid + Angular grid used b. Letter “Ch” designed based on that grid.



Figure 4. Samples to demonstrate how angular grid is used to control the Bezier handles.

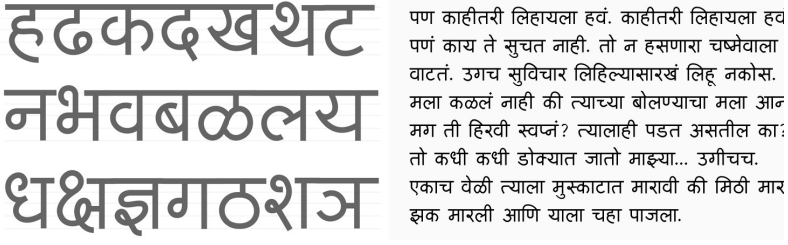


Figure 5. Designed font sample (left) and running text with 9 point size (right).

**Hence the null hypothesis is disproved.** The font can be fine tuned and subjected to the comparison with other fonts. For the future work we can further move to test the other propositions listed in 6.1.

## 7. CONCLUSIONS

Traditional Indian art and craft need to be re-examined for benefit of modern design. The context is drastically changed but still there are few hidden tools and techniques which can be helpful for a designer.

Trying to fit letterforms in Indian tradition in current technology creates many problems. It is required to explore and experiment with technology and craftsmanship to create a type design process suitable for Devanagari.

The experimental font created with the angular grid 30–120 is a readable font with uniform gray value. It can be further tested for readability and aesthetics and can be compared to other standard Devanagari fonts. The result we got here shows a lot of scope for further experimentation. This methodology points towards a new direction in type design process.

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