A review of legibility studies and its implication to Indic scripts

Subhajit Chandra
Research Scholar
Department of Design
Indian Institute of Technology Guwahati
c.subhajit@iitg.ernet.in

Dr. D. Udaya Kumar
Assistant Professor
Department of Design
Indian Institute of Technology Guwahati
d.udaya@iitg.ernet.in

TYPODAY 2015
7th-9th March, 2015 at IDC, IIT Bombay

Abstract:

The term 'Legibility' defines the quality of being clear enough to recognize a character. In the early twentieth century legibility research become popular with hand of vision and reading researchers. Among them M. A. Tinker and R. L. Pyke are the first researchers who established the term 'Legibility' avoiding another term known as 'Readability' which deals with the ease of reading text. Vision researcher Denis G. Pelli explains that the letter identification is a process of feature detection. This paper aims to discuss the various legibility issues to recognize a letterform and the design approaches.

Keywords:

Digital typeface, Indic typeface, Legibility, Typeface anatomy

Legibility:

*Legibility is the term used when discussing the **clarity of single character** (Tracy, 1986).*

*The **visual properties** of a character or symbol determining the **ease** with which it can be **recognized** (Zuffia et al., 2007).*

Parallel Letter Recognition (PLR) Model

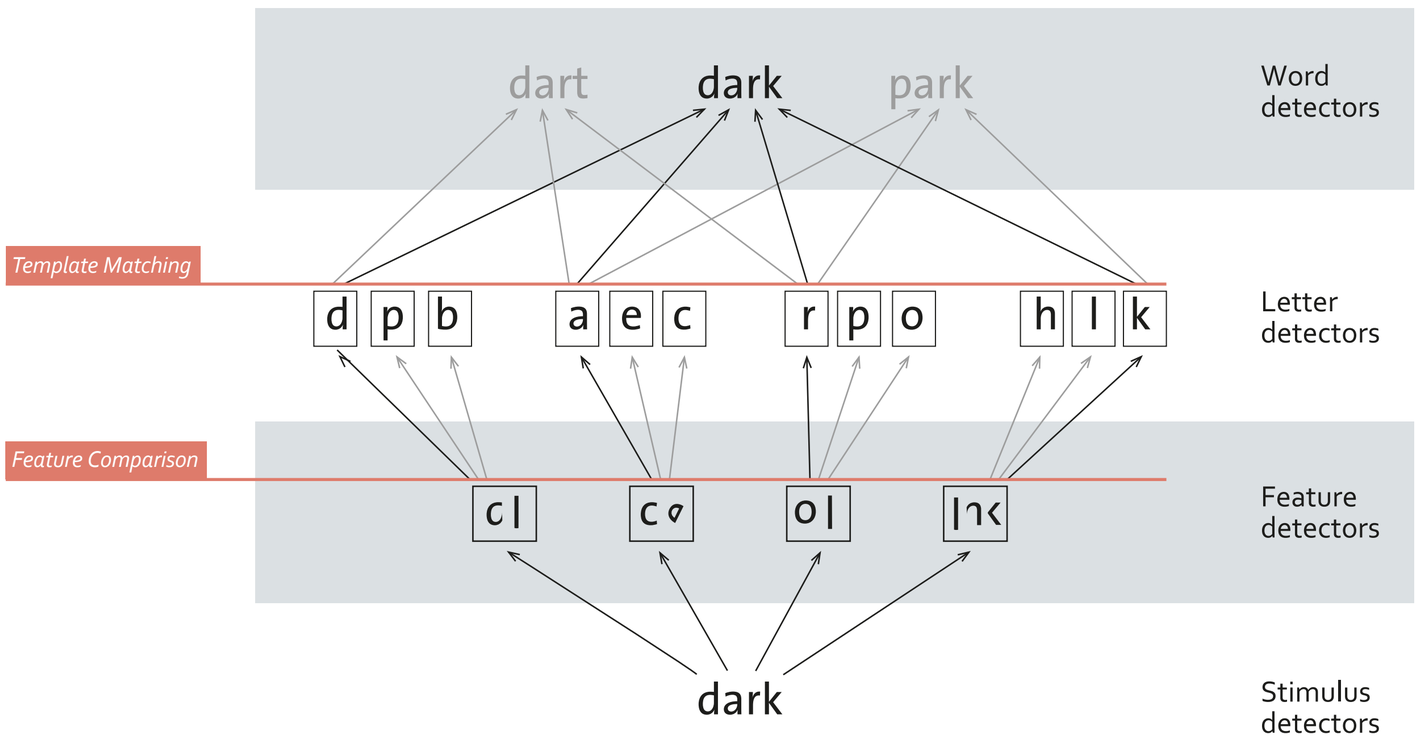


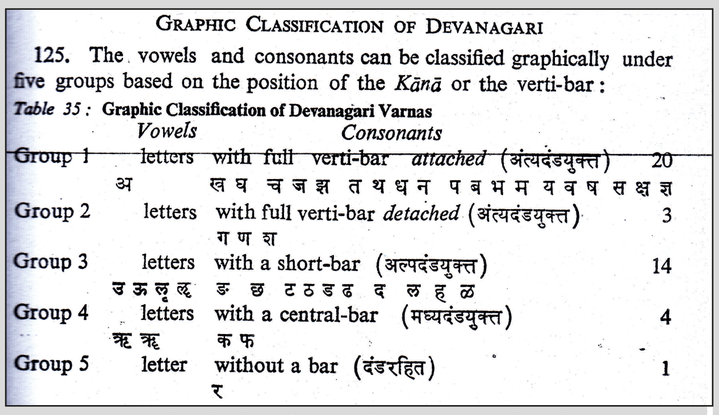
Figure 1: PLR Model (McClelland & Johnston, 1977; Rayner & Pollatsek, 1989)

This paper discusses about letter recognition and legibility issues. Therefore most accepted letter recognition model is considered during the study which is Parallel Letter Recognition (PLR) model (Fig. 1). This model explains the recognition process by using two theory, Feature Comparison and Template Matching theory. The legibility issues are pointed out and discussed based on PLR Model.

Legros & Grant (1916) measured the overlap between similar letter pairs within a typeface and between two typefaces (Fig. 2). They found that typefaces that had **more common area, have lower legibility than typefaces with less common area**.

Figure 2: Letterform comparison by Legros & Grant

B. S. Naik (1971) proposes different groups of letter according to the common graphical design element (Fig. 3). Design of the letterforms with such common letter-parts should be distinct enough to recognize individually.



GRAPHIC CLASSIFICATION OF DEVANAGARI

125. The vowels and consonants can be classified graphically under five groups based on the position of the *Kānā* or the verti-bar :

Table 35 : **Graphic Classification of Devanagari Varnas**

	Vowels	*Consonants*	
Group 1	letters	with full verti-bar *attached* (अंत्यदंडयुक्त)	20
	अ	ख घ च ज झ त थ ध न प ब भ म य व ष स क्ष ज्ञ	
Group 2	letters	with full verti-bar *detached* (अंत्यदंडयुक्त)	3
		ग ण श	
Group 3	letters	with a short-bar (अल्पदंडयुक्त)	14
	उ ऊ ऌ ॡ	ङ छ ट ठ ड ढ द ल ह ळ	
Group 4	letters	with a central-bar (मध्यदंडयुक्त)	4
	ऋ ॠ	क फ	
Group 5	letter	without a bar (दंडरहित)	1
		र	

Figure 3: Graphic Classification of Devanagari, B. S. Naik (1971)

Fiset et al. (2008) discovered that the **terminals** of the glyphs are the **most important** for letter **recognition**.

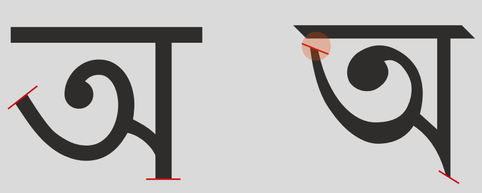


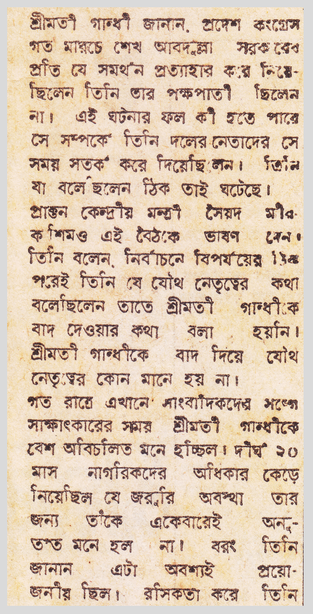
Figure 4: Latin and Indic typefaces with terminal variations

Most of all Indic typefaces have large numbers of terminals. A careful attention and fine tuning is needed to design such letterparts.

Crowding:

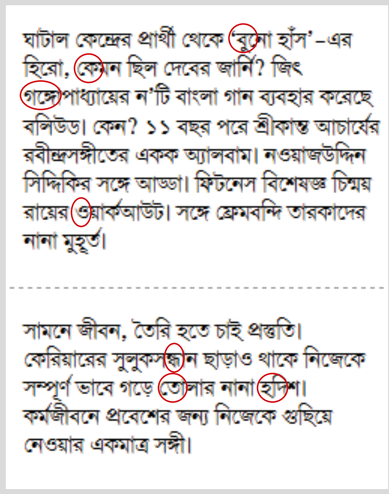
Crowding, also referred as **'contour interaction'**, where the viewer finds it difficult to identify a letter embedded in other letters or letter-part, due to the interference of each other, and in that way lowering recognition (Beier, 2009).

Excessive feature integration, inappropriate inclusion of extra features spoil recognition of the target object (Pelli et al., 2007).



শ্রীমতী গান্ধী জানান, প্রদেশ কংগ্রেস গত মারচে শেখ আবদুল্লা সরকারের প্রতি যে সমর্থন প্রত্যাহার করে নিয়েছিলেন তিনি তার পক্ষপাতী ছিলেন না। এই ঘটনার ফল কী হতে পারে সে সম্পর্কে তিনি দলের নেতাদের সে সময় সতর্ক করে দিয়েছিলেন। তিনি যা বলেছিলেন ঠিক তাই ঘটেছে।
প্রাক্তন কেন্দ্রীয় মন্ত্রী সৈয়দ মীর কাশিমও এই বৈঠকে ভাষণ দেন। তিনি বলেন, নির্বাচনে বিপর্যয়ের ঠিক পরেই তিনি যে যৌথ নেতৃত্বের কথা বলেছিলেন তাতে শ্রীমতী গান্ধীকে বাদ দেওয়ার কথা বলা হয়নি। শ্রীমতী গান্ধীকে বাদ দিয়ে যৌথ নেতৃত্বের কোন মানে হয় না।
গত রাত্রে এখানে সাংবাদিকদের সঙ্গে সাক্ষাৎকারের সময় শ্রীমতী গান্ধীকে বেশ অবিচলিত মনে হচ্ছিল। দীর্ঘ ২০ মাস নাগরিকদের অধিকার কেড়ে নিয়েছিল যে জরুরি অবস্থা তার জন্য তাঁকে একেবারেই অনুতপ্ত মনে হল না। বরং তিনি জানান এটা অবশ্যই প্রয়োজনীয় ছিল। রসিকতা করে তিনি

Figure 5: Old Bengali newspaper print



ঘাটাল কেন্দ্রের প্রার্থী থেকে 'বুনো হাঁস'-এর হিরো, কেমন ছিল দেবের জার্নি? জিৎ গঙ্গোপাধ্যায়ের ন'টি বাংলা গান ব্যবহার করেছে বলিউড। কেন? ১১ বছর পরে শ্রীকান্ত আচার্যের রবীন্দ্রসঙ্গীতের একক অ্যালবাম। নওয়াজউদ্দিন সিদ্দিকির সঙ্গে আড্ডা। ফিটনেস বিশেষজ্ঞ চিন্ময় রায়ের ওয়ার্কআউট। সঙ্গে ফ্রেমবন্দি তারকাদের নানা মুহূর্ত।

সামনে জীবন, তৈরি হতে চাই প্রস্তুতি। কেরিয়ারের সুলুকসন্ধান ছাড়াও থাকে নিজেকে সম্পূর্ণ ভাবে গড়ে তোলার নানা হদিশ। কর্মজীবনে প্রবেশের জন্য নিজেকে গুছিয়ে নেওয়ার একমাত্র সঙ্গী।

Figure 6: Screen display of Bengali typeface

Crowding (Fig. 5, 6) is one of the most common phenomena with Indic typefaces particularly for screen display. The possible reason may be the stroke density of the letterforms which is more than Latin typefaces, inappropriate hinting and other technical issues in fonts.

Conclusion:

Typefaces typically communicate in form of words and continuous text. There are negligible cases where typefaces come in the form of single letter. To solve the legibility issues, the design of a letterform is not only the concern but also the reading experiences and cognition processes.

The variables that affect legibility (in terms of cognition and reading) in Latin typefaces may or may not work for Indic typefaces. Letter design is one part of cognition and reading experiences. Further research is needed to explore such areas.

References:

1. Beier, S. (2009). Typeface Legibility: Towards defining familiarity. PhD Thesis, The Royal College of Art, London.

2. Fiset, D., Blais, C., Ethier-Majcher, C., Arguin, M., Bub, D., & Gosselin, F. (2008). Features for Identification of Uppercase and Lowercase Letters. Psychological Science, 19(11), 1167-1168.

3. Lergos, L. A., & Grant, J. C. (1916). Typographical printing-surface: The technology and mechanism of their production. London: Longmans, Green, and Co.

4. Naik, B. S. (1971). Typography of Devanagari (Vol. 1). Bombay: Directorate of Language.

5. Pelli, D. G., & Tillman, K. A. (2007). Parts, Wholes, and Context in Reading: A Triple Dissociation. PLoS ONE(8). Retrieved july 24, 2014, from http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0000680

6. Pelli, D. G., Burns, C. W., Farell, B., & Moore-Page, D. C. (2006). Feature detection and letter identification. Vision Research, 46(28), 4646-4674.

7. Pelli, D. G., Majaj, N. J., Raizman, N., Christian, C. J., Edward, K., & Palomares, M. C. (2006). Grouping in object recognition: The role of a Gestalt law in letter identification. Cognitive Neuropsychology, 26(1), 36-49.

8. Ross, F. G. (2009). The Printed Bengali Character and its Evolution (2nd ed.). Kolkata: Shishu Sahitya Samsad Pvt. Ltd.

9. Zuffi, S., Brambilla, C., Beretta, G., & Scala, P. (2007). Human Computer Interaction: Legibility and Contrast. Proc. 14th International Conference on Image Analysis and Processing (ICIAP). Retrieved from http://cs.brown.edu/~zuffi/Site/Welcome.html