Beyond Roman fonts: Extra dimensions in Malayalam fonts

Rajeesh & Aravind

July 25, 2020

Malayalam script & Rachana

Malayalam, the mother tongue of 45 million people of Kerala, southern most state in India is one of the 22 official languages of India. It is 1600 years old Dravidian language and its script is classified as Abugida, or alphasyllabary.

Unicode chart for Malayalam

https://www.unicode.org/charts/PDF/U0D00.pdf

Old vs. New script

'New lipi' (alphabet) of Malayalam that appeared in 1970's and later popularized in DTP with 140 characters is a subset of the original script with 900 conjuncts standardised by Benjamin Bailey in 1824. New lipi could easily be accommodated in fonts with Roman dimensions.

Rachana

When the language campaign named 'Rachana' began in 1999 strongly advocating traditional script in Malayalam computing the orthography demanded more space below baseline for vertical conjuncts. Particularly after the advent of Unicode Malayalam in 2004, the traditional script (Original Script), popularly known as 'Old Script' is becoming more and more used in web publishing and printing. Designing of fonts of original script satisfying dimensions of Roman fonts exerts loads of pressure on the part of designers.

Rachana font

Here in this discussion Original Script (Old Lipi) is considered, since it is the super set of all other variations of New Lipi that exist in various fonts used for word-processing and desktop publishing (DTP).

Original script consists of 51 basic characters which combine to form more than 900 conjuncts (ligatures).

Rachana Font first designed in 1999 for the campaign for traditional script underwent major modifications in 2000 and especially in 2006 when the font became Unicode compliant and distributed with GNU-GPL.

കഃ ഇഃ കൃ കൄ കൢ ക്ക ക്കഃ ക്കൢ ക്കു ക്കൂ ക്കൃ ക്കൄ കൂ കൄ കൂൃ കൃൄ കൄ

കൄൂ കൺ ക്ണ ക്ണൃ ക്ത ത്ത ത്തൃ ത്തൢ ക്തു ക്തൂ ക്തൃ ക്തൂ ക്തൃൂ ക്ൻ ക്ൻ

ക്ക ക്ക ക്കൄ ക്കൄ ക്ര ക്രു ക്രൂ ക്ല ക്ലൂ ക്ല ക്ഷ ക്ഷു ക്ഷൂ ക്ഷൃ ക്ഷ്ണ ക്ഷ്ണ

ക്ഷ്ണ ക്ഷ്മ ക്ഷ്മു ക്ഷ്മൂ ക്ഷ്മൃ ക്സ ക്സു ക്സൂ ക്സൃ ക്ക ക്കു ക്കൂ ഖു ഖൃ ഖൄ ഇ ഈ ഗ

ഗു ഗൂ ഗൃ ഗൄ ഗൢ ഗല ഗലു ഗലൂ ഗലൃ ദ ദു ദൂ ദൃ ശ ശു ശൂ ശൃ

ശൄ ശ്ര ശ്രു ശ്രൂ ശ്രൃ ഗ്ന ഗൗ ഗൂ ഗൗ ഗൗ ഗൗ ഗൗ ഗൗ ഗൗ ഗൗ ഗൗ ഗൗ ഗൗ

ഘൄ ഘൄ ഘൄ ഘൄ ഘൄ ഘൄ ഘൄ ഫ്ല ഫ്ലു ഫ്ലൂ ങ്ട ങ്ടു ങ്ക ങ്കു ങ്ഠ ങ്ഠു

ങ്ങ ങ്ങു ങ്ങൂ ച്ച ച്ചു ച്ചൂ ച്ചൃ ച്ചൄ ച്ച ച്ച ച്ച ച്ച ച്ച ച്ച ച്ച ആൄ ആൄ ആൃ

ആൃ ആൄ ആൄ ഇ ഇൄ ഇൄ ഇൄ ഇൄ ഇൄ ഇൄ ഇൄ ഇൄ ഇൄ ഇൾ

ണ്ഡണ്ഡുണ്ഡൂണ്ഡ്രണ്ഡ്രുണ്ഡ്രൂണ്ഢണ്ഢുണ്ഢൂ

ണ്ഝണ്ണണ്ണുണ്ണൂണമണുണ്മൂതളളുളൂത്തത്തുത്തൂ

ത്രത്രുത്രൂത്രൂത്രൂഥഥുഥൂഥൃഥൄതനതഃഇഃഉഃഉഃ

ഭ്ദത്മത്മുത്മൂത്മ്മത്രുത്രൂത്തുത്തൂത്തൂസസുസൂസൃ

സൄസഥസഥുസഥൂസഥൄസ്സസ്സുസ്സൂസ്മസ്മുസ്മൂ

സ്രസ്രുസ്രൂസ്രൃഗിഗിഗിഗിഗിഗിഗിഗിഗിഗ്നദ്ദദ്ദുദ്ദൂദ്ദൃദ്ദൄ

ദ്ദഗദ്ധദ്ധുദ്ധൂദ്ധൃദ്ധൄദ്ധ്നദ്ധ്നദ്ധ്മദ്ധ്മുദ്ധ്മൂദ്ദ്രദ്ദ്രുദ്ദ്രൂദ്ദഗ

ദ്ദ്രുയ്ധ്യൂയ്ധൂയ്ധുയ്ധൂയ്ധൂയ്ധ്നധ്യധ്യുധ്യൂനന്ആന്റന്റ്ന്ത

ന്ത്ന്ത്ആന്ത്നൂന്ത്ര്ന്ത്ര്ന്ത്ര്നഥനഥുനഥൂനഥൃനഥൄന്ദന്ദുന്ദൂ

ഹ്മഫ്മഫ്മഫ്മഹ്ലഫ്ലഹ്ലസസ്സഹ്ലഫ്ലറ്ററ്ററ്റബ്യബ്യ

ബ്ഗബ്ഗബ്ഗബ്ഗബ്ജബ്ജബ്ജബ്ജബ്ദബ്ദബ്ദബ്ദബ്ധബ്ധ

ബ്ഥബ്നബ്നബ്നബ്ബബ്ബബ്ബബ്ഭബ്രബ്രബ്രബ്ലബ്ലബ്ലഭ

ഭഭഭഭഭഭമുമ്മമ്മമ്മന്നന്നന്നമ്പന്യന്യന്യന്ത്രന്ത്രന്ത്രമ്മ

മ്മമ്മമ്മമമമമമ്മല്ലല്ലല്ലയ്യയ്യയ്യക്കക്കക്കക്കക്കക്കക്കക്കച്ചയ്യ

യ്യയ്യയ്യയ്യയ്യത്തത്തത്തത്തയ്യയ്യയ്യയ്യയ്യമമമമമ

യ്യയ്യയ്യരഉരുരൂല്ൽല്ൽല്ൽല്ൽല്ൽല്ൽല്ൽല്ൽല്ൽല്ൽല്ൽല്ൽ

ല്ൽല്ൽത്തഉഉള്ളള്ളപ്പപ്പപ്പപ്പപ്പപ്പഫ്ഫഫ്ഫഫ്ഫബബബ്ബമ

ല്ൽല്ൽല്ൽല്ൽല്ൽവ്വവ്വവ്വവവ്വവ്വവ്ലവ്ലവ്ലവവ്വവ്വഇഊഊ

ക്ക ക്ക ഖ ഖ ഗ്ഗ ട ട്ട ട്ട ട ട്ട ട്ട ത ത്ത ത്ത ത്ത ത്ത

ത്ത ത്ത ത്ത ഥ ദ്ദ ധ ധ ധ ന്ന ന്ന ന്ന പ്പ പ്പ പ്പ പ്പ

പ്പ പ്പ പ്പ ഫ ഫ ഫ മ മ്മ മ്മ മ്മ ര്ര ര്ര ര്ര ല്ല ല്ല

ല്ല ല ല്ല ല്ല ല്ല ല്ല ല്ല റ്റ റ്റ റ്റ റ്റ റ്റ ഹ ഹ

എ ഹന ഹന ഹന ഫമ ഹമ ഹമ ഹമ ഹ്ര ഹ്ര ഹ്ര ഹ്ല ഹ്ല ഹ്ല ള്ള

ള്ള ള ള ള്ള ള്ള ള്ള ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ

ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ ഴ റ റ റ റ റ

Now, after a long period of 15 years all 1000 plus glyphs in Rachana are totally redesigned taking more graphical liberties with less constraints exerted by Roman typography.

The paper explores new possibilities in Malayalam typography in the light of possible distancing away from Roman typography.

Conjuncts

Ligatures/Conjuncts

These considerations (i.e., moving away from Roman) are surfaced mainly related to Conjuncts (Ligature) in Malayalam which amounts to nearly 20 times basic characters.

Similar to Roman types Malayalam also have Ligatures, known as Conjuncts. They are formed combining basic characters

Aside from Roman fonts there exist two kinds of ligatures: Horizontal and Vertical conjuncts.

Ligatures/Conjuncts

$$a + e \rightarrow \text{æ}$$

Conjuncts: Horizontal and Vertical

Conjuncts in Malayalam are formed in two ways —horizontal and vertical. For example, Basic characters ഥ (tha) and സ (sa) combine horizontally to form ഥസ (thsa) i.e., ഥ + സ → ഥസ, where as സ and ഥ combine vertically, സ + ഥ → സ്ഥ (stha).

Horizontal

$$ഥ + സ → ഥസ$$

$$സ + ഥ → സ്ഥ$$

Vertical

Below base Characters

AChar and BChar

There are two parts in vertical conjuncts —Above Character
(AChar) and Below Character (BChar). AChar is placed above
base line filling x-height. BChars are always small in size w.r.t.
AChars in handwriting, calligraphy and printing.

Geometry of BChar
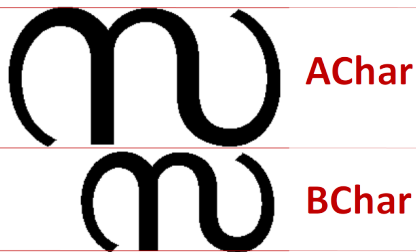
Below-base and BChar

Parts of glyphs in below base occur both in Roman and Malayalam glyphs. Basic characters in Malayalam (adopted to Malayalam Unicode Chart) are well fitted in above and below Spaces normally allocated in Roman types.

Roman Above-Below Spaces

Ascent

Ascent.

Cap height.

x-height

Base

Descent
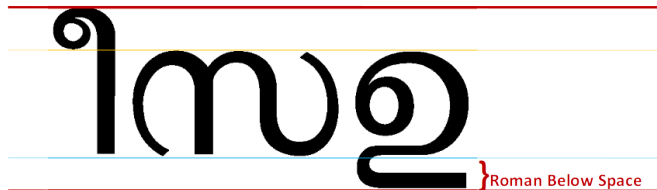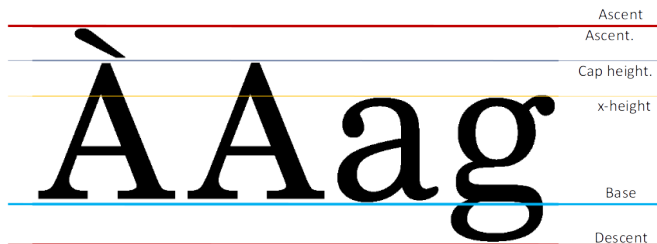
Roman Below Space

Roman Below Space

Objective of the Paper

When it comes to Vertical conjuncts in Malayalam adaptations to below base space in Roman types poses serious inconveniences.

Main objective of the paper is to show the peculiar property of vertical conjuncts in Malayalam which is in perpetual collision with the Roman Below base and how this is circumvented in the typography of Rachana based on traditional script.

Bchar Out of Boundary
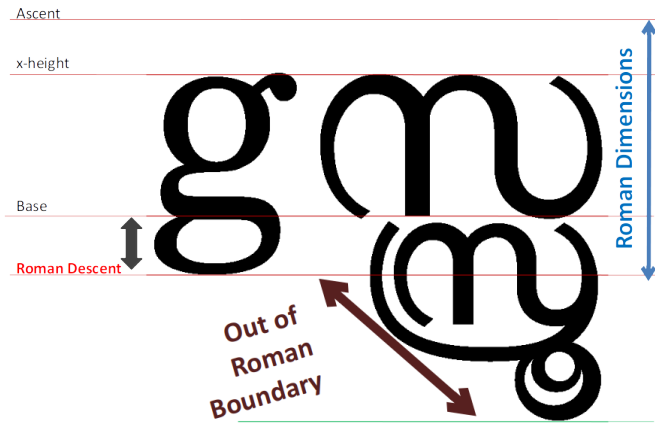
Levels

Levels in Below-base

Owing to consonant-vowel pairing, BChars have got 18 different heights that constitutes different levels unheard in Roman fonts.

Below-base Levels 1–3

Ascent

x-height

Base

ᾱ ᾱ ᾱ ᾱ

1 **2** **3**

Descent

Below-base Levels 4 & 5

Ascent

x-height

Base

4

5
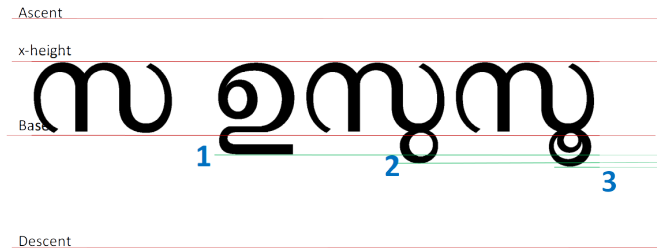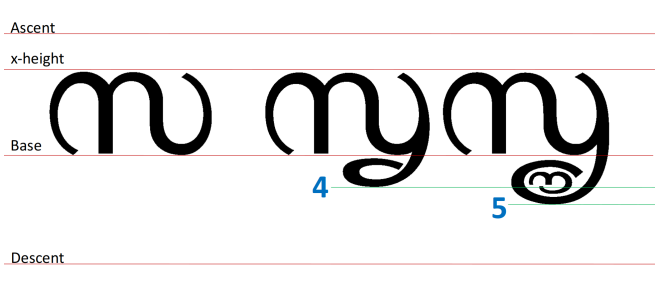
Descent

Below-base Levels 6–8

Below-base Level 9

Ascent

x-height

Base

9

Descent

Below-base Levels 10–12
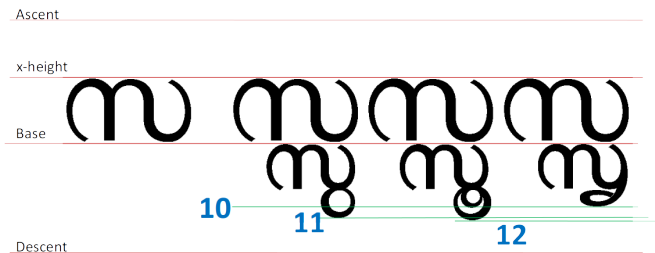
Below-base Levels 13–15
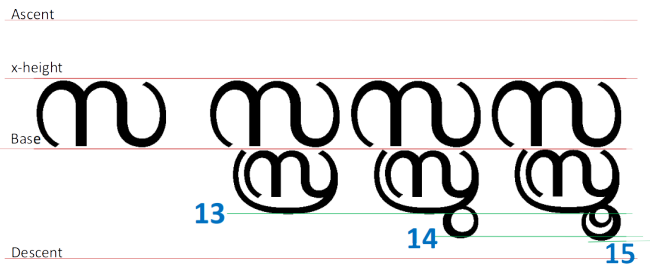
Below-base Levels 16–18
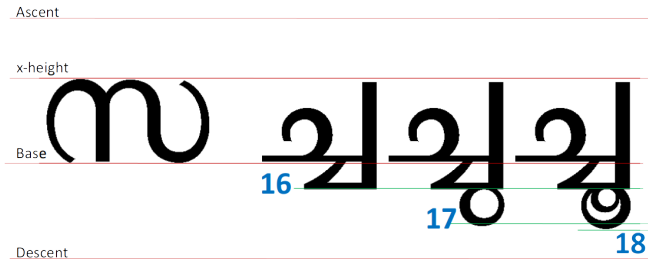
Treating BChar Levels

The height in between baseline and descent allotted for normal Roman fonts becomes too little for accommodating BChars in vertical conjuncts. Often Malayalam fonts demand more height below than in above. Below base space can not be compensated by taking from the above space since some vowel signs take cap-height.

i.e., Space above base is similar and equal as in Roman font but space below base is hopelessly in-sufficient which needs unusual treatments to handle with.
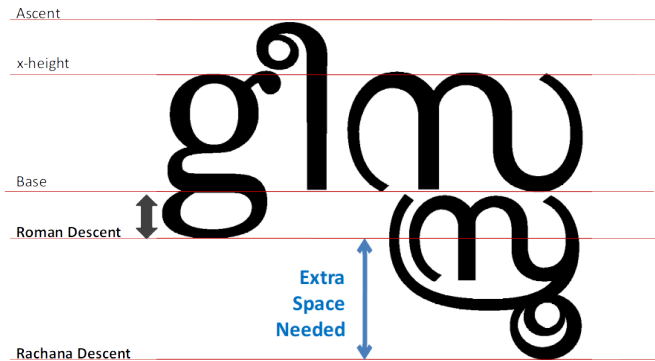
One of the solutions to accommodate BChars in Roman-Below is squeeze all levels in to a single level. This is possible graphically but will produce distorted characters totally unacceptable to Malayalam aesthetics. In fact it will be unacceptable to typography of any script in the world.

Varying vs. Constant levels

Bchar with varying levels (Applied in Rachana)
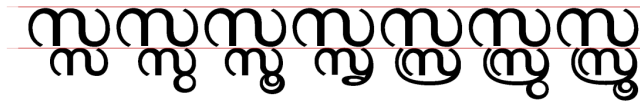
Bchar with mono level (Distorted conjuncts; Not acceptable to Malayalam aesthetics)

Equalising similar heights

Compressing all levels into a single one obviously distorts the shape of around 700 vertical conjuncts. Reducing the number of levels was achieved by another method.

In earlier Rachana font versions, attempts were made to reduce the number of levels by equalling near-heights. This resulted in reducing 18 levels to 6. By this it was hoped to attain an even below-base form of characters in text. It might be a way also to contain the unusual leading caused by vertical conjuncts.

Equalising levels 1, 4 and 6

Equalising levels 7, 8 and 9
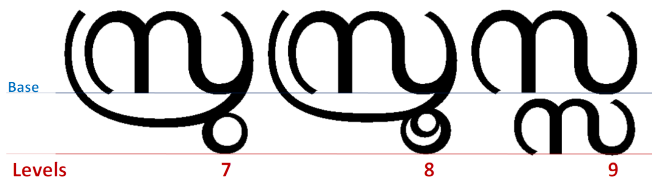
Equalising levels 10 and 13

Base

Levels   10   13
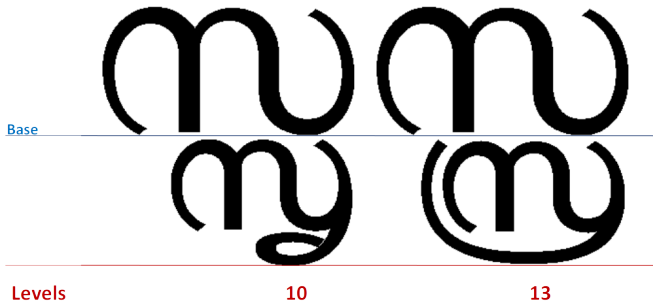
Equalising levels 11, 12, 14 and 15
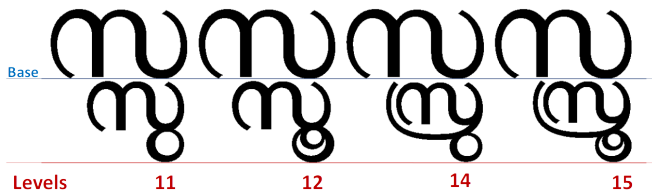
Deviations

Typographic Deviations of BChar

Though vertical conjuncts have got two parts, above and below, they are integral parts of a single character. Naturally one may expect the same typographic characteristics in both parts, but in reality they differ (actually made to differ). Practically it is found impossible to keep the same types in above and below. These differences result in violations of basic rules of typography.

Let us consider creating the vertical conjunct ന്ന using the same character ന in above and below.
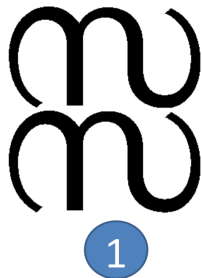
When the same AChar is placed below, the conjunct produced is unbelievably disproportional. The same type with the same size produces visually oversized BChar. BChar should be invariably small in Malayalam orthography.

A 60% uniformly scaled Bcahr strictly adheres to the typography, but produces an unbalanced shape.

3

A more balanced shape is achieved with non-uniform scaling. Let BChar is made with horizontally 70% and vertically 60% scaling. It produces a more pleasing effect compared to uniform scaling, at the same time not increasing the vertical size. This proportion is applied in Rachana to keep the height of the below part as minimum as possible, but a wider BChar to achieve legibility at lower point size (10 pt. or 11 pt.) while typesetting.
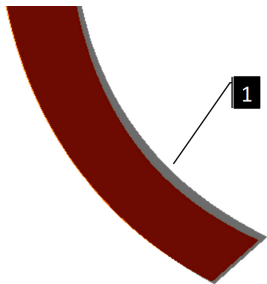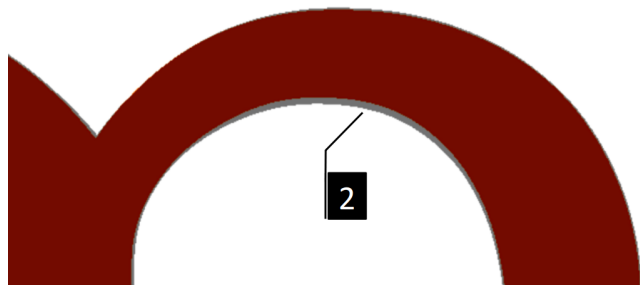
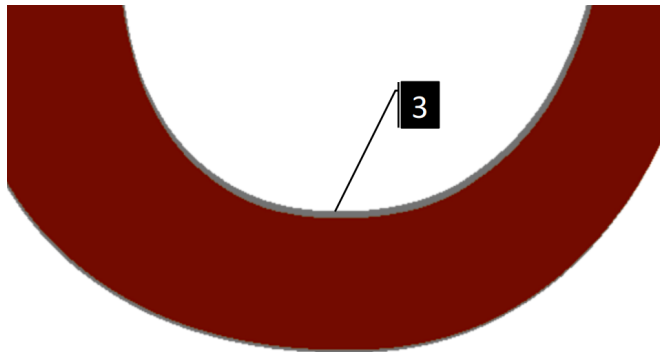**Obviously, non-uniform scaling produces a different type.**
This can be noticed by superimposing the same sized AChar and BChar.
In the next figure, the curve of BChar (gray in colour) often deviates from AChar (red). This is a clear instance of typographic deviation.

2
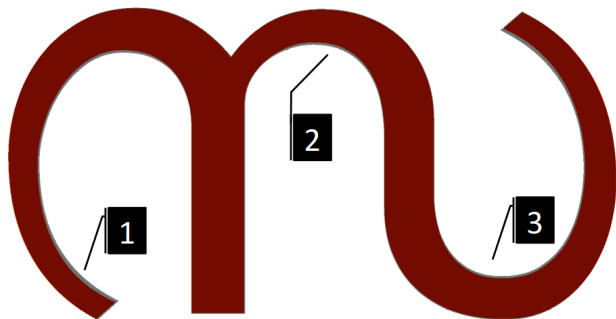
This kind of typography with two kinds of types in the same shape is improbable in Roman types. But Rachana takes liberty to deviate from accepted norms.
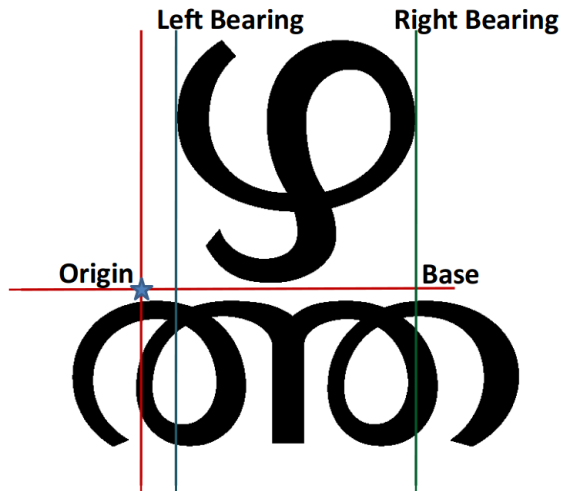
Extreme cases

Some vertical conjuncts are shaped deviating more from the usual 70%–60% proportion.

�ഴ + ഩ്ഩ → ഴഩ്ഩ

If 70%–60% scaling is applied BChar extends extremely beyond Left bearing and Right bearing resulting in collision with neighbour characters. If kerning is adjusted to avoid this, white space left and right to AChar produce 'Space effect'.

Only solution to these extreme cases is to apply a different proportion to BChar. In Rachana 45%–50% scaling instead of usual 70%–60% is used in designing these types of vertical Conjuncts. It preserves normal character space.

This kind of elasticity breaking all standard rules is perhaps not seen in typography of other Indic scripts.
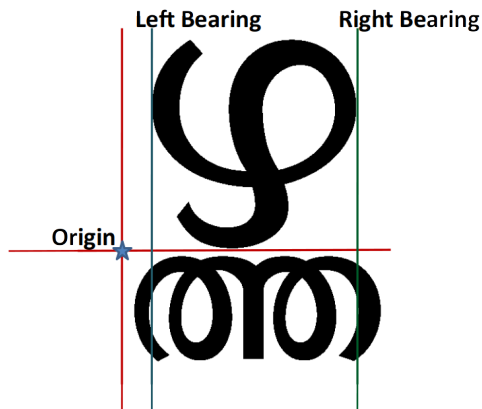
Collision with previous/next characters

Larger interspace between
characters created by kerning

തൃപ്പൂഴിക്ഷേത്രം

Normal character space, but with an abnormal reduction of BChar

തൃപ്പൂഴ്ഴളിക്ഷേത്രം

All these show that Malayalam fonts can not be designed accepting the dimensional calculations of Roman typography. This is more or less the case with all other Indic scripts due to the abundance of conjuncts. Malayalam poses extreme cases of divergence while dealing with vertical conjuncts.

Applying different proportions to different conjunct formations in the same font is in no way in conformity with principles of typography formulated for Roman types.

The complexity here is comparable to typesetting mathematics in Latin.

Monotype 4-line system for typesetting mathematics. Source: Daniel Rhatigan.
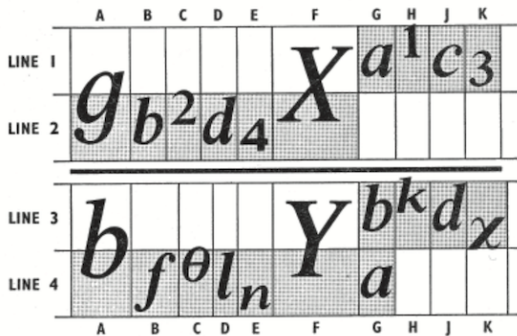
Conclusions

To keep the 'leading' (line space) as minimum as possible also puts constraints on Malayalam font designers due to many levels of BChars. Holding a fixed proportion in BChar also hurts leading. Adjustments in proportion can often be expected in BChars. This results in different calculations for Ascent-Descent and point size estimates applied in Roman fonts. Malayalam font makers are often forced to explore and apply different computation. Other Indic scripts with moderate below-base characters/ diacritical marks are lucky in this aspect. Deviating from Roman calculations poses problems while typesetting documents using Malayalam and English fonts together.

Vertical conjuncts in Malayalam are unique compared to Roman scripts and other indic scripts. Designing vertical conjuncts results in many deviations from the principles of Roman typography.

Even within a font, difficult situations arise when following a single rule for all conjuncts.

Rachana in earlier versions attempted to group and equalize many below base levels but later promoted natural proportions in shapes instead of 'forced' proportions.

Vertical conjuncts in Malayalam affect different settings in 'Leading' and 'Point Size' in contrast with Roman calculations.

For all intents and purposes Malayalam typography deviates from dimensions and geometry of Roman Typography.

It seeks different aesthetics and composition that can only be achieved by embarking a mindset beyond Roman typography.