Grid: Exploration of Sinhala Display Font

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Abstract: Grids play a crucial role in shaping the creation and analysis of letters. This study provides a brief overview of the usage of grids within the Latin script, highlighting their continuous utilization and adaptability in typography. The ongoing interplay between grids and typography has significantly contributed to the development of fundamental knowledge in Latin typography. This exploration also holds promise for less-discussed scripts from the global South, such as Sinhala. In this study, we delve into the role of grids in experimenting with letters, typefaces, and fonts, with a specific focus on applying a grid to the Sinhala font 'FM Gemunu'. 'FM Gemunu' serves as a widely-used display font in the context of Sri Lanka. Our methodology involved placing 'FM Gemunu' on the five reference lines traditionally used within Sinhala type anatomy. We then compared the font with the ideal Sinhala characters, which possess distinct anatomical features specific to each Sinhala letter. This comparison provided valuable insights for maintaining the base character features and height, which informed the development of the grid for 'FM Gemunu.' This research not only includes the creation of a grid to explore the letters but also highlights the distinctive features of this font, paving the way for further exploration and development. In conclusion, this paper suggests that such explorations hold great potential for scripts in the global South, representing an advancement and valuable contribution to the field of typography.

Keywords: Grid, Sinhala Script, FM Gemunu, Geometric, Sinhala typography

1. Background and Context

Typography, which predates the Industrial Revolution by centuries, has always fascinated people with its beautiful arrangement of letters. The existence of letters has evolved with time and with the development of the discipline of typography, and to date, many have tried to analyze letters, calligraphic forms, typefaces, and fonts. To do so, the constant use of grids is found within Latin typography research. This study starts with a discussion on the use of grids within the early stages of Latin typography, from Geoffroy Tory's pioneering efforts to revolutionize Roman type to the Bauhaus era and modern-day applications of typeface design. In 1529, Tory's book 'Champ Fleury' emphasized the significance of Roman types in comparison to the predated Gothic typefaces. For this purpose and to demonstrate the pleasing aesthetics of Roman typeface, Tory used a grid and emphasized the significance of geometry. The grid provided the visual precision needed to achieve harmonious letterforms (Smedresman, 2016). Nearly a century and a half later, in 1695, Louis Simoneau made a significant contribution to the exploration of grids in type design with the creation of the Romain du Roi typeface. Through the use of a grid, Simoneau demonstrated the immense potential for achieving various stylistic variations of the typeface. The grid system enabled the manipulation of the letterforms (Figure 1), resulting in the creation of a captivating "penche" (italic) version of the Romain du Roi typeface (Brownie, 2014). This remarkable development showcased the versatility and transformative power of grids in shaping the aesthetics and expressive range of typefaces.
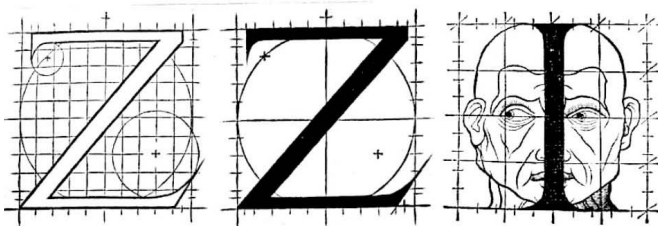
Geoffroy Tory Letter Z on Grid and Letter I on Figure on Human Face
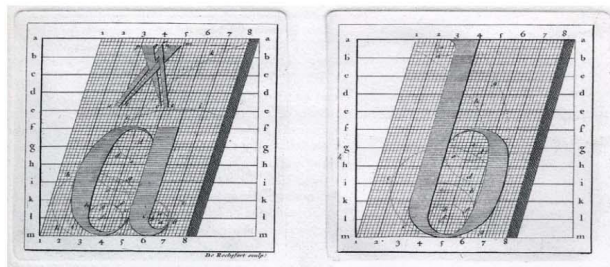
Louise Simoneau, description plataes of the Romain dun Roi,1695
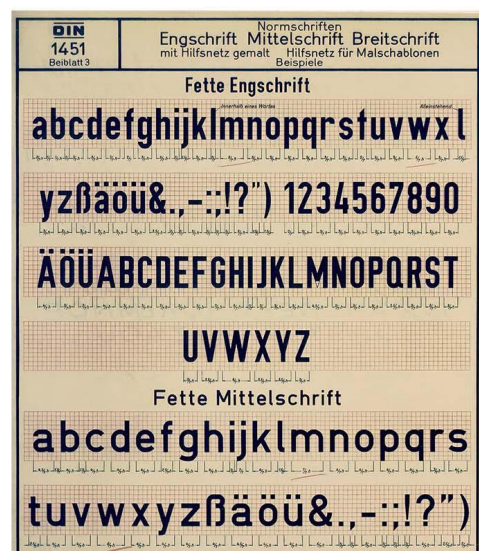
Ludwig Goller, templates for the Engschrift, Mittelschrift and Breitschrift versions of the DIN 1451 alphabet. Deutsche Institut für Normung, 1931

Figure 1 - Typography experiments using grids

By the 20th century, Troy's concept of the use of the grid was further manipulated by the Bauhaus movement. In the early 20th century, the Bauhaus alphabet, also known as "Bauhaus typography" or "Bauhaus typeface," was considered a revolutionary development in the fields of graphic design and typography. It embraced a minimalist and geometric approach (Huot-Marchand, 2020). Key features of the Bauhaus typeface include the use of a grid that portrays clean lines, sharp angles, and a reduction of letter features to their essential geometric shapes. As a result, the characters comprised often based on simple geometric shapes such as circles, squares, and triangles. Indeed, the role of a grid to demonstrate this typeface is significant. Taking a similar approach, the 'DIN 1451' typeface was developed in 1931. DIN stands for "Deutsches Institut für Normung" (German Institute for Standardization). The typeface was initially designed for technical and administrative use in Germany to standardize signage and lettering for transportation, engineering, and other official purposes (Huot-Marchand, 2020). This geometric and straightforward design was also constructed and communicated with the use of a grid. It is this grid and its ratio that confirmed the required spaces to maintain the legibility and clarity that suit a wide range of applications, especially for road signs.

The application of a grid brings clarity, and it is used to analyze letterforms and, in some cases, as DIN to build standards. Similarly, in today's context, design and typography educational institutes such as the University of Reading, the Royal Danish Academy, and the Royal Academy of Art in the Hague underline the importance of the use of grids. The work of Riccardo Olocco and Michele Patanè of the University of Reading uses grids to analyze old typefaces and revive them. In their book 'Designing Type Revivals', they demonstrate how grids are essential in typography by developing a grid and visualizing the old typefaces on it. Here, the application of a grid helps them analyze and rebuild the letters with great attention to detail, especially to maintain the height and thickness of vertical lines (Leonidas, 2022). The work of Hurka *et al* from the Hague in their type revival project uses vertical grid lines and developed the grid to analyze letters and then to explain their work. The application of grids and grid lines speaks to us about how grids support many discussions within the field of typography. The significance of grids in type design has evolved with the field of study and embraced grid systems as a foundation for typography and typeface design. Ellen Lupton's contributions to typographical education serve as a testament to the power of experimentation. In her book "Thinking with Type," Ellen Lupton discusses the fascinating realm of bitmap typefaces and their connection to pixel grids in designing letters for digital display. Bitmap typefaces are created using a grid of pixels, where each pixel represents a specific unit of the letterform. Lupton explores how pixel grids play a crucial role in

determining the shape, size, and overall appearance of the letters within digital media (Lupton, 2014).

In the digital age, pixels form the building blocks of typography on screens. Pixels operate within a grid or module system, which provides the structure for displaying typefaces digitally. The grid's inherent orderliness and precise arrangement assist designers in creating visually pleasing and legible digital typefaces. The utilization of grids in typography is a longstanding practice dating back to the inception of typography as a design discipline. Over time, the use of grids has developed in harmony with the advancements of this creative domain. However, it is apparent that the scholarly literature pertaining to grids and typography predominantly focuses on the Latin script, with scarce attention given to other scripts, particularly Indic scripts. This disparity in scholarly attention poses a significant gap in comprehending the broader implications and possibilities of grid-based typography across various writing systems. As a result, this research takes an exploratory approach and employs a single case analysis method to study a less-discussed script, Sinhala, contributing to the field of typography.

2. Case study: FM Gemunu as the Sample Typeface

The typeface being examined here is 'FM Gemunu', a monolinear display typeface designed and developed by renowned Sri Lankan type designer, Mr. Pushpananda Ekanayaka, in 1998. Mr. Ekanayake launched this font under his company 'The FontMaster' and packaged it with his pioneering first set of font-collection 'Isiwara' (*Isiwara - Sinhala Font Master*, n.d.). This font, with its square-shaped design, allows for more letters in a smaller space and visually appears both perpendicular and curved. Even though this was not well received when it was launched due to its unfamiliar shape, today FM Gemunu has become a staple in the world of Sinhala type, more specifically as a display type used widely in digital and print (Goonetilleke, n.d.).

FM Gemunu is a versatile and highly legible display typeface designed specifically for various design applications. It serves as an excellent choice for name boards of hardware shops, banners, and newspaper titles. Another well-observed fact is that both main political parties in Sri Lanka use this font (Egodawatta, 2015). Its visual appeal, readability across different contexts, and clean and balanced design make it a meticulously crafted display typeface. Therefore, this research utilizes FM Gemunu due to its reputation as a well-designed and popular display font, as well as its perpendicular, geometric nature, which seamlessly aligns with a grid consisting of horizontal and vertical lines.

ඔයෑ_මසජන ඉරදෑබ දෙං වමපව දඩෑර
ඔයෑ_මසජන ඉරදෑබ දෙං වමපව
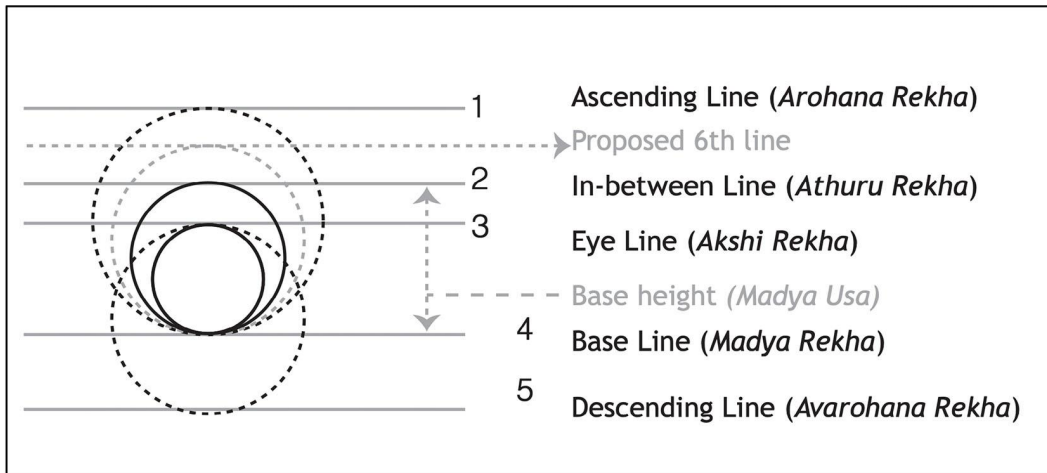
FM Gemunu typeface

Example of FM Gemunu in use

Figure 2 – FM Gemunu typeface and it is in use

2.1. Sinhala Type Anatomy and Distinct Features

After identifying the sample typeface, the research delves into the anatomy of the Sinhala type and its unique characteristics. Sinhala, an intricate script primarily used for writing the Sinhala language and prevalent in Sri Lanka, shares features with South Indian scripts. The script is based on a horizontal baseline and includes very distinct base shapes, as well as ascending and descending strokes. These foundational characteristics distinguish the Sinhala script from others. Typographic research on Sinhala utilizes five reference lines, including the ascending line, intermediate line (in-between line), eye line, baseline, and descending line (Samarawickrama, 2016).

Sinhala letters, like those in any script, consist of various anatomical components that influence their visual variations and pronunciation. The anatomy of Sinhala letters includes elements such as eyes, joints, intersections, strokes, and unique visual features like hooks, humps, and more. Each of these anatomical components plays a significant role in shaping the letters and determining their pronunciation. Even minor variations in these features can lead to significant changes in how the letter is pronounced and sounds. For instance, two visually similar letters shown on the bottom right side of Figure 3 are the letter 'ඔ' (O), which features a curve-to-curve joint, while the second letter 'ඹ' (mBa) includes a hump. This subtle difference has a pronounced impact on the pronunciation and auditory representation of these letters. The diverse array of anatomical variations in Sinhala letters contributes to their visual distinctiveness and the unique sounds they produce, forming the basis of Sinhala type anatomy. With this understanding, the research examines the distinct visual features defined

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by Samarawickrama (2016), in conjunction with the features of FM Gemunu for each Sinhala letter.

Ascending Line (*Arohana Rekha*)
Proposed 6th line
In-between Line (*Athuru Rekha*)
Eye Line (*Akshi Rekha*)
Base height (*Madya Usa*)
Base Line (*Madya Rekha*)
Descending Line (*Avarohana Rekha*)

Terming of the five guidelines for typographic purpose, Source: (Samarawickrama, 2016)

Eye with a Horizontal Line
Closed Eye
Base Stroke
Curve to Curve Joint

Anatomy of Letter 'sa'

[o]   [ᵐba]

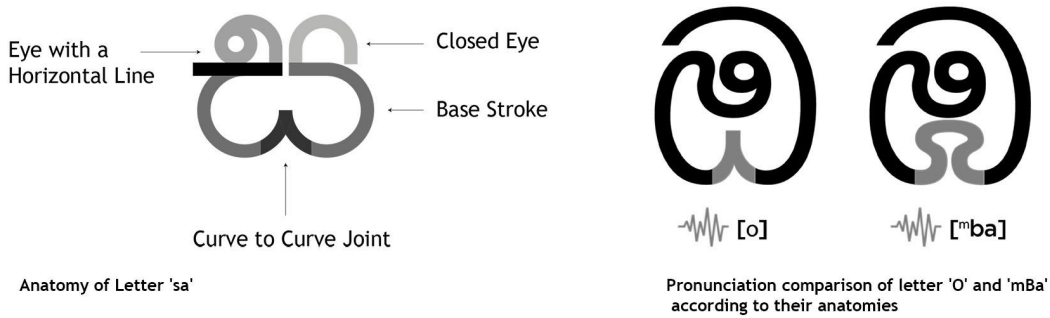Pronunciation comparison of letter 'O' and 'mBa' according to their anatomies

Figure 3 – The five reference lines, anatomy of the letter 'Sa', and pronunciation comparison

2.2. Observation of Distinct Visual Features of Sinhala Letters with FM Gemunu

The observation process began by placing each 'ideal Sinhala letter' on the five reference lines. This 'ideal letter' is extracted from typography literature on Sinhala anatomy and is considered to encompass all the visual features that characterize each letter (Samarawickarama, 2016). The 'ideal letter' is believed to contain all the visual features that define each letter. For instance, the Latin capital letter 'H' is ideally composed of two parallel vertical strokes (stems) placed on a baseline, with a horizontal stroke (crossbar) connecting the two at the midpoint. Therefore, the 'Ideal capital letter H' includes the visual features of two parallel vertical strokes, one horizontal stroke, and two joints connecting at the midpoint of the vertical strokes. However, even in this ideal letter, there are instances where the horizontal line does not join both vertical lines, and there are instances where the joint is not at the midpoint (see Figure 4). Nevertheless, this literature provides guidance on what to observe in the analysis.
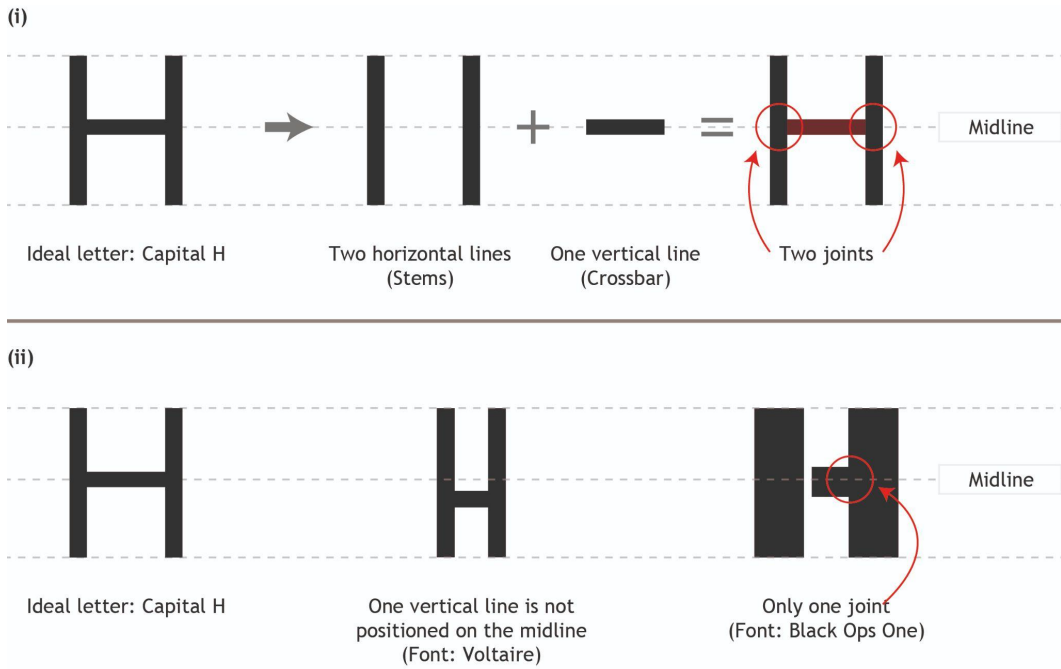
Ideal letter: Capital H | Two horizontal lines (Stems) | One vertical line (Crossbar) | Two joints | Midline

(ii)

Ideal letter: Capital H | One vertical line is not positioned on the midline (Font: Voltaire) | Only one joint (Font: Black Ops One) | Midline

Figure 4 - Variations in the 'Ideal Capital Letter H'

Similarly, the research placed each Sinhala letter alongside the FM Gemunu character and conducted a visual analysis. As exemplified in the sample letter 'Ja' (ජ) in Figure 05 (i), the ideal letter 'Ja' (ජ) was placed on the five reference lines of the Sinhala type. Then, all visual features unique to the letter 'Ja' (ජ) were highlighted and recorded. These features were then compared and noted. In the case of the sample letter 'Ja' (ජ)' there were instances where the visual features remained the same, while some were absent or modified. This analysis was repeated across sixty (60) Sinhala characters, representing 5 variations of base shapes, 6 variations of ascenders, and 3 variations of descenders.

At the conclusion of this visual analysis, anatomical features significant to FM Gemunu were identified and scientifically presented with precision (Figure 6). The results demonstrate FM Gemunu with the following anatomical features:

Tool: The tool identified can be considered a mono-linear pen. This determined the flesh of the typeface to be solid and the gray value/weight to be dark, with no contrast and no axis. The terminals were found to be both horizontal and vertical.

Hand: The hand, defined as the style or 'way of drawing/writing' (Dalvi, 2010), is geometric, and the curvature is square with no significant turns.

Stems: In Sinhala, there are three variations of stems: vertical, horizontal, and diagonal, all of which are found to be parallel.

Joints: In the case of joints, eye joints have smooth joints. The points of the curve to curve joints are unlooped, visualized as a horizontal line in most characters except in the

descender letter ''Da' (ද),' as it appears to be separate. Overall, the inclination is vertical/straight, and counters are closed except in the eye.

Category 01 (Base Shape)

5 Reference Lines   The ideal letter 'Ja' with its annotated anatomy

(i) Comparing the 'Ja' letter in FM Gemunu with the ideal Sinhala 'Ja'.

* One of the major and uncommon feature of this letter is the 'Reflected eyes'. But in FM Gemunu, this cannot be seen as the letter does not have eyes. Also the 'Knot' cannot be seen as there is not any eyes in the Anatomy.

FM Gemunu letter 'Ja' with its annotated anatomy

Category 02 (Base Shape)

5 Reference Lines   The ideal letter 'Gha' with its annotated anatomy

(ii) Comparing the 'Gha' letter in FM Gemunu with the ideal Sinhala 'Gha'.

* Eye and close eye look exactly the same, which is anatomically incorrect.

FM Gemunu letter 'Gha' with its annotated anatomy

Figure 5 - Comparing the 'Ja' and 'Gha' letters in FM Gemunu with the ideal Sinhala 'Ja' and 'Gha' respectively.

Eye: There are six visual variations of the eye in FM Gemunu. Notably, the open eye is omitted and replaced with a horizontal stroke, where the trunk-shaped eye is linked to the horizontal stroke (see Figure 6 - i). The most significant variations are observed within the sixth visual variation, which includes the navel eye, mid-range eye, and bottom-range eye. In the case of the letter 'Ma' (ම), the navel eye is linked to the ascender line, with the omission of a hook typically seen within the ideal letter. In letters such as 'Mba' (ඹ) and 'O' (ඔ), the navel eye connects to the hook/bearer and serves as an open counter. FM Gemunu also omits the midrange and bottom-range eyes.

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Knot: There are three visual interpretations of the knot in Sinhala, terminating diagonally, horizontally, and vertically. The knot in the ideal letter 'Cha' (ඡ) takes a significant shape in FM Gemunu as a close counter, resulting in an absent knot. Similarly, in the letter 'Ja' (ජ), the knot is visualized with a diagonal ascending stroke attached to the closed eye.

Hook: The hook, known as the bearer of navel, mid range, and bottom range eyes, has three visual interpretations. The navel bearer is absent in the letter 'Ma' (ම), yet appears in two ascending letters, 'Mba' (ඹ) and 'O' (ඕ), that contain an open counter eye.

Nose: There are two significant shapes of nose/points directed up and the other down. They are termed horn-shaped and point-shaped. In both interpretations, the nose is well-formed with significant directions.

Hump: The hump in FM Gemunu is a close counter, indicating a smooth connection.

Spiral: Usually, in the case of the spiral, it starts at the mid-range eye. Since there is an omission of the eye, the spiral appears in FM Gemunu.

Loop: There are four types of loops in Sinhala. The loop found within the letter 'Sha' (ශ) takes a significant shape similar to the ascending loop. Whereas the loop at the base, in the case of 'Sha' (ෂ), is omitted. On the other hand, the ascending loop is common across all except in the letter 'Ae' (ඈ), which takes a larger counter space.
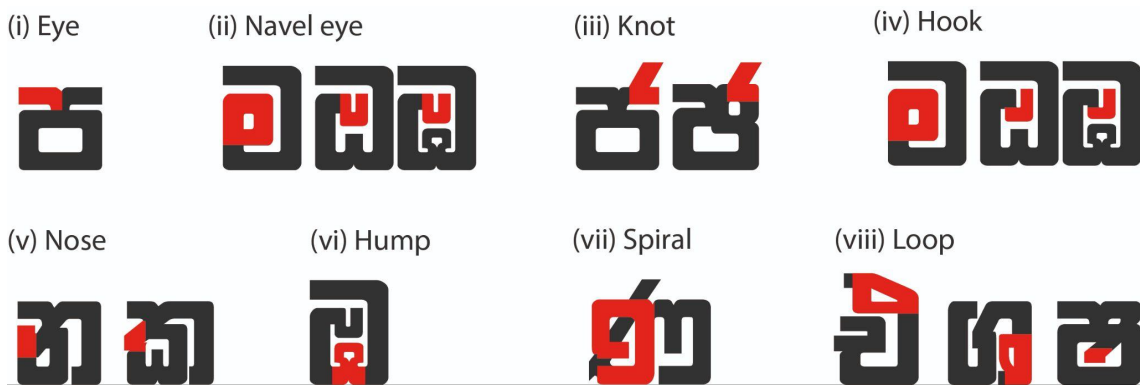

Figure 6 -Anatomical features of FM Gemunu characters

2.3. Observations of the proportions of FM Gemunu via a grid

The second stage of the observation process was focused on the proportion of FM Gemunu. For this purpose, a grid was constructed using the base character height of Sinhala, the letter 'ප' (Pa). This is the substitute for the x-height of the Latin letters.

The construction of the Grid: The letter 'pa' (ප) was placed on a baseline, and a grid was constructed around it to establish the framework for the overall analysis. The proportions and dimensions of the base letter are used to provide a clear structure for the other characters.

Therefore, the height and width of the letter 'pa' (ප) were identified as 'H' and 'W' respectively (Figure 7). Interestingly, in the case of FM Gemunu's 'pa' (ප), the height and width are equal, creating a perfect square-shaped character.
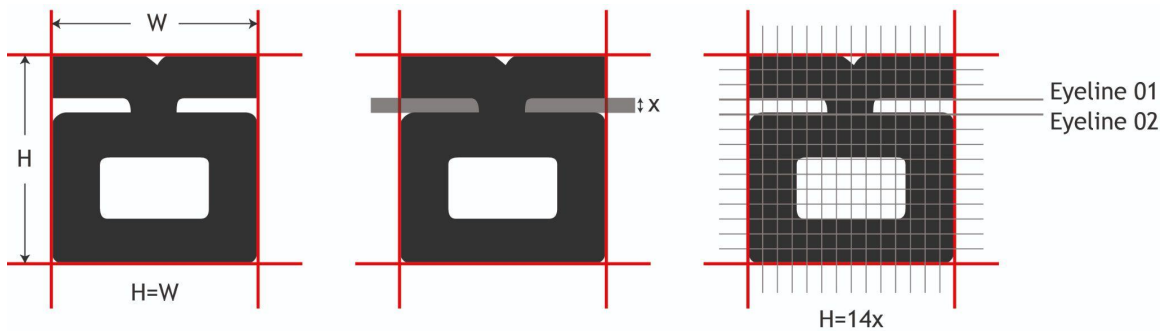

Figure 7 -Letter 'Pa' of FM Gemunu on the grid

Next, the minimum distance between two strokes (aperture) was established as 'x'. This defines the smallest area between two strokes, and the addition of another reference line was required, which was also noteworthy in FM Gemunu. Since the 'Eye Line' is defined as the imaginary line where all the eyes of the Sinhala characters sit, the line on top was considered the 'Eye Line,' and the other line was labeled as Eye Line 02 (Figure 07). Subsequently, the number of x's needed to fit inside the character's height 'H' was calculated, resulting in 14 x's (H = 14x). The stroke of the horizontal lines of the letter measures three times 'x'. In conclusion, the grid designed for FM Gemunu comprises 14 squares, both vertically and horizontally, tailored to accommodate the base character 'pa' (ප). This was followed by the next step of placing two characters, representing an ascender and a descender, in this case, the letters 'ma' (ම) and 'da' (ද). Here, the base-height grid ratio was extended to fit the two characters, as it would represent all characters in the Sinhala script. This stage continued with the highlighting of the five reference lines, the addition of the eye line (02), and the observation process. To ease the visual analysis, this stage was completed digitally, and the findings were as follows:

The Difference in Width within each Character: Positioning the letter on the grid revealed varying stroke thicknesses within a letter. This width variation is common in well-designed typefaces, as it reflects the conscious design decisions made by type designers to create a visually and optically pleasing font. In this case, since FM Gemunu was designed by a self-educated type designer, this typeface provides an opportunity to analyze his design decisions across all the characters. Notably, when examining the vertical and horizontal strokes, it becomes evident that the vertical stroke is 110% thicker than the horizontal line (Figure 8-i).
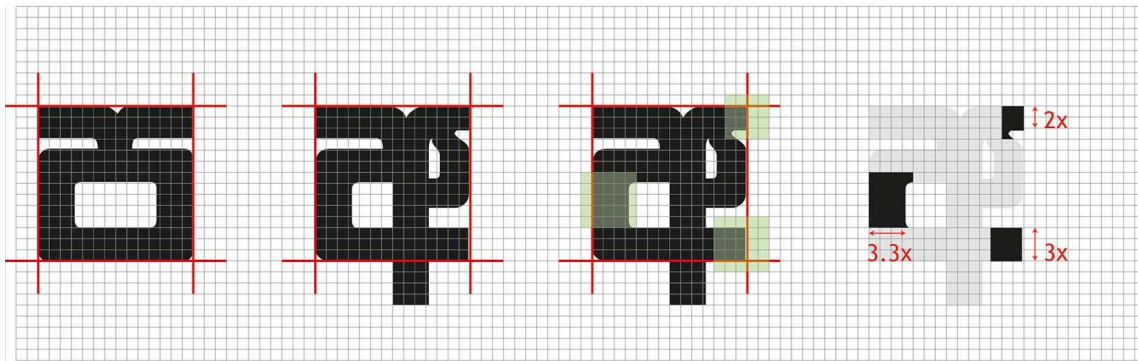
(i). Different stroke thicknesses in the same FM Gemunu letter 'A'
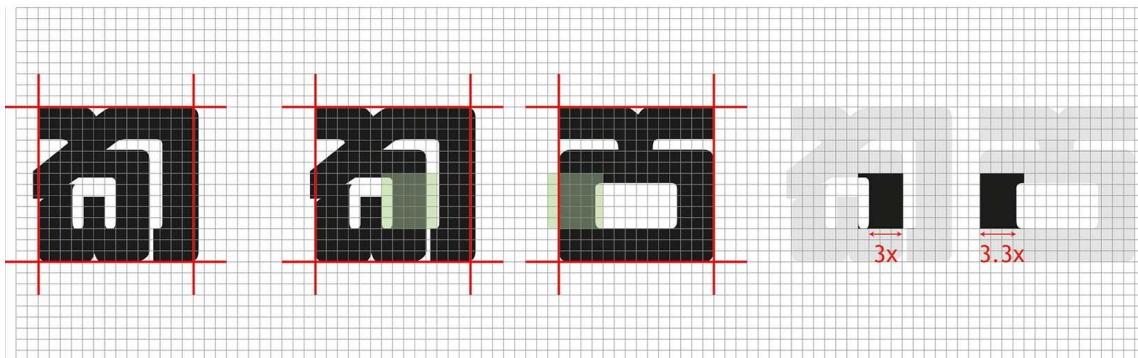
(ii). Different stroke thicknesses in different FM Gemunu letters, 'Ka' and

Figure 8 - Observation of stroke thicknesses of FM Gemunu's letters

Differences in Width within Different Characters: Similar to the previous observation, variations in stroke thickness were noticeable within different characters. For example, Figure 8-ii illustrates this by explaining this phenomenon in characters with extended length. The letter 'ka' (ක) is categorized as a long letter (extended length) in the Sinhala script because it possesses more visual features among the various base character variations. The letter 'ka' (ක) belongs to the fourth category among the five base-shape properties. This variation in stroke thickness within different characters can be seen as a deliberate design decision by the designer to reduce the stroke weight in long letters.

Different in Curvature Radius: The grid aids in achieving precision, especially concerning the curvature radius. This variation is noticeable in characters with more visual features and longer forms (taking up more space than the base character). For instance, in the case of the letters 'Ba' (බ) and 'La' (ල), it's evident that the letter 'Ba' was designed with fewer visual features compared to the letter 'La' (ල). The curvatures of the letters 'Ba' (බ) and 'La' (ල) can be measured at approximately 3.48 and 2 points, respectively, within the constructed grid (where the grid is composed of 2x2 point squares).
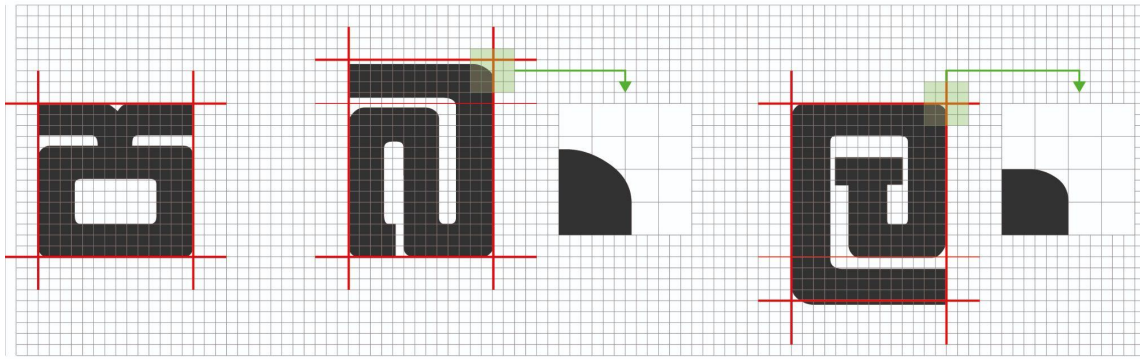
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Figure 9 - Observation of different curvature radii of the letters of FM Gemunu

Application of Multiple Ascender and Descender Lines: In all scripts, you'll find a variety of characters with different features, such as long, short, tall, rounded, and pointed characters. Regardless of the unique traits of each letter, it's the conscious design decisions of the type designer that ensure they appear visually appealing and cohesive as a whole. In the case of FM Gemunu's ascender characters, the designer integrated two ascender lines, while for FM Gemunu's descender characters, three descender lines were included. The ratio of ascenders is 1:1, and the ratio of descenders is 1:1:1.5 (see Figure 10).

Application of Multiple Eyelines and Intermediate Lines: The term 'eyeline,' as defined within the Sinhala-type anatomy, refers to the imaginary line where all eyes of Sinhala letters are positioned. The intermediate line, on the other hand, is the line located between the eyeline and the ascender line. In this visual analysis, the reference lines were positioned based on the base letter 'Pa' (ප), the ascender letter 'Ma' (ම), and the descender letter 'Da' (ද) (see Figure 11). Out of the six defined visual features for the 'eyes' within Sinhala anatomy, three of these eyes are situated on three distinct eyelines, while the remaining three eye variations are absent in FM Gemunu. The intermediate line is an imaginary line positioned between the eyeline and the ascender, typically found at the top of the letter, aligning with the eye of the letter 'Pa' (ප). In summary, there are four eyelines and three intermediate lines visible in FM Gemunu.
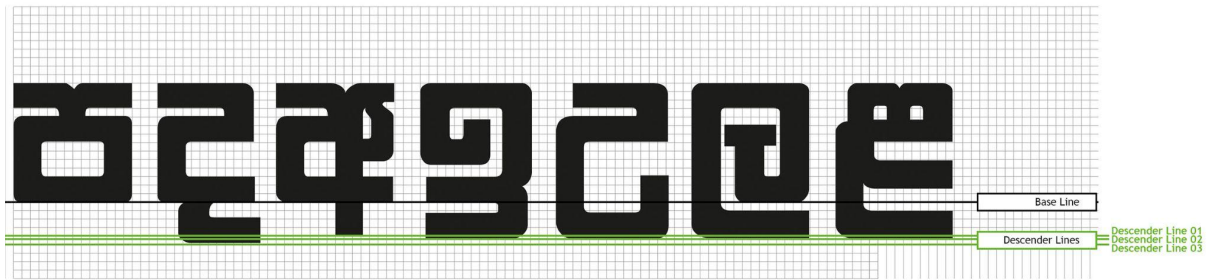
Descending lines of FM Gemunu typeface
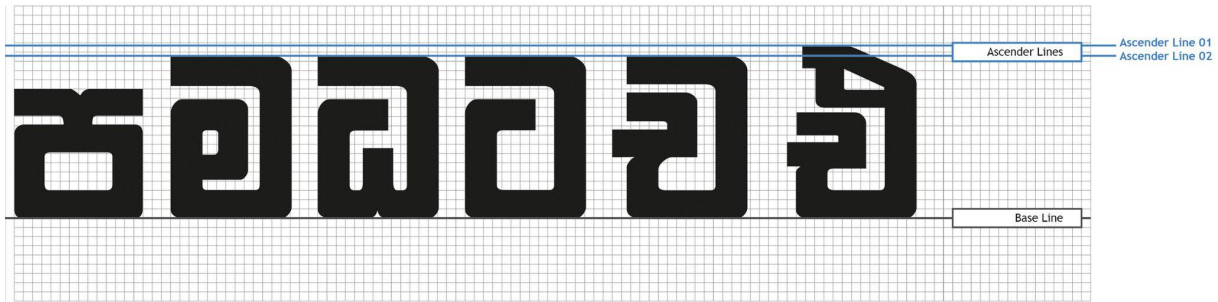
Ascending lines of FM Gemunu typeface

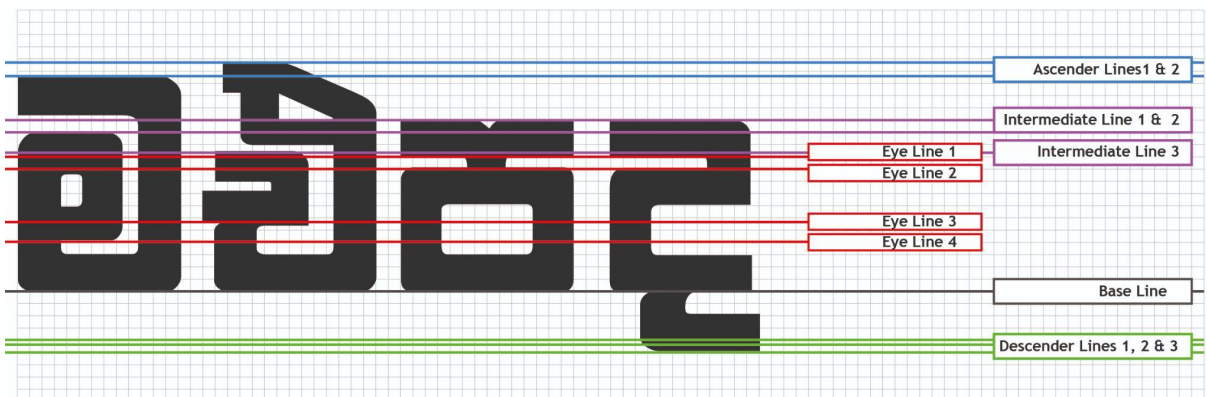*Figure 10 - Ascending and descending lines of FM Gemunu typeface*

Figure 11 -Identified reference lines (grid lines) of FM Gemunu

3. Conclusion

The grid's pivotal role in shaping the creation and analysis of letters is a common thread in typography. This study underscores the continuous utilization and adaptability of grids within the Latin script, contributing significantly to the fundamental knowledge of Latin typography. The ongoing interplay between grids and typography has laid the foundation for typographic development.

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The same principle applies when exploring scripts from regions like the global South, including Sinhala. This study, focusing on the Sinhala font 'FM Gemunu,' elucidates the importance of grids in experimenting with letters, typefaces, and fonts within this script. FM Gemunu, a widely-used display font in Sri Lanka, serves as a compelling case study in this context.

The methodology employed in this research, involving the placement of 'FM Gemunu' on the five traditional reference lines used in Sinhala type anatomy, enabled a detailed comparison with ideal Sinhala characters and conscious design decisions made by a self-educated type designer. These ideal characters are designed with distinct anatomical features specific to each Sinhala letter, making this comparative analysis invaluable. It allowed for the preservation of base character features and height, which then informed the development of a precise grid tailored to 'FM Gemunu.' This grid, in turn, serves as a crucial tool for further exploration and development in the realm of Sinhala typography.

In essence, this study emphasizes that these explorations and grid-based methodologies have immense potential when applied to scripts in the global South. They represent a significant advancement and valuable contribution to the field of typography, not only enhancing our understanding of type design but also contributing to the rich diversity of scripts around the world.

References

Brownie, B. (2014). A New History of Temporal Typography: Towards Fluid Letterforms. *Journal of Design History*, *27*(2), 167–181. https://doi.org/10.1093/jdh/ept036

Dalvi, G., (2010) Conceptual model for Devanagari typefaces. PhD Thesis, Industrial Design Centre, Indian Institute of Technology Bombay.

Egodawatta, P. (2015, October 15). *Gamunu Libre Font (Sinhala, Latin)*. Https://Groups.Google.Com/. https://groups.google.com/g/googlefonts-discuss/c/Z2zMEJ-DfEw?pli=1

Goonetilleke, A. (n.d.). *Mr. Pushpananda Ekanayaka – History of ICT*. Retrieved 12 July 2023, from https://www.ict-history.lk/en/mr-pushpananda-ekanayaka/

Huot-Marchand, T. (2020, May). *Anrt – Griiiid. Uses of the grid in creating typeface*. https://anrt-nancy.fr/fr/articles/griiiiid

Isiwara—Sinhala Font Master. (n.d.). Retrieved 9 October 2023, from https://isiwara.lk/

Leonidas, G. (2022). *Riccardo Olocco Michele Patane. 'Designing type revivals: Handbook for a historical approach to typeface design'* (G. Leonidas, Ed.). Lazy Dog. https://lazydog.eu/product/designing-type-revivals/

Lupton, E. (2014). *Thinking with Type: A Critical Guide for Designers, Writers, Editors, & Students*. Chronicle Books.

Samarawickrama, S. S. M. R. (2016). *The Anatomy and Historical Development of Sinhala Typefaces* [University of Moratuwa]. http://dl.lib.uom.lk/bitstream/handle/123/12750/TH3314-1.pdf?sequence=15&isAllowed=y

Smedresman, G. (2016). *Alphabetic Architects Geofroy Tory and the Renaissance Reconstruction of the Roman Capital Alphabet*.