Basic Character Spacing in Type Design

by Mark Jamra

The philosophy of Taoism teaches us of the interdependency of the Yin-Yang dualism; the balance of the universe lies in the mutuality of these opposites, of being and non-being, light and dark, substance and space – indeed without one, the other cannot exist. Typefaces adhere to this as well; the forms of the letters cannot exist without the space within and between them. Fundamentally, there is no value distinction between "figure" and "ground" shapes, or between "letter" and "space". The one is as important as – and thoroughly dependent upon – the other. The Yang of the letter forms needs the Yin of the space around them.

The design of well-formed letters is a rewarding challenge, but in designing a typeface it is only half the battle won. All efforts can be for naught if the designer fails to create that delicate balance and interplay of glyph and space which is the hallmark of good type design. The legibility and readability of a typeface is dependent upon the even distribution of space in and around the carefully crafted letters – as is the ultimate beauty or effect of the letters themselves.

Space, technically speaking

In handset foundry type, the space on both sides of a letter was determined by the body width of the piece of lead that extended beyond the edges of the character. This was also the determining feature in much of hot-metal technology, although sometimes the width was determined by the width of the mold – as was the case when the Linotype cast letters in a single, long metal slug. In digital type, in which I assume the reader of this text is primarily interested, the spacing is represented by numerical values for the space to the left of a character – the Left Side Bearing (LSB) – and the space to the right of the character – the Right Side Bearing (RSB).

These spacing values for each character – along with the size of the "window" (em quad) that contains each character, basic font measurements, and a table of kerning pairs – belong to what is called the Font Metrics. Digital fonts consist of these and the Outline Data, which describe the contours of the actual characters (or more accurately, *glyphs,* a word that refers to characters, symbols and any other shape that you may care to have in a font file). In the past, mathematicians and software engineers have developed algorithms in attempts to automate the process of determining letter spacing. These algorithms are often at the root of the "Auto Space" and "Auto Kern" functions in font development applications, but the results they achieve are always very poor. Ultimately, what really counts is what we perceive. Just as with the design of letters, the spacing of those letters relies upon the rules inherent in its optical appearance.

Space, optically speaking

The spaces between letters are subject to the same optical rules as the letter forms themselves[1]. The letters will behave optically together in a way that is similar to how they are positioned on the base line: while the straight stems more clearly delineate the space next to them, the curved stems need to enter into the space in order for it to appear to have the same volume as between straight stems. (Figs. 1 & 2)

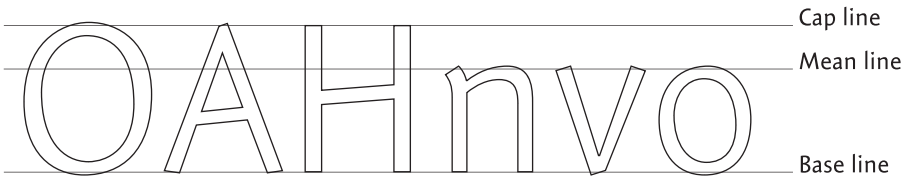

Fig. 1 *Each letter is designed for a consistent base and optical height.*

Getting Started: The Lowercase

In most type industry production, the designer/producer usually begins by establishing the best spacing between letters with simple straight stems and simple curved stems – most often the n and o. The even rhythm of black and white is achieved by placing the same space between two basic lowercase letters – usually n's – which is optically equal to the volume of the counter. (Fig. 2)

Fig. 2 *The counters of the n and o have the same volume – as well as the space between them.*

For basic spacing, it's acceptable to give the n the same values for the LSB and the RSB. (In the example here, I've given the LSB and RSB the arbitrary values of 50 units. The "hump" on the right side of the n will require some fine-tuning of the RSB later in the process.) Now you should have an even, rhythmic row of n's. (Fig. 3)

Fig. 3 *Finding the correct spacing can involve some trial-and-error searching.*

Next, add the o and give it spacing that creates an even rhythm when set with the n. (Fig. 4)

Fig. 4 *Making the n and o work together is the earliest instance of fine tuning in the spacing process.*

At this point, you have established side bearing values for basic straight stems and curve stems. These can be transposed onto other lowercase characters with similar shapes. For example: the LSB of the n can be given to the f, h, i, k, l, m, p, r, u, and the RSB can be given to the a, d, h, i, l, m, q, and u. The LSB of the o can be given to the c, d, e, q, and the RSB can be given to the b, and p. (Fig. 5)

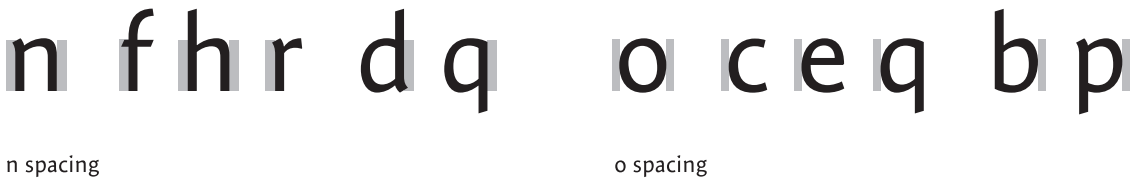

Fig. 5 *The "straight" and "curve" spacing values can be given to similar characters.*

But what about the "diagonal" characters like k, v, w, x and y? These are given side bearings that allow them to space evenly between the "straight" and "curved" characters. Here, your eye has to be the judge – and the more you do it, the better you will get at achieving an even rhythm. (Fig. 6)

Fig. 6 *The width and spacing of letters like v and k give them an even color and rhythm amongst the other characters.*

The same goes for the other "irregular" characters – the a, g, j, s and z. These letters can possess a lot of personality which is necessarily offset by the restraint of the more "plain" letters like n or o. In spacing, they are also given side bearings that allow them to settle into the even rhythm of the other lowercase letters. (Fig. 7)

Fig. 7 *The proper spacing of letters with more active shapes takes some practice.*

That gives us the basic spacing of the lowercase. From here, a certain amount of fine-tuning follows which deals with the irregularities of each individual letter form depending on its specific design. After that, it is time to turn our attention to the uppercase letters.

Second Step: The Uppercase

Knowledgeable typographers and designers will always use "tracking" in their layout applications to set all-caps with more space than what they normally get from the font. Do you know why? The answer is quite simple. Proper spacing for the caps adheres to the same rules that govern the lowercase: the spaces between the letters should have the same optical volume as the spaces within them. (Fig.8)

HHHOHOOHO

Fig. 8 *The ideal spacing for the uppercase.*

Of course, the counters of the uppercase letters (the caps) are larger than those of the lowercase - after all, the caps are larger forms. Therefore, the spaces between the caps *should* be significantly larger than the spaces between the lowercase letters. But in the average font, they aren't. Here's why: if the caps were given the spacing they need for good all-caps setting, they would stand much too far away from the lowercase letters. So type designers/producers must make a compromise: since the caps are generally used much more often with the lowercase than they are with each other, they are given spacing which allows them to fit well with the lowercase, but which is too tight when setting all-caps. Therefore, the first thing the designer must do is to find the best spacing of the caps to the lowercase. As with the lowercase, we'll start with the straight and curved characters, in this case the H and O. (Fig. 9)

HHnHnnOnHHnOOn

Fig. 9 *The lowercase letters space well, the uppercase letters space evenly and the lowercase letters space well with the uppercase – it's a bit like playing tri-level chess!*

When the proper spacing is found, the caps are spaced in much the same way as the lowercase: after you have the LSB and RSB for the H, find the values that allow the O to space evenly with the H. Remember, you are spacing the caps too tightly on purpose, so it's wise to check the spacing on each cap when set next to lowercase letters. (Fig. 10)

HHHOHOOH Han One Oon

Fig. 10 *The uppercase: spaced too tightly for each other but just right for the lowercase.*

As with the lowercase, you can now give the LSB value of the H to the B, D, E, F, I, K, L, P, R, and perhaps the U, depending on its form. You can give the RSB value of the H to the I, J and (sometimes) the U. The LSB value of the O can now be given to the C, G, and Q, while the RSB value can be given to the D. (Fig. 11)

H B D E F I K L P R U I J U O C G Q D

H spacing O spacing

Fig. 11 *The spacing of the H and O will give you values for much of the uppercase.*

With these letters spaced evenly, it's relatively easy to find proper spacing for the remaining side bearings by placing those letters in amongst lines of H's and O's and changing the side bearing values as needed.

Finishing the Basics

The production studios of the large type foundries always check the spacing of their typefaces by looking at proofs of each character as it is set between every other character. Every possible letter combination is scrutinized.

AAABACADAEAFAGAHA . . .
BABBBCBDBEBFBGBHB . . .
CACBCCCDCECFCGCHC . . .
DADBDCDDDEDFDGDHD . . .
EAEBECEDEEEFEGEHEIE . . .
FAFBFCFDFEFFFGFHFIF . . .
GAGBGCGCGDGEGFGHG . . .
etc. . .

aaabacadaeafagahaiaja . . .
babbbcbdbebfbgbhbib . . .
cacbcccdcecfcgchcicjc . . .
dadbdcdddedfdgdhdidjd . . .
eaebecedeeefegeheieje . . .
fafbfcfdfefffgfhfifjfkflf . . .
gagbgcgdgegfggghgig . . .
etc. . .

Fig. 12 *Try to space each character as evenly as possible with every other character.*

The result of this basic spacing is the first step towards a readable typeface and is followed by subtle fine-tuning to get as consistent a rhythm as possible. Well-crafted letters and well-proportioned spacing in your typeface design are indispensible to arriving at the delicate balance of typographic excellence.

FOOTNOTE:

1. See particularly fig. 4 in my essay *Some Elements of Proportion and Optical Image Support in a Typeface,* also available at TypeCulture.