Knowledge of all fonts

In the vehicle safety world, high-tech appears to rule supreme. A recent MIT study, though, has proved how optimising typeface characteristics could be a simple and effective method of providing a significant reduction in interface demand and associated distractions

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W e have a strange relationship with typography. Every day we see thousands of words composed of millions of letters. These letterforms surround us, inform us, and entice us. Yet in our increasingly literate and information-saturated society, we take them for granted, and rarely spare a thought as to how they got there, or why they look the way they do.

Few people ever bother to appreciate the myriad of differences in shape, thickness and style that define the difference between typefaces such as the austere Helvetica, fastidious Times New Roman or clownish Comic Sans. More to the point, few people realise that the design of typefaces – and the way in which their strokes and terminations play off each other from letter to letter and word to word – can have a significant impact on our ability to read and absorb what they are trying to communicate.

Typographic design

The design of a typeface is a subtle art, within which all of the letters must dance to the same tune, unified by a consistent stylistic rhythm that allows them to link together when scanned

Touchscreen mounted in simulator, with eye-tracking cameras, an IR illumination pod and the face video camera mounted on the dash

by the reader. At the same time, the letterforms must not become too constrained or monotonous, lest the reader's eye confuse a 'g' for a '9'. This tension between legibility, consistency and variation is at the heart of all typographic design. Consider Frutiger – a typeface crafted in the 'humanist' tradition, and Eurostile, a 'square grotesque' typeface (p42). Both of these are sans serif, meaning they lack the added spikes, flourishes and 'feet' found in the typeface you are reading now. As a result, at first glance they might appear to be quite similar, but a closer examination reveals substantial differences between the two typefaces. Where Frutiger is open, leaving ample space between letters and the lines of individual letterforms, Eurostile is tighter and more closed. Eurostile also enforces a highly consistent squared-off style, while Frutiger allows for more variety in letter proportions (note Eurostile's nearly identical zero and 'O').

Typographers have long addressed these issues as they pertain to long-form, static texts such as books, magazines and newspapers. But times are changing, and we increasingly read not in long stretches from printed

pages, but from digital screens in brief glances. This is especially true in motor vehicles. Where it was once the case that the numbers on the speedometer comprised the beginning and end of the driver's in-car reading material, today drivers are faced with an array of ever-shifting screens that present them with information on their fuel efficiency, traffic conditions, directions and favourite playlists. As the use of these systems becomes increasingly popular, it will be crucial to understand how their design, and in particular their typographic choices, influences usability and safety.

Road to clarity

Some work has already been done on glance-based legibility under driving conditions. After extensive study, the Federal Highway Administration (FHWA) commissioned the design of a typeface specifically for road signage. This typeface, dubbed Clearview, departs from traditional typographic conventions in a number of important

Open shapes | Ample intercharacter spacing | Unambiguous forms | Varying proportions

ABCDEFGHXYZ abcdefghxyz   ABCDEFGHXYZ abcdefghxyz
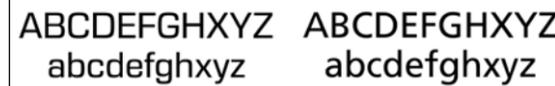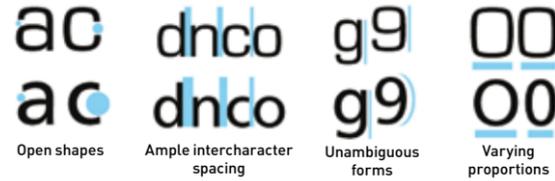
ways, most notably the generous internal space given to closed letterforms such as 'p' and 'o' (this maintains legibility when light from oncoming cars causes the letterforms to glow and blur), as well as a relatively tall x-height, which makes Clearview's lowercase letters more similar in size to its uppercase letters. Although Clearview has been greeted with enthusiasm from the design community, its uptake on roadways has been slow. Clearview is not yet approved for dark-on-light signage, and is still limited to use

(Above) The square grotesque typeface (Eurostile) is on the left and the humanist (Frutiger) typeface is on the right (Top) Showing the various characteristics thought to improve legibility

on light-on-dark signs (such as white on green or brown).

Although the adoption of Clearview has been relatively slow, the adoption of text-based interfaces in motor vehicles has been rapid. It therefore seems important to ask what effects – if any – typeface might have on the driver's ability to successfully complete common information-based tasks quickly and accurately while driving. The Monotype Imaging type foundry is strongly interested in this question, and approached the MIT AgeLab and New England University Transportation Center to investigate using driving-relevant methodologies. A series of menu-selection tasks were designed similar to those that drivers might encounter using a navigation or point-of-interest user interface. Participants were presented with menu screens in both a square grotesque (Eurostile) and humanist (Frutiger) design. Monotype provided customised versions of both typefaces to control for characteristics such as overall height and slight screen-rendering differences. The menu-selection tasks were conducted in a driving simulator while participants were monitored by eye-tracking equipment, in doing so allowing variables such as the total amount of time spent looking at the display versus the roadway to be measured. Two studies were conducted that differed only in the relative brightness of the display, and they produced highly consistent results. Across the studies, it was found that visual demand – as measured by the total glance time to the screen – was 10.6% lower among men when Frutiger was used as compared to Eurostile, or a difference of about 470ms. Men also showed a reduction of total glance time and number of glances when reading Frutiger, and both men and women showed a 3.1% reduction in task errors. In short, Frutiger resulted in more accurate use of the information system, and particularly for men, faster task completion time, lower visual demand, and ultimately more time spent looking at the road.

In-vehicle recognition

Several automobile manufacturers have come to favour square grotesque designs such as Eurostile for onscreen displays, presumably for their modern, somewhat 'techie' appearance. As sans serif typefaces, both Eurostile and the humanist design, Frutiger, lack the tiny

spikes and flourishes that would be difficult to render on a relatively coarse in-vehicle display (as opposed to the much finer resolution of traditional print). Either typeface would therefore seem to be an adequate choice for the interface, and Eurostile – with its Batmobile-like aesthetic – has a certain psychological appeal. Results from MIT's Agelab, however, show that the deeper design characteristics of each typeface create pronounced effects on glance legibility, and that the humanist-style Frutiger typeface is a better, more legible choice for a quick glance environment. A 470ms reduction in glance time could easily mean the difference between avoiding a traffic accident and having one.

The gender differences observed were surprising. Women showed little or no effect of typeface on task completion measures, and generally performed slightly better than men overall. Whether this is due to intrinsic

"A 470ms REDUCTION IN GLANCE TIME COULD EASILY MEAN THE DIFFERENCE BETWEEN AVOIDING A TRAFFIC ACCIDENT AND HAVING ONE"
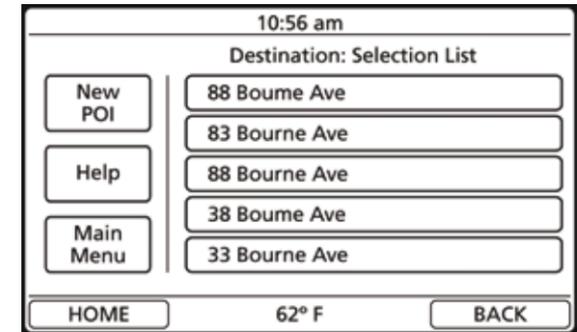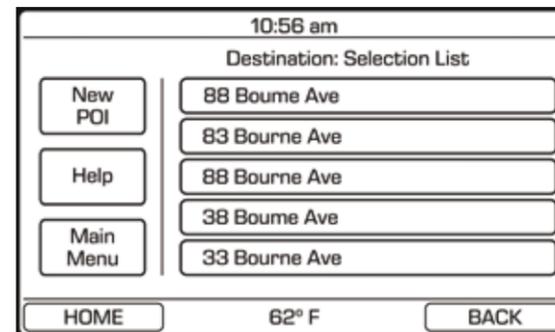
(Far left) Menu screen in a square grotesque font (Left) Menu screen in a humanist font

perceptual differences between men and woman (colourblindness, for example, is common in men but quite rare in women), or a by-product of cultural effects (women may be more cautious drivers and thus are less likely to take their eyes off the roadway for extended periods of time) remains to be seen, and presents an intriguing avenue for future research.

Human factors

As more advanced technologies become integrated into our motor vehicles – bringing with them ever more information-dense and dynamically changing display content – these nuanced human interaction and design issues will become an increasingly prominent part of our safety considerations. As research in these areas is just starting to receive attention, there are therefore tremendous opportunities to increase

the safety of the driving experience, even in something as easily overlooked as a typeface. ◀

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Further reading

The research discussed in this article is detailed in a white paper released by the MIT AgeLab, An Evaluation of Typeface Design in a Text-Rich Automotive User Interface *(http://agelab.mit.edu/files/AgeLab_typeface_white_paper_2012.pdf). Monotype Imaging has also released a video detailing much of the research, and includes interviews with the researchers behind the project (https://www.youtube.com/watch?v=BMP5cuAYG_Q). This is also available with Japanese subtitles (https://www.youtube.com/watch?v=R9CQ_NAwpOI)*