

Braille, Innovations, and Over-Specified Standards

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ABSTRACT

The new Tiger embossing technology, developed in the author's research group, produces more readable braille than conventional embossers. The better readability traces to a smaller diameter embossed dot than that made by conventional technology. Some sighted braille experts initially levelled criticism at the new technology on the grounds that this dot diameter is smaller than what is required by a published "standard". The criticism has died away in the face of strong acceptance by blind people, but it stands as an example of the danger of over-specifying standards.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces—*standardization*

Keywords

Braille, guidelines, standards, tactile

1. INTRODUCTION

Well-founded standards can be a boon in many ways. They can assure that technologies are compatible, thus assisting further developments that do not need to continue to solve the same problems over and over. Standards can promote better communication, better data access, and in general a better life for human beings. However there is a human tendency to over-specify details that can be harmful by suppressing innovation. This paper describes one such real-life instance of an over-specified standard.

Braille characters consist of six tactile dots arranged in two columns and three rows. This is a universally-recognized standard. The dot patterns assigned to the 26 lower case letters a-z by Louis Braille in the early nineteenth century are also universally accepted. Little else about braille is universal. Braille contractions and shorthand used in one language have little resemblance to those used in other languages. Codes for math and science also differ radically among languages, and there are often several codes in use within one country. Since losing his sight in 1988 this author has led an information accessibility research team whose goals have included development

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of alternatives and extensions to braille that may eventually reduce the mystery and confusion that prevent many people from learning and using braille. The focus of this paper is on tactile aspects of the research that have resulted in a new technology for producing tactile materials. This new technology produces braille cells that are substantially different in some aspects from the "standards" but that are found by users to be as readable, and often much more readable, than braille made by more conventional technologies.

2. BRAILLE CELL DIMENSIONS

The spacing of dots within a cell, the inter-cell and inter-line spacing, and the size of dots defined as "standard" for various countries are summarized by [1] and differ substantially from country to country. Generally there are standards for "normal" braille, micro-braille, and jumbo braille. Micro-braille is used extensively in Japan, and jumbo braille is made for people with reduced tactile sensitivity.

"Normal" braille standards define the dot spacing within a braille cell to be between 2.3 and 2.5 mm, the cell to cell spacing to be 6.0 to 6.2 mm, and the dot height to be 0.25 to 0.53 mm. Micro-braille differs mostly in having inter-cell dot spacing of 2.0 to 2.1 mm, and jumbo braille generally has dot spacings of order 25% larger than standard braille. Nearly all braille materials produced in western countries are the "normal" size. Few braille readers can distinguish the subtle differences in dot size/spacing of the various forms of normal braille,

The author's observation is that although most braille readers find normal braille comfortable, a substantial fraction of blind people find normal braille difficult to read. People with diabetes and many elderly people have reduced fingertip sensitivity and consequently have more difficulty learning braille than others. These people can read jumbo braille more easily, but jumbo braille is seldom encountered except in very special circumstances. Westerners find micro-braille difficult to read. Some Japanese authorities hold the private opinion that microbraille is too small for many Japanese readers and that it is only Japanese tradition that continues to support its use. Although micro-braille is still dominant, much braille material in Japan is now being made in normal braille size.

3. TIGER BRAILLE

In 1996, Mr. Peter Langner, an MS student in the author's Science Access Project, developed a novel method for embossing dots on paper and other media. Mr. Langner was searching for a way to emboss dots at 20 dots per inch resolution. 20 dpi is a "magic" resolution that would produce much higher resolution tactile graphics than had been possible before and that could emboss braille with

inter-cell dot spacing of 2.54 mm and inter-cell spacing of 6.25 mm, values that qualify as normal braille. He and the author thought that the braille quality was excellent, an observation confirmed quickly by several blind scientists who were good braille readers. Mr. Langner received the Collegiate Invention of the Year award [2] in 1996 for this new technology that was dubbed Tiger (Tactile Graphics Embosser). The technology was patented by Oregon State University [3], licensed to the spin-off company ViewPlus Technologies (<http://www.ViewPlus.com>), and the first Tiger embossers were developed and shipped in 2000.

The quality of the braille turned out to be even better than initially believed. People with reduced tactile sensitivity found it far more readable than normal braille, even than jumbo braille. The author's hypothesis is that Tiger braille is more readable because the dots have a smaller diameter than made by most braille embossers, so the dots feel better resolved, even though their dot to dot spacing is the same as normal braille.

The Tiger technology was found to have additional advantages over other embossing technologies. It was possible to make controllable variable height dots, permitting excellent tactile graphics to be printed from almost any figure. The default graphics mode is to print black areas with tall dots and light areas with progressively smaller dots. Interpoint braille (braille printed on both sides of the page) made with Tiger technology is not as rough-feeling as normal interpoint, since the "dimples" are significantly smaller.

The Tiger developers were surprised when their new better technology was roundly criticized by many sighted braille transcribers, special educators, and other braille "experts". These experts had grown accustomed to the visual appearance of standard braille and described Tiger dots as "ugly". Many initially refused to approve the purchase of Tiger embossers for their students. This attitude has largely disappeared in the United States and other countries where ViewPlus has established a strong user base but is still encountered in new markets. A number of those who opposed the new embossing technology based their criticism on the failure of Tiger embossers to meet one minor "standard" for braille. In addition to the dot spacing and height parameters, the standards also specify a

dot base diameter, generally in the range 1.2 to 1.5 mm. Dot base diameters of Tiger dots are smaller than this value. Braille readers touch the tops of braille dots, not their base, so this standard value is rather meaningless, but it was obviously of importance to some critics. In the end, the only tactually-perceivable difference between Tiger dots and conventional braille is that the Tiger dots have stronger curvature of the top. The curvature itself is not really perceivable tactually, but the finger can perceive that Tiger dots have more space around the dots. It is the extra space that makes Tiger dots easier for people with poor tactual sensitivity to perceive. The extra space has apparently not been any kind of hindrance to good braille readers [4, 5], and the author does not understand why the new technology created such controversy initially. This should be taken as a warning that standards need to be devised carefully and should not be over-specified. If the research director had not been a confident blind person and had consulted sighted braille experts initially instead of blind braille readers, he might have elected to abandon the Tiger concept. The world would be the poorer for it.

4. REFERENCES

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