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L2/99-160

To: Unicode Technical Committee
ISO/IEC JTC1/SC2/WG2

From: STIX Project of the STIPUB Consortium (a consortium of scientific societies and scientific/technical publishers)

Subject: Proposal to encode mathematical variant tags (revised)

References: L2/98-406, Proposal to encode mathematical variant tags
L2/99-049, Addendum to L2/98-405: Request for assignment of codes to mathematical and technical symbols
L2/99-159, Request for assignment of codes to mathematical and technical symbols that do not appear in Unicode 2.0 or ISO/IEC 10646 (revised)

This document complements the request for assignment of codes to mathematical and technical symbols (L2/98-159), superseding the other two referenced documents.

While the complement of basic symbol shapes used in mathematical and technical publishing is open-ended, it grows rather slowly. However, extension of the symbol set by modification and adaptation of existing symbols is a much more rapidly growing and productive area. That is the area being addressed here.

The concept of mathematical variant tags was introduced in L2/98-406, initially for the designation of different math alphabets. That use has now been bypassed, but additional uses proposed in L2/99-049 are still amenable to this technique.

A mathematical variant tag would act rather a like nonspacing combining mark, designating the desired modification of the symbol represented by the base code point. There are several obvious categories of modifications in current use in the mathematical literature.

Size variants Only one size variant is proposed. Its purpose is to transform a binary relation into an n -ary operator, which is indicated visually by an increase in size and/or weight (as well as a change in location in a math expression). The requirement can be documented from existing mathematical literature.

MV11 math large (operator; normal size is a relation)

Some examples of this are already present in Unicode, with additions requested in L2/99-159.

$$M_i - \text{int}(M_i) = \bigcup_{i' \in I(j) - \{i\}} \left(M_i \cap M_{i'} - \text{int}_{M_{i'}}(M_i \cap M_{i'}) \right)$$
$$\varphi_{\sigma}^*(I_n(\gamma_1 \otimes \cdots \otimes \gamma_n)) = \epsilon(\sigma)(I_{n_1+1} \otimes I_{n_2+1}) \left(\bigotimes_{i \in S_1} \gamma_i \otimes \Delta \otimes \left(\bigotimes_{i \in S_2} \gamma_i \right) \right)$$

Using math variant notation, these could be expressed as follows:

- $U+222A = \cup$; $U+222A + \langle MV11 \rangle = \cup$ (Unicode U+22C3)
- $U+2297 = \otimes$; $U+2297 + \langle MV11 \rangle = \otimes$ (2X22 in L2/99-159)

Shape/orientation variants The purpose of these variants is to add common modifiers to base symbols, or to modify the shape or orientation of existing elements of compound symbols.

- MV21 math negation, oblique (default)
[U+0337 and/or U+0338 might serve, but it seems preferable to have a unique modifier and leave the size questions to the font/glyph resolution]
- MV22 math negation, upright
[U+20D2 and/or U+20D3, similarly to $\langle MV21 \rangle$]
- MV23 math negation, reverse oblique
[this is not in Unicode at present, but has been requested as 7X0D in L2/99-159]
- MV31 combining single equals below
(default; horizontal rule below a character of equal width)
[U+0332 could be used, but is not ideal]
- MV32 combining double equals below
[U+0333 could be used, but is not ideal]
- MV33 combining single equals above
[U+0305 could be used, but is not ideal]
- MV34 combining double equals above
[U+033F could be used, but is not ideal]
- MV35 slant/conforming equals (modifies existing equals)
- MV36 equals doubler (modifies existing equals)

Examples:

- $U+2261 + \langle MV21 \rangle: \equiv (U+2261) \rightarrow \not\equiv (U+2262)$
- $U+2208 + \langle MV22 \rangle: \in (U+2208) \rightarrow \notin (2X06)$
- $U+2261 + \langle MV23 \rangle: \equiv (U+2261) \rightarrow \not\equiv (3X03)$
- $U+003C + \langle MV31 \rangle: < (U+003C) \rightarrow \leq (U+2264)$
- $U+003C + \langle MV32 \rangle: < (U+003C) \rightarrow \leq (U+2266)$
- $U+003C + \langle MV33 \rangle: < (U+003C) \rightarrow \overline{<} (U+22DC)$
- $U+2264 + \langle MV35 \rangle: \leq (U+2264) \rightarrow \leq (3X18)$
- $U+2264 + \langle MV36 \rangle: \leq (U+2264) \rightarrow \leq (U+2266)$