

## Proposal to spread a warning about legibility of six bidi-mirrored symbols

For consideration by Editorial Committee

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*“We must always say what we see.  
Above all we must always  
— which is more difficult —  
see what we see.”*

Alain Finkielkraut quoting Charles Péguy

### Problem

The tilde occurs both as standalone symbol and as part of a variety of relational operators. The non-commutative part of nearly all relational operators is mirrored by intercharacter glyph exchange, so that semantics stays legible in right-to-left runs without right-to-left glyphs. On the other hand, in most operators, tildes are not mirrored by intercharacter glyph-exchange, only by right-to-left glyphs; by contrast, much inconsistently, the tilde is mirrored by intercharacter glyph exchange in six operators:

#### Intercharacter Glyph Exchange Bidi-Mirroring of Tilde and Reversed Tilde Shapes

U+223C	~	TILDE OPERATOR	U+223D	⋈	REVERSED TILDE
U+2243	≈	ASYMPTOTICALLY EQUAL TO	U+22CD	≍	REVERSED TILDE EQUALS
U+2245	≅	APPROXIMATELY EQUAL TO	U+224C	≎	ALL EQUAL TO

The resulting uncertainty of ordinary and reversed tilde shapes keeps compromising legibility.

With respect to the principle of listing in the upper (uncommented-out) part of BidiMirroring.txt [1] all bidi-mirrored characters that have a usefully mirrored counterpart character, the operators ~, ⋈, ≈, ≍, ≅ and ≎ are edge cases, that it was not considered worth breaking the rule for, whatever confusion the mix of mirrored and unmirrored tildes may result in. Hence after underdoing it for a while, BidiMirroring.txt is now overdoing it. Either is harmful to legibility, although version 11.0.0 of the Standard has greatly improved things.

Actually, the prerequisite for parsing tildes correctly is to know the three above-mentioned operator pairs. Indeed, when occurring in an RTL directional run, the tildes of these six symbols are mirrored everywhere Unicode is implemented, while those in symbols like ≈, ≍, ≅, ≈ or ≎ are so only in high-end environments. With less performing fonts, the confusing point is that unreversed-tilde-shaped elements may have either tilde semantics or reversed-tilde semantics, depending on the symbol they occur in.

There is no such problem with *slashes*, as all operators featuring a standalone solidus or diagonal (eventually circled or squared) have a matching mirrored counterpart in the UCS. Intercharacter glyph exchange mirroring leaves only negation strokes unmirrored, if not using variants with a vertical stroke.

## Background

Markus Scherer introduced the idea of intercharacter glyph exchange bidi-mirroring [L2/00-131].

Roosbeh Pournader volunteered to fulfil Action Item #82 of UTC meeting #153 [2] and submitted a list of missing pairs for version 11.0.0 of the Unicode Standard [L2/18-049R]. This was approved at UTC meeting #154, where it resulted in Action Item #95 [3].

To fix the above-mentioned issue, L2/17-438 §3.1 proposed that without dedicated RTL glyphs, no operator shall be mirrored for a tilde's sake, resulting in all tildes staying unmirrored, unless OpenType support is available to get all tildes mirrored. (Please note that revision 7 of this paper supersedes L2/18-026.) [4]

## Proposed changes

Unless or until the tilde legibility issue gets fixed by fine-tuning the Bidi\_Mirroring\_Glyph property, a warning to the attention of user communities is proposed for being anchored in the Standard.

In the Unicode Standard Annex (UAX) #9, *Unicode Bidirectional Algorithm*, section 7 Mirroring:

1. Insert a paragraph break after “The formal property name for this data in the Unicode Character Database [UCD] is Bidi\_Mirroring\_Glyph.”

2. Change the last sentence from:

A comment in the file indicates where the pairs are “best fit”: they should be acceptable in rendering, although ideally the mirrored glyphs may have somewhat different shapes.

to:

Comments in BidiMirroring.txt indicate where the pairs are “best fit”: they should ensure sufficient legibility, although the ideally mirrored glyphs have somewhat different shapes.

3. Continue the new paragraph with something like:

If the file is used to streamline the algorithms for publishing-ready rendering, the best-fit pairs should be discarded, and the right-to-left glyphs of the font be used instead. The purpose of the file is to help in implementing a legible rendering when right-to-left glyphs are not available.

[[ New paragraph ]]

In implementations fully relying on BidiMirroring.txt, the unmirrored rendering of tildes and slashes is the rule, except where the UCS has matching symbols with reversed tilde or reverse solidus. As a result, all solidi operators and diagonals are mirrored, while only negation strokes stay unmirrored or vertical. By contrast, most operators featuring a tilde show that tilde unmirrored, while six operators listed in the table below are mirrored.

[[ Table above goes here ]]

It is therefore recommended to advise end-users of this phenomenon with respect to legibility of mathematical formulae.

## References

L2/00-131: Markus Scherer, *Proposal for new Mirror.txt file with mirror-character*, 2000-04-18  
<https://www.unicode.org/L2/L2000/00131-mirror.txt>

L2/18-049R: Roozbeh Pournader, *Pair mappings missing from BidiMirroring.txt*, 2018-01-24  
<https://www.unicode.org/L2/L2018/18049r-bidi-mirror.txt>

[1] <https://www.unicode.org/Public/12.0.0/ucd/BidiMirroring.txt>

[2] <https://www.unicode.org/L2/L2017/17362.htm#153-A82>

[3] <https://www.unicode.org/L2/L2018/18007.htm#154-C25>

[4] <https://www.unicode.org/L2/L2017/17438-bidi-math-fdbk.html>

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