Emoji again

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Because at the ConTgXt 2016 meeting color fonts\textsuperscript{1} were on the agenda, some time was spent on emoji (these colorful small picture glyphs). When possible I bring kids to the BachoTgX conference so for the 2017 BachoTUG I decided to do something with emoji that, after all, are mostly used by those younger than I am. So, I had to take a look at the current state. Here are some observations.

The UNICODE standard defines a whole lot of emoji and if mankind manages to survive for a while one can assume that a lot more will be added. After all, icons as well as variants keep evolving. There are several ways to organize these symbols in groups but I will not give grouping a try. Just visit emojipedia.org and you get served well. For this story I only mention that:

- There are quite some shapes and nearly all of them are in color. The yellow ones, smilies and such, are quite prominently present but there are many more.
- A special subset is full of persons: man, woman, girl, boy and recently a baby.
- The grown ups can be combined in loving couples (either or not kissing) and then can form families, but only up to 2 young kids or gender neutral babies.
- All persons can be flagged with one of five skin tones so that not all persons (or heads) look bright yellow.
- Interesting is that girls and boys are still fond of magenta (pinkish) and cyan (blueish) cloths and ornaments. Also haircuts are rather specific to the gender.

For rendering color emojis we have a few color related OPENTYPE font properties available: bitmaps, SVG and stacked glyphs. Now, if you think of the combinations that can be made with skin tones, you realize that fonts can become pretty large if each combination results in a glyph. In the first half of 2017 MICROSOFT released an update for its emoji font and the company took the challenge to provide not only mixed skin tone couples, but also supported skin tones for the kids, including a baby. This recent addition already adds over 25,000 additional glyphs\textsuperscript{2} so imagine what will happen in the future. But, instead of making a picture for each variant, a different solution has been chosen. For coloring this seguemj font uses the (very flexible) stacking technology: a color shape is an overlay of colored symbols. The colors are organized in pallets and it’s no big deal to add additional pallets if needed. Instead of adding pre-composed shapes [as is needed with bitmaps and SVG] snippets are used to build alternative glyphs and these can be combined into new shapes by substitution and positioning (for that kerns, mark anchoring and distance compensation is used).

So, a family can be constructed of composed shapes [man, woman, etc] that each are composed of snippets (skull, hair, mouth, eyes). So, effectively a family of four is a bunch of maybe 25 small glyphs overlayed and colored. In figure 1 we see how a shape is constructed out of separate glyphs.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{emoji_snippets.png}
\caption{Emoji snippets.}
\end{figure}

\textsuperscript{1} For that occasion the cowfont, a practical joke concerning Dutch ‘koeieletters’, were turned into a color font and presented at the meeting.

\textsuperscript{2} That is the amount I counted when I added all combinations runtime but the emojipedia mentions twice that amount. Currently in ConTgXt we resolve such combinations when requested.
Figure 2: Emoji snippets overlayed.

Figure 2 shows how they can be overlayed with colors (we use a dedicated color set). When a font supports it, a sequence of emoji can be turned into a more compact representation. In figure 3 we see how skin tones are applied in such combinations.

When we have to choose a font we need to take the following criteria into account:

- What is the quality of the shapes? For sure, outlines are best if you want to scale too.
- How efficient is a shape constructed. In that respect a bitmap or SVG image is just one entity.
- How well can (semi) arbitrary combinations of emoji be provided. Here the glyph approach wins.
- Are all skin colors for all human related shapes supported? Actually it opens the possibility for racist fonts.
- Are all reasonable combinations of persons supported? It looks like (depending on time and version) kissing men or women can be missing, maybe because of social political reasons.
- Are black and white shapes provided alongside color shapes.

Maybe an SVG or bitmap image can have a lot of detail compared to a stacked glyph but, when we’re just using pictographic representations, the later is the best choice.

When I was playing a bit with the skin tone variants and other combinations that should result in some composed shape, I used the UNICODE test files but I got the impression that there are some errors in the test suite, for instance with respect to modifiers. Maybe the fonts are just doing the wrong thing or maybe some implement these sequences a bit inconsistently. This will probably improve over time but the question is if we should intercept issues. I’m not in favour of this because it adds more and more fuzzy code that not only wastes cycles (energy) but is also a conceptual horror. So, when testing, imperfection has to be accepted for now. This is no big deal as until now no one ever asked for emoji support in ConTEXT.

When no combined shape is provided, the original sequence shows up. A side effect can be that zero-width-joiners and modifiers become visible. This depends on the fonts. Users probably don’t care that much about it. Now how do we suppose that
users enter these emoji sequences in a document source? One can imagine a pop up in the editor but TeXies are often using commands for special cases. We already showed some combined shapes. The reader might appreciate the outcome but getting there from the input takes a bit of work. For instance a two person man light skin tone woman medium skin tone girl medium-light skin tone baby medium-light skin tone involves this:

```
font 67: seguiemj.ttf @ 10.0pt
features [basic: ccmp=yes, dist=yes, mark=yes, mkmk=yes, script=dflt, tlig=yes, trep=yes] [extra: analyze=yes, autolanguage=position, autoscript=position, checkmarks=yes, colr=yes, curs=yes, devanagari=yes, dummies=yes, extensions=yes, extrafeatures=yes, extraprivates=yes, kern=yes, liga=yes, mathkerns=yes, mathrules=yes, mode=node, spacekern=yes, visualspace=yes]
```

**step 2**

```
```

feature 'ccmp', type
'gsub_ligature', lookup 's_s_0', replacing U+1F467 upto U+1F3FC by ligature U+F01BC case 2

```
[+TLT] U+F147F: ☕️ ☕️ ☕️ ☕️ ☕️ U+F01D2: ☕️ ☕️ ☕️ ☕️ ☕️ U+200D: ☕️ ☕️ ☕️ ☕️ ☕️ U+F020E: ☕️
```

feature 'ccmp', type
'gsub_ligature', lookup 's_s_0', replacing U+1F476 upto U+1F3FC by ligature U+F020E case 2

step 3

```
[+TLT] U+F147F: ☕️ ☕️ ☕️ ☕️ ☕️ U+F01D2: ☕️ ☕️ ☕️ ☕️ ☕️ U+200D: ☕️ ☕️ ☕️ ☕️ ☕️ U+F020E: ☕️
```

feature 'ccmp', type
'gsub_contextchain', chain lookup 's_s_2', replacing single U+F01C5 by U+F147F

step 4

```
[+TLT] U+F147F: ☕️ ☕️ ☕️ ☕️ ☕️ U+F01D2: ☕️ ☕️ ☕️ ☕️ ☕️ U+200D: ☕️ ☕️ ☕️ ☕️ ☕️ U+F020E: ☕️
```

feature 'ccmp', type
'gsub_contextchain', chain lookup 's_s_3', index 1, replacing character U+200D upto U+F01D2 by ligature U+F14A7 case 4

```
[+TLT] U+F147F: ☕️ ☕️ ☕️ ☕️ ☕️ U+F01D2: ☕️ ☕️ ☕️ ☕️ ☕️ U+200D: ☕️ ☕️ ☕️ ☕️ ☕️ U+F020E: ☕️
```

feature 'ccmp', type
'gsub_contextchain', chain lookup 's_s_5', index 1, replacing character U+200D upto U+F01BC by ligature U+F1474 case 4
contextgroup > context meeting 2017

step 5  [+TLT] U+F147F: ⦖  
U+F14A7: ⦖ U+F1474: ⦘ U+200D: ⦘  
U+F020E: ⦧  

feature 'ccmp', type 'gsub_contextchain', chain lookup 's_s_6', index 1, replacing character U+200D upto U+F020E by ligature U+F14C2 case 4  


feature 'ccmp', type 'gsub_contextchain', chain lookup 's_s_7', replacing single U+F1474 by U+F1467  


feature 'dist', type 'gpos_single', lookup 'p_s_0', shifting single U+F147F by single U+F1474 by single (0pt,0pt) and wh (0pt,0pt)  


feature 'dist', type 'gpos_single', lookup 'p_s_1', shifting single U+F1474 by single xy (0pt,0pt) and wh (1.25pt,0pt)  


feature 'dist', type 'gpos_single', lookup 'p_s_2', shifting single U+F147F by single (0pt,0pt) and correction (1.25pt,0pt)  


feature 'dist', type 'gpos_contextchain', chain lookup 'p_s_3', shifting single U+F14A7 by single (4.76074pt,0pt) and correction (0pt,0pt)  


feature 'dist', type 'gpos_contextchain', chain lookup 'p_s_3', shifting single U+F14A7 by single (0pt,0pt) and correction (8.27148pt,0pt)  


feature 'dist', type 'gpos_contextchain', chain lookup 'p_s_5', shifting single U+F1474 by single xy (0pt,0pt) and correction (-4.76074pt,0pt)  

feature 'mark', type 'gpos_mark2base', lookup 'p_s_27', bound 1, anchoring mark U+F1467 to basechar U+F14A7 => (6.32812pt,0pt)
step 13 [\+TLT][kern] U+F147F: x
[kern][kern] U+F14A7: x [kern] U+F1467: x U+F14C2: x

feature 'mark', type 'gpos_mark2base', lookup 'p_s_28', bound 2, anchoring mark U+F14C2 to basechar U+F14A7 => (0.00977pt, 0pt)

result [\+TLT][kern] U+F147F: x
[kern][kern] U+F14A7: x [kern] U+F1467: x U+F14C2: x

A black and white example is the following family
woman girl:

font 70: seguiemj.ttf @ 10.0pt

features [basic: ccmp=yes, dist=yes, mark=yes, mkmk=yes, script=dflt, tlig=yes, trep=yes] [extra: analyze=yes, autolanguage=position, autoscript=position, checkmarks=yes, curs=yes, devanagari=yes, dummies=yes, extensions=yes, extrafeatures=yes, extraprivates=yes, kern=yes, liga=yes, mathkerns=yes, mathrules=yes, mode=node, spacekern=yes, visualscape=yes]

step 1 [\+TLT] U+1F469: 🌃
U+200D: ] U+1F467: 🌃

feature 'ccmp', type 'gsub_contextchain', chain lookup 's_s_4', replacing single U+1F469 by ligature U+1F46B case 4

step 2 [\+TLT] U+F149D: 🌃
U+1F46B: 🌃

feature 'ccmp', type 'gpos_contextchain', chain lookup 's_s_5', index 1, replacing character U+200D upto U+1F467 by ligature U+1F46B case 4

step 3 [\+TLT] U+F149D: 🌃
U+1F46B: 🌃

feature 'dist', type 'gpos_single', lookup 'p_s_1', shifting single U+F149D by single xy (0pt, 0pt) and wh (1.25pt, 0pt)

step 4 [\+TLT] U+F149D: 🌃 [kern] U+F146B: 🌃

feature 'dist', type 'gpos_contextchain', chain lookup 'p_s_4', shifting single U+F149D by single (1.25pt, 0pt) and correction (0pt, 0pt)

feature 'dist', type 'gpos_contextchain', chain lookup 'p_s_4', shifting single U+F149D by single (0pt, 0pt) and correction (4.76074pt, 0pt)

step 5 [\+TLT][kern] U+F149D: 🌃
[kern] U+F146B: 🌃

feature 'mark', type 'gpos_mark2base', lookup 'p_s_28', bound 1, anchoring mark U+F146B to basechar U+F149D => (0.00977pt, 0pt)

result [\+TLT][kern] U+F149D: 🌃
[kern] U+F146B: 🌃
I will not show all emoji, just the subset that contains the word woman in the description. As you can see the persons in the sequences are separated by a zero-width-joiner. There are some curious ones, for instance a woman wearing turban which in terms of UNICODE input is a female combine with a turban wearing man that becomes a beardless woman wearing a turban. Woman vampires and zombies are not supported so these are male properties.
<table>
<thead>
<tr>
<th>Woman Farmer</th>
<th>Officer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woman Firefighter</td>
<td>Woman Pouting</td>
</tr>
<tr>
<td>Woman Flat Shoe</td>
<td>Woman Raising</td>
</tr>
<tr>
<td>Woman Frowning</td>
<td>Woman Hand</td>
</tr>
<tr>
<td>Woman Genie</td>
<td>Woman Red Haired</td>
</tr>
<tr>
<td>Woman Gesturing No</td>
<td>Woman Rowing</td>
</tr>
<tr>
<td>Woman Gesturing Ok</td>
<td>Woman Boat</td>
</tr>
<tr>
<td>Woman Getting Haircut</td>
<td>Woman Running</td>
</tr>
<tr>
<td>Woman Getting Massage</td>
<td>Woman Sandal</td>
</tr>
<tr>
<td>Woman Golfing</td>
<td>Woman Scientist</td>
</tr>
<tr>
<td>Woman Guard</td>
<td>Woman Shrugging</td>
</tr>
<tr>
<td>Woman Hat</td>
<td>Woman Singer</td>
</tr>
<tr>
<td>Woman Health Worker</td>
<td>Woman Student</td>
</tr>
<tr>
<td>Woman in Lotus Position</td>
<td>Woman Superhero</td>
</tr>
<tr>
<td>Woman in Steamy Room</td>
<td>Woman Supervillain</td>
</tr>
<tr>
<td>Woman Judge</td>
<td>Woman Surfing</td>
</tr>
<tr>
<td>Woman Juggling</td>
<td>Woman Swimming</td>
</tr>
<tr>
<td>Woman Lifting Weights</td>
<td>Woman Teacher</td>
</tr>
<tr>
<td>Woman Mage</td>
<td>Woman Technologist</td>
</tr>
<tr>
<td>Woman Mechanic</td>
<td>Woman Tipping</td>
</tr>
<tr>
<td>Woman Mountain Biking</td>
<td>Woman Hand</td>
</tr>
<tr>
<td>Woman Office Worker</td>
<td>Woman Vampire</td>
</tr>
<tr>
<td>Woman Pilot</td>
<td>Woman Walking</td>
</tr>
<tr>
<td>Woman Playing Handball</td>
<td>Woman Wearing Turban</td>
</tr>
<tr>
<td>Woman Playing Water Polo</td>
<td>Woman White Haired</td>
</tr>
<tr>
<td>Woman Police</td>
<td>Woman With Headscarf</td>
</tr>
<tr>
<td>Woman Zombie</td>
<td></td>
</tr>
</tbody>
</table>
So what if you don't like these colors? Because we're dealing with TeX you can assume that if there is some way around the fixed color sets, then it will be provided. So, when you use ConTeXt, here is a way to overload them:

\definecolor[emoji-red][r=.4]
\definecolor[emoji-green][g=.4]
\definecolor[emoji-blue][b=.4]
\definecolor[emoji-yellow][r=.4,g=.4]
\definecolor[emoji-gray][s=1,t=.5,a=1]

\definefontcolorpalette[emoji-s][black,emoji-gray]
\definefontcolorpalette[emoji-r][emoji-red,emoji-gray]
\definefontcolorpalette[emoji-g][emoji-green,emoji-gray]
\definefontcolorpalette[emoji-b][emoji-blue,emoji-gray]
\definefontcolorpalette[emoji-y][emoji-yellow,emoji-gray]

\definefontfeature[seguiemj-s][ccmp=yes,dist=yes,colr=emoji-s]
\definefontfeature[seguiemj-r][ccmp=yes,dist=yes,colr=emoji-r]
\definefontfeature[seguiemj-g][ccmp=yes,dist=yes,colr=emoji-g]
\definefontfeature[seguiemj-b][ccmp=yes,dist=yes,colr=emoji-b]
\definefontfeature[seguiemj-y][ccmp=yes,dist=yes,colr=emoji-y]

\definefont[MyEmojiS][seguiemj*seguiemj-s]
\definefont[MyEmojiR][seguiemj*seguiemj-r]
\definefont[MyEmojiG][seguiemj*seguiemj-g]
\definefont[MyEmojiB][seguiemj*seguiemj-b]
\definefont[MyEmojiY][seguiemj*seguiemj-y]

In figure 4 we see how this is applied. You can provide as many colors as needed but when you don’t provide enough the last one is used. This way we get the overlaid transparent colors in the examples. By using transparency we don’t obscure shapes.

The emojipedia mentions “Asked about the design, MICROSOFT told emojipedia that one of the reasons for the thick stroke was to allow each emoji to be easily read on any background color.” The first glyph in the stack seems to do the trick, so just make sure that it doesn’t become white. And, before I read that remark, while preparing a presentation with a colored background, I had already noticed that using a background was no problem. This font definitely sets the standard.

How do we know what colors are used? The next table shows the first color palette of seguiemj. There are quite some colors so defining your own definitely involved some studying.
Normally special symbols are accessed in ConTeXt with the symbol command where symbols are organized in symbol sets. This is a rather old mechanism and dates from the time that fonts were limited in coverage and symbols were collected in special fonts. The emoji are accessed by their own command: \emoji. The font used has the font synonym emoji so you need to set that one first:

\definefontsynonym [emoji] [seguiemj*seguiemj-cl]

Here is an example:

\emoji{woman light skin tone}\quad \emoji{woman scientist}\quad \{\bf d bigger \emoji{man health worker}}

or typeset: 👧🏻 👬更大的형님

The emoji symbol scales with the normal running font. When you ask for a family with skin toned members the lookup can result in another match (or no match) because one never knows to what extend a font supports it.

\expandedemoji the sequence constructed from the given string
\resolvedemoji a protected sequence constructed from the given string
\checkedeemoji an typeset sequence with unresolved modifiers and joiners removed
\emoji a typeset resolved sequence using the emoji font synonym
\robustemoji a typeset checked sequence using the emoji font synonym

In case you wonder how some of the details above were typeset, there is a module fonts-emoji that provides some helpers for introspection.

\ShowEmoji
\ShowEmojiSnippets
\ShowEmojiSnippetsOverlay
\ShowEmojiGlyphs
\ShowEmojiPalettes

Examples of usage are:

\ShowEmojiSnippets [family man woman girl boy]
\ShowEmojiGlyphs [family man woman baby girl]
\ShowEmoji [\^man]
\ShowEmoji
\ShowEmojiPalettes
\ShowEmojiPalettes[1]
A good source of information about emoji is the mentioned emojipedia.org website. There you find not only details about all these symbols but also has some history. It compares updates in fonts too. It mentions for instance that in the creative update of Windows 10, some persons grew beards in the seguemj font and others lost an eye. Now, if you look at the snippets shown before, you can wonder if that eye is really gone. Maybe the color is wrong or the order of stacking is not right. I decided not to waste time looking into that. Another quote: “Support for color emoji presentation on MS WINDOWS is limited. Many applications on MS WINDOWS display emojis with a black and white text presentation instead of their color version.” Well, we can do better with TeX, but as usual not that many people really care about that. But it’s fun anyway.

We end with a warning. When you use ‘ligatures’ like this, you really need to check the outcome. For instance, when MICROSOFT updated the font end 2017, same gender couples got different hair style for the individuals so that one can still distinguish them. However, kissing couples and couples in love (indicated by a heart) seem to be removed. Who knows how and when politics creep into fonts: is public mixed couple kissing permitted, do we support families with any mix of gender, is associating pink with girls okay or not, how do we distinguish male and female anyway? In figure 5 we see the same combination twice, the early 2017 rendering versus the late 2017 rendering. Can you notice the differences?

Figure 5: Incompatible updates.