

The question:

It took me ages to find the bug in the following spu code.

If you really have nothing to do and you feel like a challenge, see if you can spot it.

Given quadword x, 4 angles each in the range 0 to 1, representing 0 to 2pi radians, it remaps angles into the 2 waveforms shown, which are then suitable as inputs to a half-wave sine function producing valid output in the $-\pi/2$ to $\pi/2$ range, as a prelude to evaluating cos and sin for the angles... and it achieves this in 6 instructions. Except, as shown, it doesn't quite...

```
// note: sign_bit = 0x80000000 in each word
//      half = 0.5f in each word
//      quarter = 0.25f in each word
//      input is in x
//      arg_c0, arg_c1, arg_s0, arg_s1 are temporaries
//      range-reduced values are output in arg_c (ready for cos)
//      and arg_s (ready for sin)

// range-reduction for cos
fs      arg_c0, half, x
andc    arg_c1, arg_c0, sign_bit
fs      arg_c, arg_c1, quarter

// range-reduction for sin
andc    arg_s0, arg_c, sign_bit
fs      arg_s1, arg_s0, quarter
selb    arg_s, arg_s1, arg_c0, sign_bit //
```

The diagram illustrates the range-reduction process for cosine and sine. On the left, a sawtooth wave is shown with a period of π . The first half-cycle (from 0 to $\pi/2$) is the positive half-cycle, and the second half-cycle (from $\pi/2$ to π) is the negative half-cycle. An arrow points to the right, where the resulting waveform is shown. For cosine, the resulting waveform is a half-wave sine wave, which is zero at $\pi/2$ and $3\pi/2$, and has a peak at π . For sine, the resulting waveform is a half-wave cosine wave, which is zero at $\pi/2$ and $3\pi/2$, and has a peak at 0 and 2π .

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P.S. I'll give the answer tomorrow.