Base 3 Time

"The Ramans do everything in threes" – Arthur C. Clarke, the last line of *Rendezvous with Rama*

Some time ago it occurred to me that it would be kind of cool to build a base 3 clock. A very cheap way to do this, compared to how we build base 10 displays, would be to use a multicolor LED for each digit and color-code the three possible values. One could, for example, take the example of traffic lights and the order in which they change, Green-Yellow-Red to mean either -1, 0, 1 or 0, 1, 2 depending on whether you intend a balanced or unbalanced ternary system. Since clocks don't involve multiplication the balanced/unbalanced distinction actually doesn't affect a clock.

Back in a certain day the basic multicolor LED was a red and a green wired back to back; feeding the composite LED alternating current generated yellow. Nowadays most multicolor LED's are full RGB but the blue could come in useful for another reason to be mentioned later.

Grouping

Just as a binary digit is a bit, it seems common to call a ternary digit a trit.

While the ternary multiplication table is wonderfully simple, it's also wonderfully impractical since, like binary, ternary representations of practical numbers tend to have an unwieldy number of digits; for example, the 3 digit decimal 100 is 6 trit 10201 ternary. So, just as we group bits into octal or hexadecimal groups for convenience, would a three-thinking race adopt a grouping of trits?

The Soviet Setun 6 computer, the only practical ternary computer ever built, used a "tryte" of 6 trits. This could be regarded in turn as either three base 9 tribbles or two base 27; in either case the maximum decimal value is 728 represented either as QQ (assuming decimal 10 is A as in normal hexadecimal notation and Forth) or 999.

Base 9 tribbles are comfortably close to base 10 digits. Base 27 is very economical but involves a much greater investment in digit memorization. However the Mayans were able to work in base 60, and my own middle school made us memorize multiplication tables through decimal 25 x 25.

I think it's reasonable to assume a somewhat fluid approach if we're using an LED trit display, to assume that both base 9 and base 27 are used according to convenience with both being expressed as groupings of trits. (Our clock might be as much of a novelty to the Ramans as a binary clock is for us.)

Dividing the Day

So it seems reasonable to assume that Ramans have a day and need to divide it up into intervals. A single trit conveniently divides the day into three intervals that conveniently match our own clocks, morning from 0 to 1, midday from 1 to 2, and evening from 2 through midnight.

A second trit gives us decimal 9 divisions, each being exactly 2 hours 40 minutes long. This is actually close to the system used by monasteries, which divided the day into decimal 8 intervals, and which led directly to modern time notation.

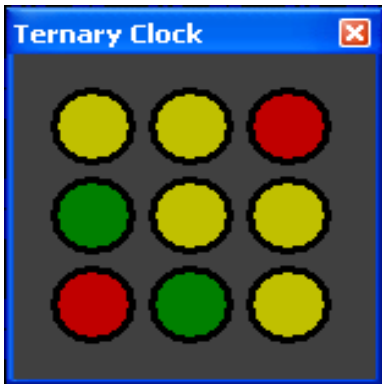
A third trit gives decimal 27 divisions which is conveniently close to the 24 hour divisions we use, with each interval being 53 minutes 20 seconds long. If the Ramans use base 27 tribbles this would be a

single digit. We can represent it nicely as a row of three trits, which has a nice three-ness about it.

What do we call this one-tribble division of the day? The etymology of *hour* is fairly ancient and in a lot of cases has little to do with the way we divide the day today. For the rest of this essay I am going to assume the Ramans have a 27-house astrological system, flip to another language, and call it a *casa*. Feel free to pick your own random word when you write your followup essay.

As the medieval Ramans improved their clocks they would surely proceed to add a second tribble to subdivide the casa. Unlike the casa tribble where each trit has some significance at this point we're just counting off smaller intervals; a second tribble gives us an interval of 1 minute 58 seconds, allowing the Ramans to get a precision with two elegant tribbles (or two rows of three trits) that our notation needs four to achieve. Since the Spanish word for “room” isn't as punchy as the word for “house” I'll flip to French and call this ternary minute a *salle*. The Ramans would probably use the salle about as we use the minute for scheduling activities that don't fall neatly on the casa but don't really involve mechanical precision.

And adding a third tribble, which is a pleasantly three-ish thing to do, gives us a division of 4.389 seconds, for which I will flip back to Spanish and snag the false cognate *estante*. Behold the standard Raman clock, all full of delicious threes:



It's totally obvious that this is 12:36 PM, right?

As I was playing with the implementation I realized that it's a bit static compared to a clock with a second hand or display; the least significant trit (at the lower right) only changes every 4 seconds, which is a bit longer than the usual clock glance. I improved the situation (and also provided a cue for orientation, should you say wake up and see this clock in a dark room) by blinking the LST three times per estante, and making the three blinks different, starting long and getting shorter toward the next change of estante, and makes the clock a bit more of a dynamic toy.

It is really easy to implement this in VB thanks to the Timer function; one of these days I'd like to build one in a normal clock form factor, but ironically time has been a problem for such projects.

In any case I have included the VB source code and the compiled executable, which has no dependencies and should run on any Windows system which has ever had a VB6 app (which is all of them out of the box since Windows 2000).

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