An implementation on the Mayan numbering system in *DERIVE*

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ABSTRACT

The Mayan number system is a base *20*, positional (to be read from top to bottom, not from left to right) system that makes use of a symbol representing zero. It has slightly different variations when used for counting days (in religious and astronomical contexts).

Therefore, *20* symbols are needed to represent *0,1,2,...,19*. Of these, the positive ones were represented using dots (the value of each dot is *1*), and horizontal segments (the value of each segment is *5*), while the zero was denoted by a shell (see figure below).
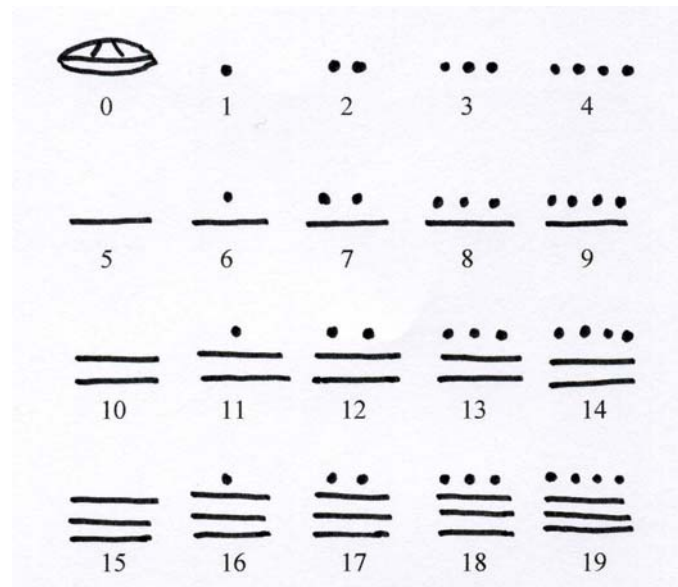
If a number is greater than *20*, the symbols corresponding to units, twentieths, *400's*, *8000's*… are stacked from bottom (units) to top in pure base *20*, while in our decimal system, the different orders correspond to tenths, hundreds, thousands, etc.

We can choose the input and output bases in *DERIVE* in *Options > Mode Settings* from *2, 8, 10* and *16*. Therefore we have implemented a procedure that allows to convert numbers between any bases, and that returns the output in (row) vector style.

We have implemented another procedure that builds the *20* Mayan symbols for *0,1,2,…19* (making use of the DISPLAY command). Finally, another procedure (denoted `Maya`), that uses the previously mentioned procedures, converts any number from base *10* to base *20* and represents it in the Mayan numbering system. These procedures only make use of the standard DERIVE commands.

For instance, for *2821* we would obtain:

```
#10:                                    maya(2821) =
```

(note that *2821 = 6 × 20 × 20 + 16 × 20 + 1*).

We do not know of any other similar implementations in CASs, apart from [1] (that uses special facilities for inserting graphics) and the similar [2], by the same authors of this paper, but written in *Maple*.

We believe this is an interesting example of synergy among different branches of knowledge (Mathematics, History of Mathematics and Computer Science), that can increase the interest of the students for different topics.

Acknowledgments

Bibliografía

[1] URL: `http://www.mapleprimes.com/forum/convertmayannumber`

[2] E. Roanes Lozano, F.A. Gonzalez-Redondo: Implementación del sistema de numeración maya en *Maple*: una experiencia interdisciplinar. Bol. Soc. Puig Adam 83 (2009). To appear.