CommonUnits — Draft

CommonUnits Contributors

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Preface

I should start by saying that CommonUnits started as a chat in a Developers community on Telegram. Devs Chat is one of the groups in the TheDevs[1] network. See their list of groups at `https://thedevs.network`.

Why CommonUnits?

The International System of Units (Système international/SI) did an excellent job at defining standard units for use in scientific and daily use. They built on top of the metric system and set in stone (or metal, in the case of the kilogram) the units that were to be followed for decades to come. The SI system was great when it was published in 1960. However, today, as some of us look back and say, “Why is time 60 seconds in a minute instead of 100?”, “Why is 11:50 not midway from 11 to lunchtime?”, it might be worth thinking of an alternative system—one set entirely in base 10.

Why base 10?

Base 10 is the most intuitive for humans to understand. The reason is straightforward: we have ten fingers to count with. As a child at school, I remember me and my batch being unable to understand why some units were different from others. As we grew older, we have come to get used to the weirdness of our units—but that does not mean we should settle for what exists. We might as well be still running MS-DOS on IBM clones with that mindset.

The quirks of SI

SI has seven base units—metre, kilogram, second, ampere, kelvin, mole, and candela.

A metre is 1000 millimeters, a litre is 1000 milliters, an ampere is 1000 milliamperes, and a candela is 1000 millicandelas. But:

- A kilogram is 1000 grams — kilogram is the base unit, not grams.
- 60 seconds make a minute.
- One kelvin is simply a kelvin.
- One mole is the amount of substance that contains as many (arbitrary) representative particles as in 12 grams of Carbon-12.

Likewise, we have the following derived units:

- radian (angle)
- hertz (frequency)
- newton (force, weight)
- pascal (pressure, stress)
- joule (energy, work, heat)

[1] `https://t.me/thedevs`

- watt (power, radiant flux)
- coulomb (electric charge or quantity of electricity)
- volt (voltage (electrical potential difference), electromotive force)
- farad (capacitance)
- ohm (electrical resistance, impedance, reactance)
- siemens (electrical conductance)
- weber (magnetic flux)
- tesla (magnetic flux density)
- henry (inductance)
- degree Celsius (temperature)
- lumen (luminous flux)
- lux (illuminance)
- becquerel (radioactivity (decays per unit time))
- gray (absorbed dose (of ionizing radiation))
- sievert (equivalent dose (of ionizing radiation))
- katal (catalytic activity).

A decimal time system is not unheard of. The French and Chinese have done it[2] . It just never became a global standard. Similarly, gradian[3] is an alternative to degrees or radians in angle measurement. 100 gradians make a quadrant, and 400 make a circle.

Maybe those mentioned above were not perfect on their own either. However, we have to consider how best to solve the problems of moving from Frankenstein-like units to pure base 10. Several other units mentioned above have their quirks which at the time of creation of the SI, might have been as far as they could get.

Moreover, since the SI also defines ten metric prefixes[4] , might as well make full use of them.

Goals

Our goal is to try to renormalise as many of these units to base 10 and use more intuitive standards. The CommonUnits[5] manifesto needs help making, and every bit is appreciated. Raise issues[6] and start pull requests[7] as you deem fit.

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[2] https://en.wikipedia.org/wiki/Decimal_time
[3] https://en.wikipedia.org/wiki/Gradian
[4] https://en.wikipedia.org/wiki/Metric_prefix
[5] https://github.com/commonunits/draft
[6] https://github.com/commonunits/draft/issues/new/choose
[7] https://github.com/commonunits/draft/compare

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Chapter 1: Challenges

1.1 Resistance

The proposed CU System has massive challenges. Obviously.
The first of them is general criticism and resistance. **Obviously**.
As a race, we've always **tried** to resist change, for good or bad—but change never stops.

1.2 Inertia

The second challenge is *inertia to change*. When something new gets introduced, there is a time-gap for that change to be in effect where it does the opposite of productivity. It adds an extra overhead on things that have become easy over time. Said overhead can be countered with the argument that **after** a new system is adopted, it would make things easier than the old system ever did.

Defining a bunch of units is the easier part. Fathoming its implications is an entirely different matter. Every single textbook would need to change to adapt to a new system if one was to be created. Practising mathematicians and physicists would curse the creators of such new standards. There needs to be a graceful fallback or downgrade to SI. All this sounds very simple, but as I write, my heart trembles.

Take the speed of light in space for example. It will not be $3 \cdot 10^8 m/s$ anymore (or $299,792,458 m/s$ if you want to be accurate).
Light travels 25,902,068,371,200 metres in 86,400 seconds or a regular day.
Make the following assumptions:

A regular day is 100 kiloclarkes.

A kiloclarke is 10 hectoclarkes.

A hectoclarke is 100 clarkes (After Arthur C. Clarke[1] , influential science fiction author, affectionately called Prophet of the Space Age).
Therefore, a day is simply 100,000 clarkes.
The speed of light in CU is now $2.59 \cdot 10^8 metres/clarke$ instead. Such a change would probably face criticism because by convention, we have learnt the speed of light as $3 \cdot 10^8 m/s$. CommonUnits is however convenient because it equals to $2.59 \cdot 10^{13}$ metres in a day. Observe how only the order of magnitude changes while the mantissa/significand stays the same (approximated to two decimals in mantissa):
The speed of light in SI:

$2.99 \cdot 10^8 m/second$
$1.79 \cdot 10^{10} m/minute$
$1.07 \cdot 10^{12} m/hour$
$2.59 \cdot 10^{13} m/day$

The speed of light in CU:

$2.59 \cdot 10^8 m/clarke$
$2.59 \cdot 10^{10} m/hectoclarke$
$2.59 \cdot 10^{11} m/kiloclarke$
$2.59 \cdot 10^{12} m/day$

Disclaimer: The above is cited purely as an example, and does not attempt to define the standard for clarkes.

[1] https://en.wikipedia.org/wiki/Arthur_C._Clarke

1.3 Practicality

This is not to say that it's all roses and unicorns in the land of decimals. Some units are more resilient to change than others. Angles are a particular case. Measuring angles in decimals is by far one of the hardest things to tackle. *Gradians* is a very reasonable way to do it—100 gradians in a right angle and 400 in a circle. The disadvantage is that 2 of 5 standard angles would become repeating decimals.
0 degrees would become 0 gradians.
30 degrees would become $\frac{100}{3}(33.\overline{3})$ gradians.
45 degrees would become 50 gradians.
60 degrees would become $\frac{200}{3}(66.\overline{6})$ gradians.
90 degrees would become 100 gradians.
The pattern continues in that fashion. Here we cannot like before, arbitrarily choose to dismiss the inconvenient angles. For example, 30 and 60-degree angles have widespread existing application in mathematics, physics, chemistry, architecture, and countless other fields. Even if we did hypothetically change these to $0, 25, 50, 75$ and 100, their sin and cosine values would be ridiculous. At the moment of writing, suitable solution has yet to be realised.