Geosci. Instrum. Method. Data Syst. Discuss.,
https://doi.org/10.5194/gi-2019-27-RC1, 2019

Geoscientific Instrumentation Methods and Data Systems Discussions

Interactive comment on "Low power GPS drifters with local storage and GSM modem made from off the shelf components" *by* Rolf Hut et al.

Anonymous Referee #1

Received and published: 29 November 2019

General comments:

This manuscript describes the building of a low-cost GPS drifter, and provides the instructions to assemble the device from off-the-shelf components, and to program the microprocessor. The manuscript also provides some broader discussion of the concept of "Open Hardware", and its relevance for scientific practice.

Although I appreciate the authors' clear enthusiasm for low-cost modular and (partly) open source technology that promotes "tinkering", I have several reservations with the current manuscript.

First of all, the scientific content is extremely thin. From a technical perspective, the presented solution is very simple. Literally hundreds of examples of similar (and often

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far more sophisticated) designs can be found online, especially within the user communities of the presented technologies. This does not mean that documented another one has no value, but in this case the presented design fails to push sufficiently the technical or scientific boundaries to warrant publication in a peer-reviewed journal (see below for some specific comments on this aspect).

I understand the simplicity of the design is part of the focus of the article, as a way to show how these technologies are becoming more accessible for geoscientists. In itself, I think that this is a valid focus. Technologies such as Arduino have indeed made hardware (and related software) more accessible via a combination of open source licenses, online availability, and modular hardware components. But also here, the manuscript does not endeavor beyond the most well known and obvious.

On the contrary, I find some aspects of this discussion problematic. One is of an ideological nature: as far as I know, the particle.io is not fully open source. Contrary to Arduino, I do not think that the firmware nor the compiler chain are open source (though I would be happy to be proven wrong). They also rely on a commercial telemetry platform, which seems to go against the open source ideology. So it is a bit of an odd choice for a project that advocates open source.

Another aspect is more theoretical: the manuscript seems to divide (geo)scientists in a rather black-and-white fashion into 2 categories, i.e. those with electrical and software engineering skills, and those without. I think that reality is far more nuanced and very different processes are at play here.

One is the open source philosophy, which has indeed promoted accessibility and affordability. Another aspect is simply technological advances - the open source movement does not have an exclusive access to low-cost technology; there is nothing that intrinsically prevents commercial entities to make products of similar levels of cost (and reliability). The fact that this may not happen is probably more an economic question (e.g., lack of sizeable market) than a technological one.

Lastly, the aspect of easy-of-use is much more complex than the authors suggest. Surely the current design is easier to build now than 20 years ago - but it still requires a level of non-trivial expertise that may or may not be available in a research team. The choice for a specific technology will depend on the specific project needs, as well as the available skills, time, and resources available. The availability of open hardware is definitely a useful addition to widen the technological options in this context, but the whole process is probably more complex than the "cheaper-is-better" optimism that this manuscript exudes.

To conclude, the manuscript scratches a surface beyond which there is a lot of interesting science to explore, both in terms of technology and the broader application context. But unfortunately the current manuscript stays very close to that surface.

Specific comments:

- Power consumption: the abstract mentions that making such devices operate at low power levels requires detailed electric expertise. However, this is not elaborated in the manuscript. The manuscript itself is very brief on power consumption, with as main message that the sleep current is around 200uA. That is in itself not very spectacular - many microCPUs consume only a few uA in sleep modes. I assume that in this case the main power consumption is the GPS (although it would be nice to see some specific results). I also wonder whether the detailed electric expertise refers to putting the CPU in sleep mode (which seems pretty straightforward with a single command in the code) or whether it refers to bringing the consumption down below the current 200uA. If the latter, then it would be good to elaborate further. If this is what a GPS needs to maintain a fix on satellites, then it may be very hard to reduce this, even with detailed electric expertise.

- why do you use an SD card? An EEPROM or flash memory chip should provide sufficient storage at a lower cost and lower power consumption.

- is the solar panel really relevant? If it only extends the battery life of the device with

2 days, then adding a second battery seems to be a more logical option. Additionally, a battery life of 2 days seems short if the standby power consumption is only 200uA. Also here, a more detailed assessment of power consumption would be useful.

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