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DIY approach to measuring surface water properties in the estuary

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The monitoring of water bodies, specifically complex ones such as estuaries, has been historically limited. Various research efforts were hindered due to the gaps in the technology implementation and accompanied by the price of developed solutions (usually as a black box for the end-user). However, thanks to the growing trend of open source solutions both in hardware and software domain, it has become more available to apply the DIY (do it yourself) approach and build the equipment that one might need. As all frugal innovations tend to emerge from a problem that had an existing commercial solution but was too demanding on resources, the floating measurement system presented in this study was designed to get surface water properties simultaneously in multiple points. Using multiple commercial probes to do such measurements was too expensive. Therefore, we have developed an innovative low-cost drifter based on the Arduino platform as an alternative. Our device is designed to measure position, temperature, and electrical conductivity in multiple drifter realisations or short-term moored measurements. The system consists of a floating container equipped with the following components: an Arduino Mega development board, a power management module, an SD card logging module, a Bluetooth module, a temperature measuring module, a global positioning satellite (GPS) position module, and a newly developed module for measuring electrical conductivity (EC). The applicability was tested at the estuary of River Jadro near Split (Croatia) and obtained spatial data (velocity, temperature, electrical conductivity and salinity) was analysed and compared with analytical models. All used tools are open-source and greatly supported by the worldwide community. Furthermore, we consider this prototype to be one of the first steps toward development of various DIY monitoring systems with a potential for a broader range of applications. We present our work with a purpose to initiate a dialogue with more collaborators interested in developing different variations of custom-built sensors for water properties.