New developments of OhmPi, an open-source and open Hardware resistivity-meter

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A major research effort in recent decades has led to the development of multi-electrodes, multi-channels, accurate, robust and versatile resistivity meters. This work has contributed to the emergence of the electrical resistivity tomography technique and has led to major advances in many fields such as geosciences or the environment or civil engineering. The main limitation of this equipment does not lie in its quality or robustness in the field. It concerns the cost of the equipment and its low adaptability for specific scientific problems.

For these reasons, the method is underused for humanitarian applications, in developing countries and for non-profit applications (archaeology, environment). In the field of environment, civil engineering or geosciences, geophysical monitoring has become a key to assess natural systems and phenomena. For these problems, the immobilisation of one or more resistivity meters is not always technically and financially possible. Finally, many applications today require the ability to control the measurement with external information and thus optimise the measurement in the context of a "big data". The OhmPi project aims at proposing an open source hardware and software resistivity meter to the community and the academic world. The objective of this work is to present OhmPi, an open source resistivity meter based on a Raspberry Pi board for dedicated applications. In a first step, we will briefly present the hardware required for multiplexed 4-points measurement. In a second step, we will present the results obtained during laboratory and field experiment. In the last step, we will introduce the latest developments, in particular the proposed communication protocol and the new graphical user interface.
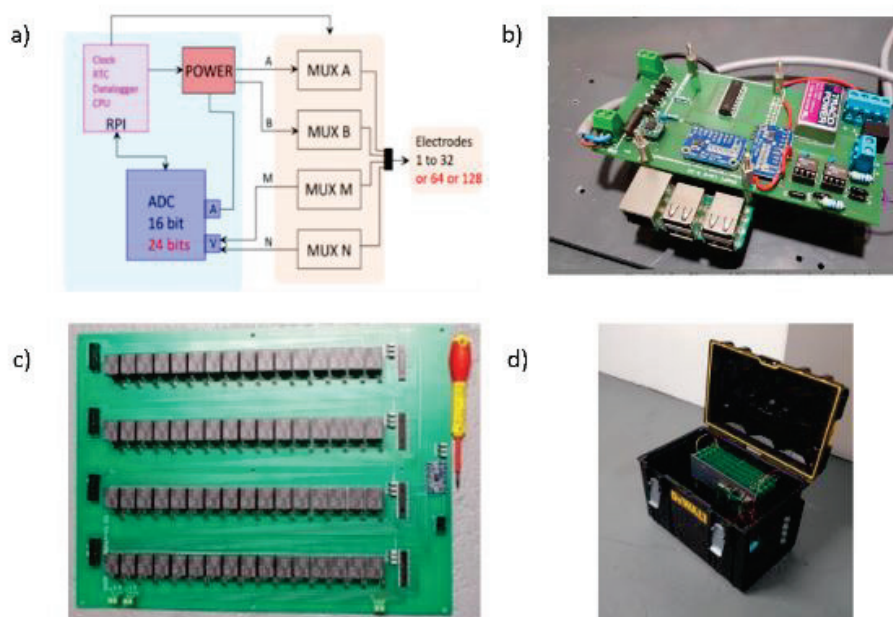
Figure: Ohmpi v2 description: a) schematic of Ohmpi, b) new plug and play acquisition board plugged on a raspberry Pi 3B, c) new I2C multiplexer board 64 electrodes, d) Ohmpi in the box.