Energy Report: Navigation
EPFL Xplore

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Title: ERC 2023 Energy Report for the Navigation task

Executive Summary:

The purpose of this report is to highlight the energy consumption and power usage during the Navigation task in the ERC 2023 competition. This document complies with the REQ-FUN-250 requirement, as stated in the official ERC 2023 rules:

> "Rover shall be able to measure power consumption for each task during its execution."

This report fulfils all aspects of the aforementionned requirement. In addition, it provides insighful data and graphs about the power consumption on the different voltage rails that power the rover's subsystems.

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1 Energy consumption

During the Navigation task, the rover used (60 ± 4) Wh of energy. In particular, for every subsystem, the energy consumptions were measured and reported.

Figure 1.1 summarizes how the rover's energy was distributed during the mission.

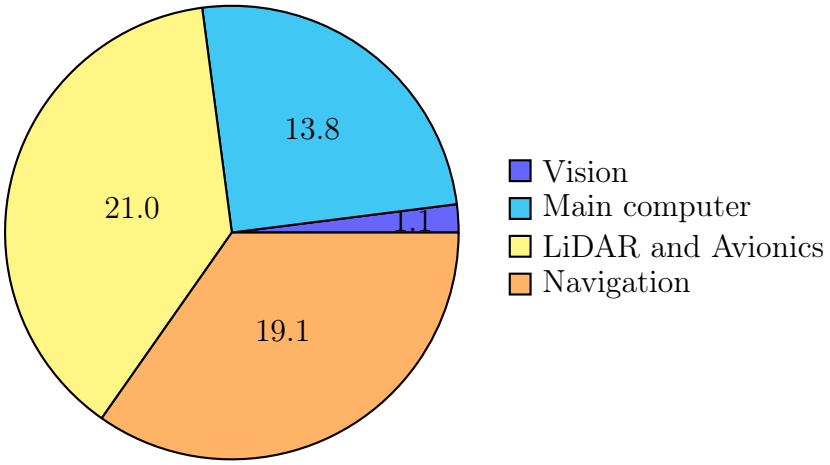

Figure 1.1: Energy consumption per subsystem [Wh]

The state-of-charge of the battery at the end of the mission could be estimated thanks to the battery cell voltage curve and the rover's energy consumption estimate. The battery voltage and energy consumption through time were plotted in Figure 1.2.
The battery cell voltage, along with the total energy consumption, allowed us to estimate the projected remaining operational time of the rover. If the rover had a constant power usage, it would have been operational for (230 ± 5) minutes.

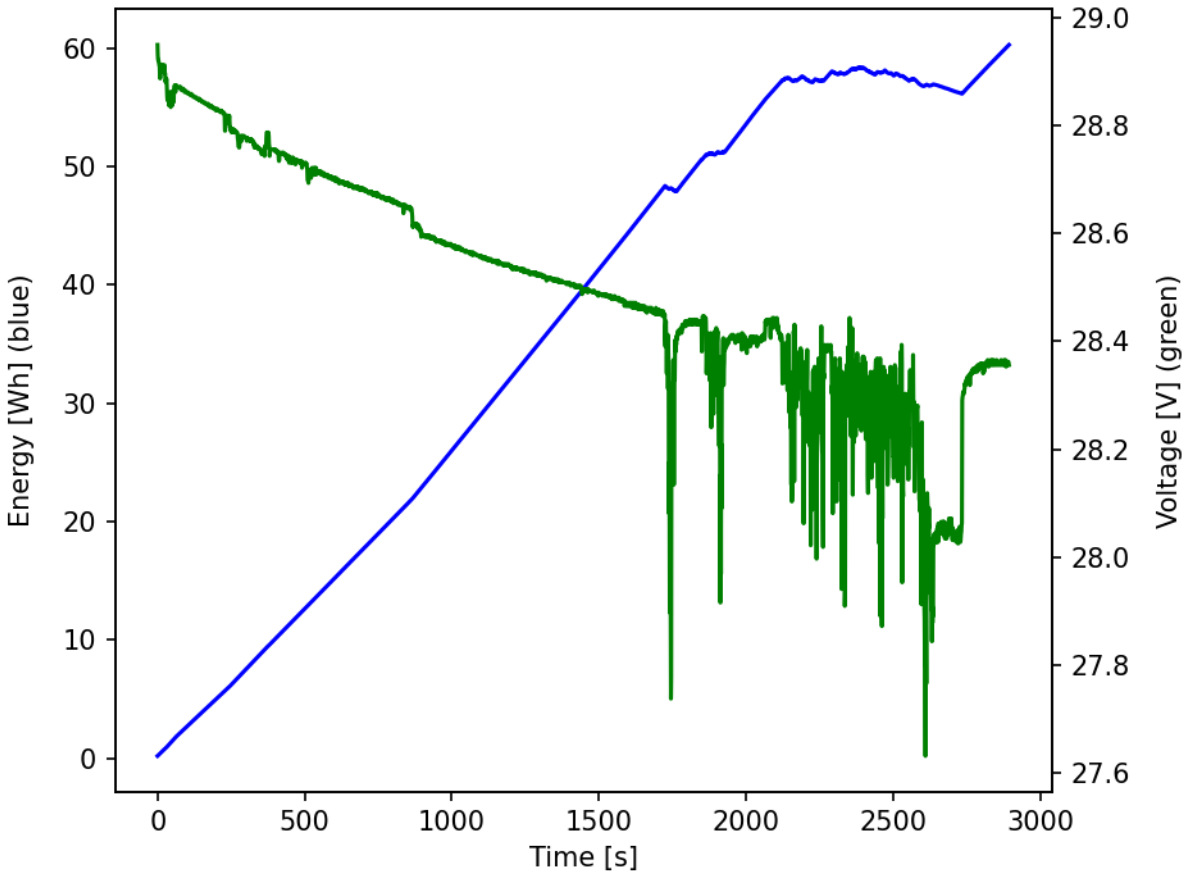

Figure 1.2: Battery state-of-charge estimators versus time

2 Power usage

Throughout the mission, the EPFL Xplore rover made use of more or less power, according to the mission operations procedure and unknown environmental effects. The total used power is plotted in Figure 2.1

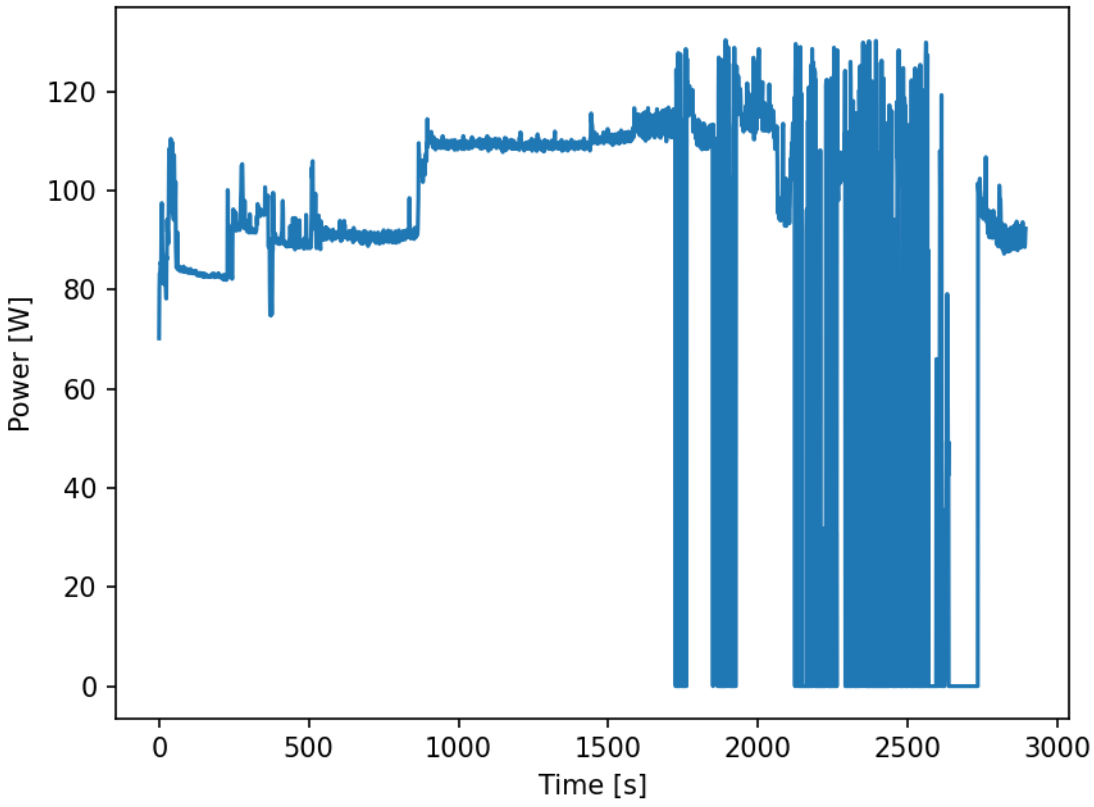

Figure 2.1: Total power delivery versus time

In addition, the evolution of the power usage per subsystem was also recorded and plotted in Figure 2.2.

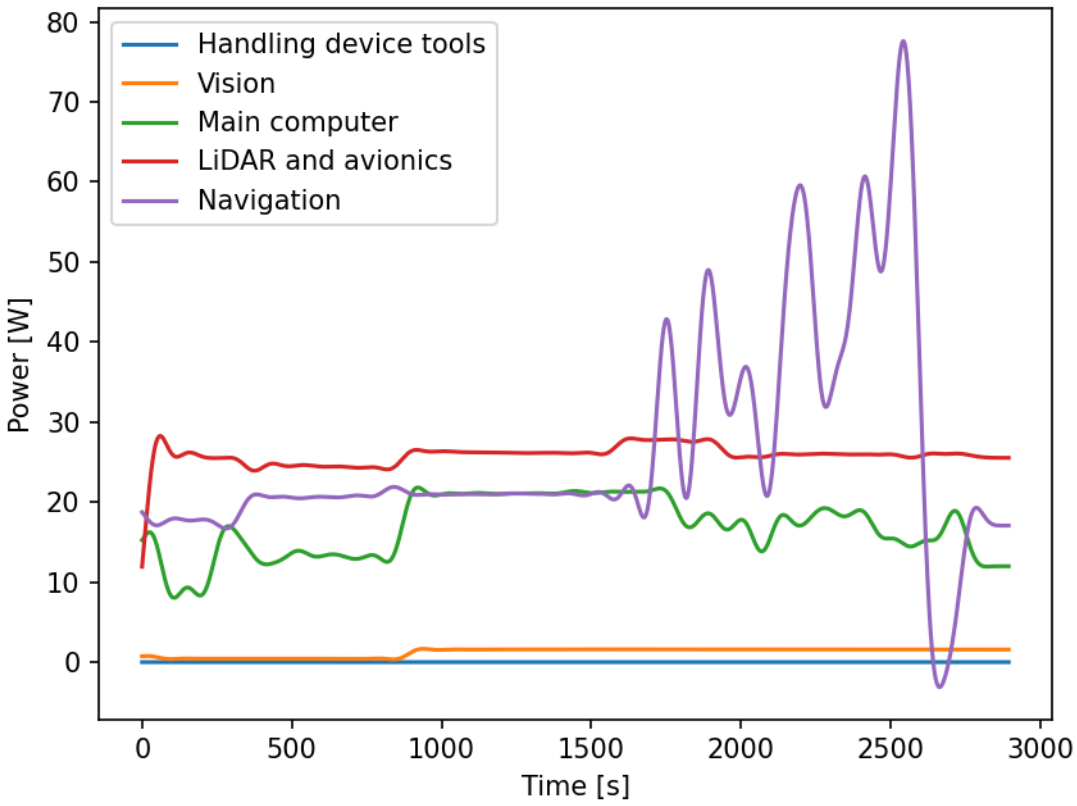

Figure 2.2: Power delivery to subsystems versus time