

Biomedical Data Acquisition Demonstrator

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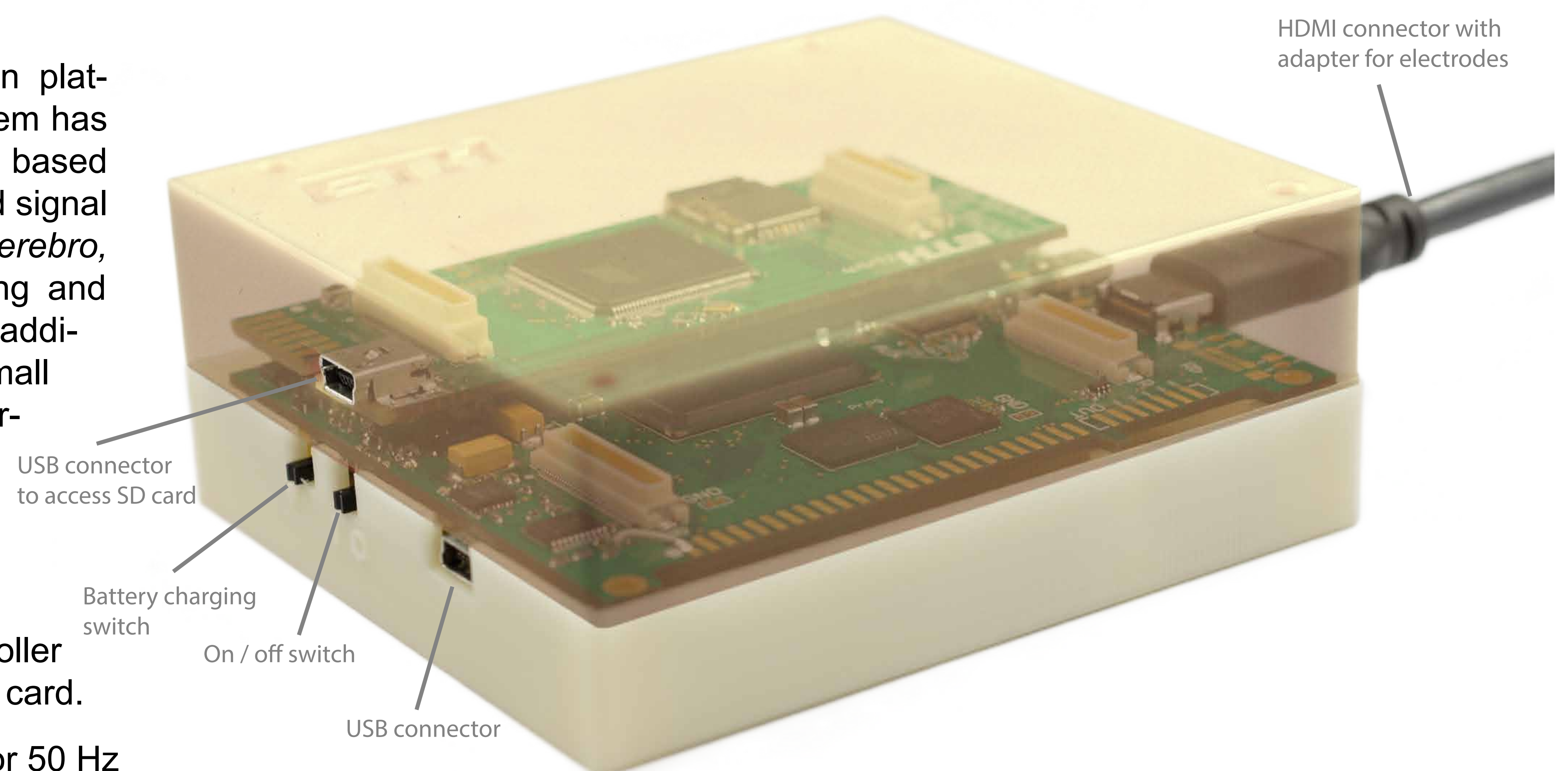
General Overview

A modular development and demonstration platform of the biomedical data acquisition system has been designed. It consists of a motherboard based architecture including the recently developed signal acquisition ASIC for healthcare systems *Cerebro*, and a Xilinx Spartan-6 FPGA for controlling and signal processing. It can be extended with additional features by stacking different small module boards on both sides of the motherboard.

The current demonstrator comes with a Bluetooth module to send the acquired data to a nearby station, e.g., a tablet. A second module with an Atmel AVR 32-bit microcontroller is used to store the processed data on a SD card.

On the FPGA, optimized digital algorithms for 50 Hz mains interference cancellation and differential electrode offset compensation are implemented.

The electrodes signals are fed through a HDMI connector to the board. The board itself is encapsulated in a 3D printed box and powered by a Lithium-Ion battery being charged over the USB interface.



Module Boards

The new demonstrator can be extended by small module boards to add new functionalities to the overall system. The modularity extends the features of the system to cope with future requirements, i.e., new module boards are designed instead of expensive motherboards. Thus, the demonstrator serves more as a development board for fast prototyping and testing new solution approaches before integration.

Up to six module boards can be stacked on the motherboard. The bottom-side of the motherboard is designated for up to two RF module boards, the top for up to four general purpose module boards. Besides the Bluetooth and AVR modules, there also exists a module for pulse-oximetry support, and another for EEG data acquisition.

SD Card Support

Depending on the quality of the Bluetooth channel, a large amount of data may get lost. To cope with data loss, a module with an Atmel AVR 32-bit microcontroller was designed to store the biomedical data on a SD card for offline analysis. The microcontroller supports mass storage mode to easily read out the data from the SD card through a USB interface.

Live Data Monitoring

The Bluetooth module is used to send data to an Android tablet which runs a dedicated software to plot the acquired data in real-time on the tablet and to control the demonstrator. At the same time, all data is stored on the SD card to ward off data loss arising from a weak Bluetooth connection. Besides coping with data loss by using a SD card, another key role plays the mass storage by considerably reducing power consumption. Since the Bluetooth connection consumes relatively high power, the live monitoring can be turned on for short time durations.

