Department of Electrical Engineering and Information Technology

Master thesis

SS2024

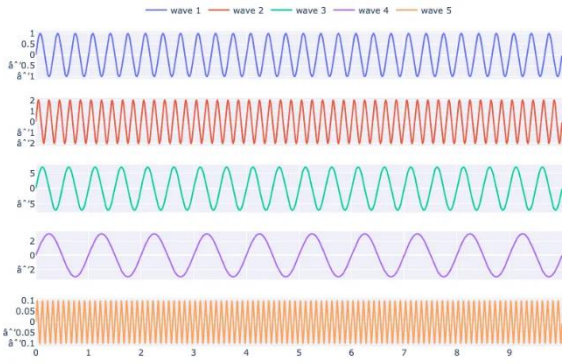
Towards Efficient Bio-Sensing: A Low-Power STM32 Impedance Spectrometer

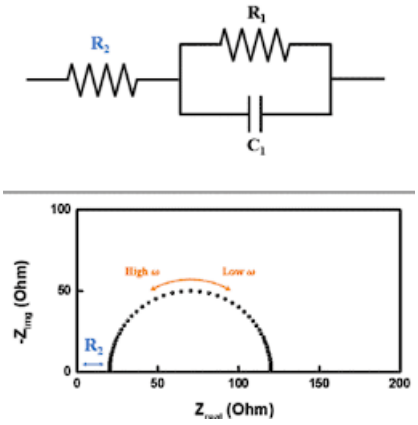
Project type: ☐ Hardware ☐ Software ■ Hardware/Software ☐ Simulation ☐ Modeling

Project description

Bioimpedance spectroscopy (BIS) is a non-invasive and widely used method to monitor human health. It is a method for assessing the electrical impedance of biological tissues or systems over various frequencies. Microcontrollers (MCUs) are vital components in embedded systems, often requiring a balance between processing power and energy efficiency. We want to use the optimum microcontroller for our STM32 impedance measurement system. This project compares different STM32 regarding power consumption, measurement accuracy, and measurement time.

This project aims to compare the power consumption of different STM32 series, focusing on the impact of ADC (Analog-to-Digital Converter) and DAC (Digital-to-Analog Converter) usage on overall power draw.





Tasks:

Task 1: Implementation of signal generation on selected STM32 boards.

Task 2: Comparison of power consumption and measurement time on selected STM32.

Task 3: Analyzing the impact of advanced ADC measurement techniques on power consumption

Task 4: Implementation of Impedance Spectroscopy.

Task 5: Validation of the work and choice of the optimal STM32 for impedance spectroscopy

Task 6: Work documentation.

Competences:

- Python and C/C++ programming
- STM32, Embedded system
- Self-learning ability, creative thinking, and motivation to work independently.

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