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Real-time Simulation for a Functional Electrical Stimulation system validation

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Abstract

Functional Electrical Stimulation (FES) is used in therapy for rehabilitation or substitution for disabled people. They are control systems using electrodes to interface a digital control system with living beings. Hence the whole system gathers continuous-time (muscles and nerves) and discrete-time (controllers and links) components. During the design process, realistic simulation remains a precious tool ahead of real experiments to check without danger that the implementation matches the functional and safety requirements. The paper presents a real-time open software simulation system, dedicated to the analysis of FES systems deployed over distributed execution resources and wireless links. The simulation tool is especially devoted to the joint design and analysis of control loops and real-time features.