Embedded implementation of a real-time switching controller on a robotic arm

Two applications have been developed:
- **Application-1**: The ScortecControlGAM is directly linked to the hardware encoder counters and PWM signal sources.
- **Application-2**: Performs a hardware-in-the-loop simulation including a ModelGAM interconnected with the ScortecControlGAM to simulate the robot arm.

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This work presents and compares the performance of the control algorithm implementation on a bare-metal and on a FreeRTOS deployment. The control algorithm to drive the DC motors of the robotic arm is based on a switching PID theory. New version of MARTe C++ framework has been developed with a software architecture aiming at enabling the execution of the same code across different bare-metal systems.

The same infrastructure can be used to develop similar real-time applications using this ecosystem. Switching proportional controller can improve the transient response performance (less overshoot, higher convergence speed). FreeRTOS performance figures similar to Bare-Metal.