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A flexible validation framework for streamlining hardware testing in accelerator control systems

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A new high-performance Sensors, Acquisition and Motion Control system (SAMbuCa) is under development at CERN to address the challenging requirements of motion control for beam intercepting devices such as the collimators of the Large Hadron Collider. These requirements include high precision in extremely radioactive environments, millisecond-level synchronization, and long-term operational reliability. To meet these stringent demands, rigorous testing and validation is essential throughout the development process. The abstraction models used by existing frameworks for executing and defining tests often lack the flexibility required as they are software oriented. To address this, a generic framework for Production Test Suites (PTS) has been developed, helping to validate all the SAMbuCa components before mass production. It is an open-source hardware validation framework written in Python, with the Accelerator Controls community in mind. The framework targets different types of tests, such as end-of-line, reliability, and calibration. The PTS framework addresses common challenges faced by accelerator and industrial teams. It provides an adaptable and scalable testing solution relevant across multiple control-system environments. In this paper, the architecture and rationale behind PTS is explained and its functionality compared with existing solutions.

Footnotes

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