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Development of GigE vision camera control system and application to beam diagnostics for SPring-8 and NanoTerasu

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As an imaging system supporting beam diagnostics using screen monitors (SCMs) at the SPring-8 site, we have continuously developed and improved a GigE Vision camera control system and expanded its adoption. By adopting the versatile open-source library Aravis, we eliminated vendor dependency and built an image acquisition system integrated into the SPring-8 control framework, *MADOCA 4.0. Key features include the ability to control up to eight GigE cameras per computer with centralized management of camera power, trigger distribution, and screen operations. Its long-distance cabling enables flexible and simple deployment. Operation is achieved by writing the configuration file without programming, significantly reducing development costs and time. As part of the SPring-8 upgrade, this system was successfully implemented for the SCMs of the beam transport line (XSBT) that uses the SACLA linac as the injector for the SPring-8 storage ring**. We expanded the application of this system to the SCMs of the SACLA linac and the SACLA-BL1 linac (SCSS+), replacing the complex and costly Camera Link cameras. We also newly applied it to NewSUBARU injector linac and NanoTerasu in Sendai. This presentation outlines the R&D of our GigE Vision camera control system for stability and enhancements, reporting on multi-facility deployment, operation, and stabilization efforts toward advanced utilization like automated beam parameter optimization from beam diagnostics using machine learning.

Footnotes

- T. Sugimoto et al, THPS004, IPAC'25 ** A. Kiyomichi et al, THAPP03, ICALEPCS2019

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