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Recent development of micro-triangulation for magnet fiducialization

In the frame of the Particle Accelerator Components'Metrology and Alignment to the Nanometre scale (PACMAN) project, we develop the micro-triangulation method for the magnet fiducialization. The wire detection algorithm and the wire reconstruction algorithm are the most important parts of this study. High accuracy robotic theodolites observe the stretched wire, used for the determination of the magnetic axis, and the fiducial points in one coordinate system. The theodolites are equipped with the QDaedalus measuring system, mainly consisting of a CCD camera and a focusing mechanism. The advantage of QDaedalus is the capability to perform accurate, automatic, remote controlled angle measurements. The dedicated software controls the hardware and applies online computer vision techniques to detect and measure the targets. We examine how variation of environmental factors, such as light condition, focus, camera calibration, etc., may affect the measurements, and what is the precision of the QDaedalus system in a considerably stable environment. Preliminary results of simulations reveal the level of precision we can achieve given the instrumentation and the configuration constraints of the final PACMAN bench.

Summary

In the frame of the Particle Accelerator Components'Metrology and Alignment to the Nanometre scale (PACMAN) project, we develop the micro-triangulation method for the magnet fiducialization. The wire detection algorithm and the wire reconstruction algorithm are the most important parts of this study. High accuracy robotic theodolites observe the stretched wire, used for the determination of the magnetic axis, and the fiducial points in one coordinate system. The theodolites are equipped with the QDaedalus measuring system, mainly consisting of a CCD camera and a focusing mechanism. The advantage of QDaedalus is the capability to perform accurate, automatic, remote controlled angle measurements. The dedicated software controls the hardware and applies online computer vision techniques to detect and measure the targets. We examine how variation of environmental factors, such as light condition, focus, camera calibration, etc., may affect the measurements, and what is the precision of the QDaedalus system in a considerably stable environment. Preliminary results of simulations reveal the level of precision we can achieve given the instrumentation and the configuration constraints of the final PACMAN bench.

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