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8.27 Plasma image acquisition and position detection by using visible camera on EAST

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The shape and position of Tokamak plasma play a crucial role in controlling the steady-state operation. Due to the high speed and good visual effect, a high-speed CCD is used for observing the configuration of plasma on Experimental Advanced Superconducting Tokamak (EAST). According to the layout of EAST diagnostics window, the large field of view visible and infrared integrated endoscopy diagnostic system is introduced in this paper. The hardware structure and software design are designed to obtain plasma radiation image with the Phantom V710 high-speed camera. The camera is calibrated with the improved calibration method of Zhang Zhengyou's planar target placed in a vacuum chamber and spatial location is measured. According to the characteristics of plasma image position during the plasma discharge, the Snake algorithm based on the improved watershed is proposed in real-time plasma boundary detection. The boundary is fitted by the curve fitting algorithm based on the least square method and the plasma spatial position is obtained. The EAST experimental results show that the method presented in this paper can realize the expected goals and produce almost perfect effect which is of great significance for better plasma control.

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