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修士論文題目	Three-dimensional Measurement of Dusts in a Nuclear Fusion Reactor with High Speed Stereo Camera	

In recent times, nuclear fusion reactors have been widely researched in the world for replacing current nuclear fission reactors. To foster these studies, a nuclear fusion reactor called "ITER" was build. To run the reactor stably, the behaviour of tritium particles and particle substances from the worn structure inside of the reactor should be known.

For observation and analysis of trajectories of the dust particles, the experiment was conducted with artificial carbon dusts and the high speed stereo camera. The dust particle was inserted into the reactor through the dust holder set on the plasma orbit. If the trajectory of the dust particles is precisely obtained, the relationship between dust and plasma may be analysed.

In this thesis, a measurement method of dust trajectories from the sequential stereo images is proposed. This includes the calibration of the stereo camera on the basis of the stereo images and the CAD data of the reactor. In the explanation of the measurement method, a investigation of particle tracking methods is conducted to obtain a multitude of dust trajectory automatically. Moreover, a new stereo matching method is also proposed to enable better performance of stereo matching of high density dust. The main concept of this method is that use the prediction from the dust trajectory data of the previous frames to improve the matching performance.

Three experiments were conducted. first one was the examine of the dust tracking performance of the relaxation method, and second one was the examine of the performance of the proposed stereo matching method. The experiments use synthesized test dust data. In the first experiments, the precision of the tracking of the relaxation method was approximately 0.9 when the tracking parameter Φ was 1, and approximately 0.7 when Φ was approximately 0.58. Moreover, the experiments also revealed that the best maximum velocity of the relaxation method was 12 pixels which was just higher than the actual maximum velocity, approximately 11. In the second experiments of stereo matching, precision of the proposed stereo matching method remain 0.9 when the tracking parameter Φ was 1 when the eight frame precise trajectory data was given. The precision of $\Phi \simeq 0.58$ remain 0.6. These result were higher than the simple matching method which matches the particles whose y coordinates are the closest each other.

Finally, the proposed measurement method was applied to the target stereo images. Total 60 trajectories were extracted from the 600 stereo images.