Visual Tracking Enhancement of Object on Circular Path based on Tuned Kalman Filter by Particle Swarm Optimization

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Authors:
Saad Zaghlul Saeed, Muhamad Azhar Abdilatef, Zead Mohammed Yosif

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Abstract

Digital image presents information in two-dimensional data, which can be used as feedback measurement for robot visual servoing control. Median filter and morphological operation are used for object detection and extraction its features. Kalman filter is applied for visual measurements that contain noises and uncertainties captured by video camera over the time. Sinusoidal Kalman filter and sinusoidal measurement model is used. The derivations of noise’s process and matrices’ control are presented. The Kalman filter is tuned by using PSO optimization to produce values closer to the true spatial measurements of the target. A developed PSO is proposed in which adaptive inertia weight chaotic PSO algorithm and velocity constriction factor are used in order to overcome premature and local optimum convergence. Simulation for tracking object on circular path are presented. Experimental result shows good performance of the proposed method for noisy measurement of the target.

References


**Index Terms**

Computer Science  
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**Keywords**

Circular path, Kalman filter, Particle swarm optimization, Robot manipulator, State space representation, Visual servoing.