

Prediction and Estimation of Vessel Movement Parameters Based on Video Monitoring

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Summary

Video monitoring as an important part of bridge health monitoring is getting more and more attention in practice. The acquirement of vessel movement parameters through video monitoring is a practical but challenging problem encountered in the engineering field. An approach combining kalman filtering with iteration algorithm was proposed to practically predict and estimate the vessel movement parameters using the monitored spatial data of vessels. The vessel state vectors are obtained through moving object tracking method based on optical flow. Numerical simulations as well as practical analysis are demonstrated to verify the accuracy and feasibility of the proposed approach. The results indicate that the proposed approach can accurately predict and effectively estimate movement parameters of vessels.

Key words: Video Monitoring, Movement parameters, Kalman Filtering, Iteration Algorithm, Moving Object Tracking

1. Introduction

Video monitoring as an important part of bridge health monitoring is getting more and more attention in practice. By using video monitoring, amount of object information, such as vehicle information on the bridges and vessel movement parameters will be available with less expenses in civil engineering. Also, structure behaviors, such as deformation can be obtained through image processing. Sun[1] verified that traffic flow parameter and bridge safety assessment can be achieved by combining traffic video monitoring with structural strain data.

Vessel-bridge collision accidents have been observed frequently in recent years, so bridge anti-collision system is being designed as an important component of bridge system to keep the bridge safety. With the development of SHM, bridge active anti-collision forewarning system is becoming the emphasis of research. Video monitoring included in active system makes it possible to acquire the vessel real time movement parameters, such as position, speed and acceleration through image processing. To prevent vessel-bridge collision, predicting the position and estimating the speed even more acceleration of vessels is very necessary before the active system instructs the vessels to follow the correct channel.

Kalman filtering[2] as the optimal algorithm of linear quadratic estimation problem can make it very effective to predict and estimate the moving state of monitored objects. Feng [3] employed kalman filtering for predicting the vehicle's future location to increase the performance of VANETs. However, the speed of vehicles is estimated without considering the input term in state equation.