Enhancing Moving Object Detection and Tracking in Remote Sensing Videos using Kalman Filter

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With the development of remote sensing, satellite video cameras can provide continuous observation for a large-scale area, which is important for many remote sensing applications, such as space-based surveillance. However, attaining accurate moving object detection and tracking in remote sensing videos remains a persistent challenge. The limited appearance information of objects and the presence of satellite jitter contribute to the instability of remote sensing videos. To address these challenges, the researchers in previous studies proposed various methods, with a strong emphasis on their remarkable ability to effectively handle the issues related to jitter. However, as the image size of remote sensing videos increases, a new issue arises - the number of objects detected also grows, leading to a significant increase in false alarms, which ultimately results in poor performance. This paper introduces the Kalman Filter and object matching algorithms. These techniques are employed to address the issue of increased false alarms, thereby enhancing the overall performance of the moving object detection system. Specifically, the Kalman Filter is utilized for estimating the motion of objects in the previous frame, and the estimated results are then used to perform object matching with the current frame. Finally, we apply the strict output criteria to reduce the number of false alarms. The experimental results demonstrate that our proposed algorithm significantly reduces the number of false alarms by 60%. Moreover, the precision and accuracy rates were notably increased by 60% and 25%, respectively.

Keywords: Remote Sensing Videos, Moving Object Detection, Kalman Filter