

Deteksi dan pelacakan objek bergerak pada UAV (unmanned aerial vehicle) = Detection and tracking of moving objects on a UAV (unmanned aerial vehicle)

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Abstrak

[ABSTRAK

Pesawat tanpa awak (Unmanned Aerial Vehicle atau disingkat UAV) adalah sebuah mesin terbang yang berfungsi dengan kendali jarak jauh secara autopilot. Penggunaan terbesar dari pesawat tanpa awak ini adalah dibidang militer untuk pengintaian, pengawasan, dan penyerangan. Dalam mendeteksi sebuah objek yang bergerak secara real-time oleh sebuah UAV, terdapat proses pengolahan sinyal yang kompleks dibandingkan apabila objeknya dalam keadaan diam. Ada beberapa masalah yang terdapat dalam proses deteksi objek bergerak pada UAV yang disebut uncertainty constraint factor (UCF) yaitu lingkungan, jenis objek, pencahayaan, kamera UAV, dan pergerakan (motion) objek. Salah satu masalah praktis yang menjadi perhatian beberapa tahun ini adalah analisis pergerakan (motion analysis). Pergerakan (Motion) dari sebuah objek pada setiap frame membawa banyak informasi tentang piksel dari objek bergerak yang memainkan peranan penting sebagai image descriptor. Pada tesis ini digunakan algoritma SUED (Segmentation using edge based dilation) untuk mendeteksi objek bergerak. Inti dari algoritma SUED adalah mengkombinasikan frame difference dan proses segmentasi secara bersama untuk mendapatkan hasil yang optimal dibanding dengan menggunakannya secara terpisah. Hasil simulasi menunjukkan peningkatkan performansi algoritma SUED dengan menggunakan kombinasi wavelet dan sobel operator pada deteksi tepinya yaitu jumlah frame untuk true positive meningkat sebesar 41 frame, kemudian false alarm rate yang didapatkan menurun menjadi 7 % dari 24 % apabila hanya menggunakan sobel operator. Kombinasi kedua metode tersebut juga dapat meminimalisir noise region yang mengakibatkan kesalahan dalam proses deteksi dan pelacakan. Hasil simulasi pelacakan objek bergerak dengan metode kalman filter bisa dilihat pada beberapa sampel yang diuji menunjukkan adanya penurunan kesalahan (error) centroid antara hasil deteksi dan hasil pelacakan objek bergerak

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ABSTRACT

An unmanned aerial vehicle (UAV), commonly known as a drone and also referred by several other names is an aircraft without a human pilot aboard. The flight of UAVs may be controlled either autonomously by onboard computers or by the remote control of a pilot on the ground or in another vehicle. Unmanned aerial vehicle (UAV) usually is used in military field for reconnaissance, surveillance, and assault. To detect a moving object in real-time, there are complex processes than to detect the object that does not moving. There are some issues that faced in detection process of moving object in UAV, called constraint uncertainty factor (UCF) such as environment, type of object, illumination, camera of UAV, and motion of the object. One of the practical problems that become concern of researcher in the past few years is motion analysis. Motion of an object in each frame carries a lot of information about the pixels of moving objects which has an important role as the image descriptor. In this thesis, we use SUED (Segmentation using edge-based dilation) algorithm to detect moving objects. The concept of the SUED algorithm is combining the frame

difference and segmentation process to obtain optimal results than using them separately. The simulation results show the performance improvement of SUED algorithm using combination of wavelet and Sobel operator on edge detection, the number of frames for a true positive increased by 41 frames, then the false alarm rate decreased to 7% from 24% when only using Sobel operator. The combination of these two methods can also minimize noise region that effect detection and tracking process. The simulation results for tracking moving objects by Kalman filter show that there is error decreasing between detection and tracking process., An unmanned aerial vehicle (UAV), commonly known as a drone and also referred by several other names is an aircraft without a human pilot aboard. The flight of UAVs may be controlled either autonomously by onboard computers or by the remote control of a pilot on the ground or in another vehicle. Unmanned aerial vehicle (UAV) usually is used in military field for reconnaissance, surveillance, and assault. To detect a moving object in real-time, there are complex processes than to detect the object that does not moving. There are some issues that faced in detection process of moving object in UAV, called constraint uncertainty factor (UCF) such as environment, type of object, illumination, camera of UAV, and motion of the object. One of the practical problems that become concern of researcher in the past few years is motion analysis. Motion of an object in each frame carries a lot of information about the pixels of moving objects which has an important role as the image descriptor. In this thesis, we use SUED (Segmentation using edge-based dilation) algorithm to detect moving objects. The concept of the SUED algorithm is combining the frame difference and segmentation process to obtain optimal results than using them separately. The simulation results show the performance improvement of SUED algorithm using combination of wavelet and Sobel operator on edge detection, the number of frames for a true positive increased by 41 frames, then the false alarm rate decreased to 7% from 24% when only using Sobel operator. The combination of these two methods can also minimize noise region that effect detection and tracking process. The simulation results for tracking moving objects by Kalman filter show that there is error decreasing between detection and tracking process.]