

Perancangan pengendali panduan terbang PUNA untuk pelacakan sasaran dalam misi pengawasan = Design of the uav flight guidance controller for target tracking in its surveillance mission

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Abstrak

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Pesawat Udara Nir Awak (PUNA) identik dengan misi pengawasan dari udara. Misi ini semakin kompleks mulai dari pengawasan area hingga pengawasan terhadap sasaran yang bergerak. Dalam pengawasan terhadap sasaran bergerak, PUNA membutuhkan informasi posisi sasaran untuk suatu selang waktu ke depan serta membutuhkan sistem pemanduan yang menuntunnya semakin dekat pada sasaran tersebut. Metoda Pelacakan Sasaran telah bervariasi dari Nonlinear Target Tracking, RVQ, Robust Trajectory, Nonlinear Dynamic Inversion, RISE feedback, Multitarget Tracking dan lainnya. Metode-metode ini membutuhkan informasi posisi, kecepatan, bahkan video berpresisi tinggi dalam penerapannya. Sementara, apabila semakin sedikit sensor yang dipasang pada PUNA maka semakin ringan beban yang dibawa dalam misi terbangnya.

Penelitian ini ditujukan untuk merancang metode Pengendali Panduan Terbang (flight guidance-controller) yang dapat diterapkan pada misi terbang pengawasan (surveillance/monitoring) PUNA. Metode ?backstepping-like? dipilih untuk melakukan pemanduan dalam model nonlinear. Dalam Tesis ini, PUNA akan mengukur posisi target dalam Jarak, Sudut Elevasi dan Sudut Azimut dalam Tata Acuan Koordinat Benda. Pengukuran tersebut diolah dengan Extended Kalman Filter untuk memperkirakan posisi target ke masa depan pada suatu selang waktu. Besaran jarak, elevasi dan azimut yang terukur akan diolah menjadi posisi xyz Target dalam Tata Acuan Koordinat Horizon. Selanjutnya, Pengendali Panduan (guidance-controller) akan menghasilkan perintah kendali berupa kecepatan, sudut tanjak lintas terbang dan sudut arah lintas terbang untuk mengarahkan PUNA untuk bergerak menuju Target serta melakukan misi pengawasan.

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ABSTRACT

Monitoring and surveillance mission of a UAV has become more complex because the needs to track moving targets. This is due to the needs of the UAV in getting the position of the targets for a duration of time ahead while it must have guiding system to chase the target.

The methods of such Nonlinear Target Tracking, RVQ, Robust Trajectory, Nonlinear Dynamic Inversion, RISE feedback, Multitarget Tracking etc. has developed for tracking the moving target. For their accuracy, the methods need the position information, speed, and even a high precision video camera to be applied.

While the fewer sensors needed, then the smaller of weight will be carried by the UAV for its mission.

This work were intended to design a flight guidance-controller that suitable to be applied in PUNA (Indonesian Unmanned Aerial Systems) which is doing target-tracking in its surveillance or monitoring mission. The guidance controller will be constructed using the ?backstepping-like? method. The PUNA measured the target?s Range, Elevation and Azimuth angle in the Body Reference Coordinate System. Then, the measured parameter will be processed into the Extended Kalman Filter to predict the target?s position for a durations of moment ahead of the measurement time. The measured range, elevation and azimuth will

be processed into xyz-position of the target with respect to Horizontal Reference Coordinate System. Then the guidance-controller derived the commanded velocity, flight path angle, and course angle so the PUNA can reduce its distance from target and continuously doing its surveillance mission; Monitoring and surveillance mission of a UAV has become more complex because the needs to track moving targets. This is due to the needs of the UAV in getting the position of the targets for a duration of time ahead while it must have guiding system to chase the target.

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