

무인 비행기 함상 착륙을 위한 전후방 VFF-PASTd 알고리즘

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Forward Backward VFF-PASTd Algorithm for UAV (Unmanned Aerial Vehicle) Autolanding on the Shipboard

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Abstract: In this Paper, we propose a new subspace estimation algorithm for UAV autolanding. In UAV autolanding on the shipboard with radar system, the surface reflection and the pitching make it difficult to estimate the angle information of UAV. This Paper proposes a new subspace estimation algorithm based on forward-backward PASTd with time varying forgetting factor for the time-varying and coherent DOA estimation. The algorithm is derived from VFF-PASTd method proposed by the authors in [1].

1. Introduction: For several years, many researchers have studied the military and commercial applications of UAV (Unmanned Aerial Vehicle). In military applications, recovery is important issue because UAV carries many valuable sensor systems and information with it. It necessitates more precise and safer landing systems with landing gear. Radar guide autolanding system is one of the promising candidates. The system provides the altitude information from the elevation angle.

In practice, UAV landing system should meet various landing conditions from rough ground to pitching shipboard. Especially in landing on the shipboard, radar frequently has trouble in tracking low flying targets because of the reflection from the sea or the pitching shipboard. The reflected ray consists mainly of the specular component for low grazing angle. The specular component makes coherent signals [2]. In addition, the relatively fast angle variation should be considered which comes from the pitching shipboard. The pitching rate depends

on sea state. Therefore, the radar in autolanding system requires high-resolution variable rate tracking capability against the time-varying coherent signal condition.

In this Paper, we develop a recursive algorithm to estimate the signal subspace for the time-varying and coherent DOA. We have proposed VFF-PASTd for time-varying subspace [1]. This algorithm cannot be applied to the direct and the coherent reflect signal environments, and then we modify the VFF-PASTd to handle the coherent signal by forward/backward scheme. It introduces a kind of space smoothing effect to ease the coherency between the direct ray and the reflected ray. It makes radar to track the time-varying coherent DOA more accurately.

2. Forward Backward PASTd (FB-PASTd) Algorithm: The PASTd algorithm is one of the low complex recursive subspace estimation method, which is useful for DOA estimation. The PASTd algorithm is summarized the left side in Table 1 [3]. PASTd, however, doesn't work in coherent signal environments