

Convergence properties of time inhomogeneous Markov chain based discrete and continuous time linear consensus algorithms are analyzed. Provided that a so-called infinite jet-flow property is satisfied by the coupling chain, necessary conditions for both consensus and multiple consensus are established. A recent extension by Sonin of the classical Kolmogorov-Doeblin decomposition-separation for homogeneous Markov chains to the inhomogeneous case is then employed to show that the obtained necessary conditions are also sufficient when a discrete time chain is in Class P^* , as defined by Touri and Nedic. It is also shown that Sonin's D-S Theorem leads to a rediscovery and generalization of the existing related consensus results in the literature. Finally, a geometric approach first developed by Shen is taken to extend the results of the discrete time case to the continuous time case.