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Optimal Inter-Copy Delay for Dual-Copy Transmissions in ALOHA Networks with No Feedback

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Abstract

There are cases in which propagation delay or the absence of a return channel, possibly in conjunction with critical importance of the timeliness of information, limit communication in ALOHA networks to a single attempt. One possible example is communication from an array of sensors to a base station. In such situations, there is often an advantage to the transmission of multiple copies in order to increase the probability of reception. In this paper, we address the dual-copy case, focusing on optimization of the inter-copy delay. Our goal is to minimize expected delay for any given feasible combination of throughput and probability of failure (of both copies). It is shown that this is achieved with a linearly-decreasing probability of the inter-transmission interval's length; the exact function is derived. This is shown to also hold in conjunction with power capture.

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