

A Parrondo paradox in coherent systems

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Abstract

Parrondo's games are composed of two games: playing each game individually the player is led to lose, whereas he/she may expect to win if the games are played randomly. These games were first described by Parrondo [4] at a workshop in 1996. (See also the contributions by Harmer and Abbott [2] and [3].) We present a suitable version of Parrondo's paradox in reliability theory involving coherent systems. We consider two systems in series, the units of the first system being less reliable than those of the second in the "usual stochastic order" sense. We find conditions such that if the first system is modified so that the distributions of its new units are mixtures of the previous distributions with equal probabilities, then the new system is more reliable than the second one. The given results are partially based on a previous paper [1], in which an application to Parrondo games is also provided.

References

- [1] Di Crescenzo, A. (2007). A Parrondo paradox in reliability theory. *Math. Scientist* 32, 17–22.
- [2] Harmer, G.P. and Abbott, D. (1999) Parrondo's paradox. *Stat. Sci.* 14, 206-213.
- [3] Harmer, G.P. and Abbott, D. (1999) Parrondo's paradox: Losing strategies cooperate to win. *Nature* 402, 864.
- [4] Parrondo, J.M.R. (1996). How to cheat a bad mathematician, In: *EEC HC&M Network on Complexity and Chaos* (#ERBCHR-CT940546), ISI, Torino, Italy, Unpublished.