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Agent-based color categorization: the role of population and color-stimulus heterogeneities.

ABSTRACT: We present results from investigations that simulate the evolution of color lexicons to evaluate the role of two realistic constraints found in the human phenomenon: (i) heterogeneous observer populations and (ii) heterogeneous color stimuli. Such constraints, idealized and implemented as agent categorization and communication games, produce interesting and unexpected consequences for stable categorization solutions evolved and shared by agent populations. We find that the presence of a small fraction of color deficient agents in a population, or the presence of a region of increased salience in the color stimulus space, breaks rotational symmetry in population categorization solutions, and confines color category boundaries to a subset of available locations. Further, these heterogeneities, each in different, predictable, ways, seem to influence category number and size. In addition, the concurrent presence of both types of heterogeneity gives rise to novel constrained solutions that optimize the success rate of categorization and communication games. Our findings are discussed in the context of perceptual processing constraints on human color categorization, with consideration to (i) trade-offs among factors expected to influence formation of a category system, and (ii) the ways simulation studies relate to the behavioral literature.

ARTICLE citations, links and .pdfs:

(1) Komarova, N. L., K. A. Jameson and L. Narens. (2007). Evolutionary models of color categorization based on discrimination. Journal of Mathematical Psychology, 51. 359-382.

LINK:
http://aris.ss.uci.edu/~kjameson/KomarovaJamesonNarensJMP2007.pdf

(2) Komarova, N. L. and K. A. Jameson (2007). Population Heterogeneity and Color Stimulus Heterogeneity in Agent-based Color Categorization. (under review. Journal of Theoretical Biology).

LINKS:
http: //aris.ss.uci.edu/~kjameson/KomarovaJameson2007.pdf
http: //www.imbs.uci.edu/tr/abs/2007/mbs07_07.pdf