Modeling the Evolution of Communication

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Communication enables animals to coordinate their actions, to express their cognitive and emotional states, to inform, threaten, warn, comfort, deceive, and entertain. Animal communication systems range from apparently simple alarm calls and threats, to honeybee dances, elaborate mating rituals, bird song, and human language. Communication, in one form or another, seems to be a prerequisite for complex social behavior. Furthermore, the processes by which individual animals acquire a communication system involves a complex interplay between innate and learned components

A number of researchers have investigated the evolution of communication by means of computational simulations of simple models of communicative behavior. In some such simulations all behavior is innately specified, usually as the result of a simulation of evolution by natural selection; in some simulations an individual learns from observating the communicative behavior of others, and in some simulations both evolution and learning are combined. Other simulations attempt to model the communicative behavior or the underlying mechanisms of specific animal species, using techniques from behavioral ecology or neuroethology.

Though such models are quite simple, they have begun to prove their value in elucidating aspects of the evolution of communication that are otherwise quite difficult to investigate. For example much attention has been paid to the issue of whether and how various aspects of human language could be innate rather than learned. To some degree such debates rely on intuitions about how certain features of language might or might not be evolutionarily adaptive or learnable or some combination of both. However few such intuitions are trustworthy: The evolution of any complex social behavior involves an environment (the behavior of the other animals) which is changing as the animals learn or evolve new behavioral tendencies, and therefore the system can be highly unstable and unpredictable. Mathematical and computational models, even simple ones, can be used to investigate the consequences of assumptions, and explore proposed scenarios, relevant to the evolution of communication.

In this symposium we will explore these issues and consider how such research ought to proceed. Some specific questions to be addressed are:

- What issues involving communication and language can be usefully explored with computational models?
- How complex and/or realistic do models have to be for their properties to be worth investigating?
- What specific implementation and analysis techniques are available for modeling the evolution of communication?
- What animal species have types of communicative behavior that are worth modeling?
- How much should these models attempt to capture specific aspects of human language?
- How can simulation results be assessed? In particular, how can effects due to arbitrary details of the simulations be separated from the significant results?

The symposium will begin with a presentation of background issues and a survey of the field. This will be followed by short presentations of some recent simulation experiments. A respondent from the field of linguistics will present a critical discussion of the presentations. An open discussion will follow.

References

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