Computing with Biosensors

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The current model of computing requires users to program sequences of deterministic instructions. This model leads to computer programs that are highly brittle--often failing to perform in an unpredictable world. On the other hand, endurance and adaptation are common traits in biological systems. Biological systems have the ability to tolerate changes in the environment. Such tolerance is facilitated by a number of factors--hierarchical control, from stimulus response to natural selection which modifies an organisms' program. Moreover, biological systems show that cooperative groups where individuals operate in parallel are much more resilient than individual organisms. In order to realize their true potential in an uncertain world, biosensors will need to be combined with a new paradigm of computing which accounts for the continuous, disruptive and unpredictable environments. Programs will need to consist of actors which purposefully navigate their environment, foraging for resources and evolving. Such actor will use biosensors and bioactuators to interact with the real-world, and have the ability to self-modify. Moreover, groups of actors will need to cooperate to maintain a stable ecology, creating new actors (splitting) to respond to changes, and joining to synthesize new possibilities.

1.Gul Agha, “Concurrent Object-Oriented Programming,” *Communications of the ACM*, vol. 33, no.9, 1990, pp. 125-141.

2. N. Jamali, P. Thati and G. Agha, “An Actor-based Architecture for Customizing and Controlling Agent Ensembles,” *IEEE Intelligent Systems*, volume 14, issue 2, pages 38-44, April 1999.