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Memristor-based information gathering approaches, both ant-inspired and hypothetical

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Abstract

Novel gatherer allocation methods based on both memristor function and ant behaviour are tested in both resource rich and poor environments by simulating the non-linear aspects of gathering using memristor models. In the *All Sites* method gatherers are allocated according to the voltage drop across the memristor simulating each food site. This performs better in environments of a similar quality by depleting the worse sites first and then using the freed-up gatherers to make up for declining productivity elsewhere. The *Leafcutter* allocation method, based on ant behaviour, first depletes the best resource and then allocates gatherers as for *All Sites*. This method functions best in environments with a wide distribution in site quality. These models suggest approaches for dealing with data transfer between nanomachines while also demonstrating useful behaviour of memristor-based nanonetwork-on-chips. An example

of information transfer under these gathering approaches is given and shows the clear superiority of the *Leafcutter* approach once the system contains more than small numbers of memristors. Taking the *Leafcutter* approach to the extreme whereby each site is depleted in turn, the *Sequential* allocation method, is the worst performer in all tests.



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Keywords

Memristor; Ants; Gathering; Nanonetwork-on-chip; Collective behaviour

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