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Collective sorting and segregation in robots with minimal sensing

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Long paper

Abstract

Many ants sort their brood so that brood items at similar stages of development are grouped together, and separated from items at different stages of development. Brood items are moved individually. The only model proposed to date assumes that ants engaged in brood sorting can sense both the type of element they are carrying, and the local spatial density of that type of element; the model was demonstrated in simulation using two types of objects. This paper describes a system of simple homogeneous autonomous mobile robots which are able to segregate or sort two types of physically identical objects differing only in colour, yet can sense only the colour of the object they are carrying, and have no capacity for spatial orientation or memory. This shows that this sorting problem can be solved by agents simpler than was previously supposed possible.