Swarm Intelligence

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What is Swarm Intelligence?

- Collective behaviour of decentralised, self-organising systems
- Complex behaviour emerges from interaction between simple agents and their environment

Forms of swarm intelligence

- Stochastic diffusion search
- Particle swarm optimisation
- Ant colony optimisation

Applications

- Routing problems
- Crowd simulation

Stochastic diffusion search

- Probabilistic search and optimisation technique
- Each individual constructs a hypothesis (candidate solution to the problem)
- Individuals then communicate (one on one) and adopt the better hypothesis
- Has been used for wireless network site selection, object recognition, robot localisation and more

Particle Swarm Optimisation

- Optimisation algorithm which works by having a swarm of particles exploring the search space
- Particles move based on their closeness to a neighbour, direction of the average of the group, and both the particle's and swarm's best known positions

Ant colony optimisation

- Probabilistic search method for problems that can be reduced to finding good paths through a graph
- Individuals wander randomly through a graph, laying down markers as they do
- Markers degrade over time
- As a result, the shortest path gets reinforced the most,
- Used mostly in scheduling and routing problems

References

- http://dsp.szu.edu.cn/dsp2006/research/areas/t08/papers/SITutorial.pdf
- http://sci2s.ugr.es/sites/default/files/files/Teaching/GraduatesCourses/Metaheuristicas/Bibliography/The-biologic-principles-of-swarm-intelligence.pdf