

Think Like an Ant

When we were young, we were often given examples of good qualities from the animal world – so we taught to be brave like a lion, loyal like a horse, hardworking as an ant.

The example of ants was used to show how a team of ants would collect and pull together a piece of food several times the weight that any one ant could pull.

However, the small ant was never held up as an example of how to think. On the contrary, it was derided – "cheenti jitnee buddhi" (type in devnagari script) meant feeble brains.

Computer scientists and mathematicians from Belgium have made some breakthroughs that should put this metaphor in disuse. The humble ants may have intelligence that can solve networking routing and travelling salesman problems better than human beings.

When algorithms based on the foraging behaviour of ants cope were applied to telecommunication networks routing, they coped with congestion better than most of the current schemes in use.

When ants search for food, they randomly wander the forest or jungle floor and lay a trail for nest-mates to lead them to a source of food. Many individual ants may discover different routes to the same food but the shortest path that leads to it will have the strongest concentration of pheromone, a chemical indicator laid down by the ants. It will swiftly become the most popular path because it is the smelliest and easiest for the ants to spot and track.

Researchers in NTT, the Japanese telecom giant, created computer programs that mimicked the behaviour of ants. These programs were let loose from each node on the network and asked to find a route to a given node. By laying and smelling the "artificial pheromones" along each potential route, the ants generated a map showing the fastest routes to any end point.

A fuel firm on the Italian-Swiss border is using ant-derived algorithms for solving the Travelling Salesman problem. This used to work out the best route for its drivers delivering supplies to petrol stations.

The broad area of study that uses the collective foraging behaviour of ants to solve optimization problems is called *Ant Colony Optimization*.

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Ant Colony Optimisation is part of a broader area called *Swarm Intelligence*. Swarm Intelligence is a new computational and behavioural metaphor for solving distributed problems; it is based on the principles underlying the behaviour of natural systems consisting of many agents, such as ant colonies and bird flocks– have you ever wondered how does a bird flock keep its movements so graceful and synchronized? Most people assume that the bird in front leads and the others follow. In fact, bird flocks don't have leaders: they are organized without an organizer. And a surprising number of other systems, from termite colonies to traffic jams to economic systems, work the same decentralized way.

Perhaps it is time to stop labelling errors in computer programs as "bugs" – we have seen how smart programs with “artificial ants or bugs” can be!