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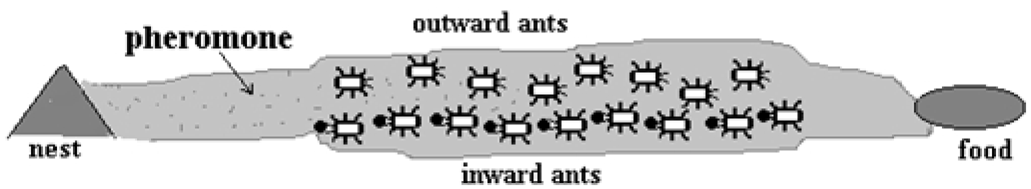
Ants and the Internet

In the fairy tale, Hansel and Gretel traced their way back home by following a trail of pebbles that Hansel left while their father led them into the forest. Ants do the same thing to navigate and show the way, says **S.Ananthanarayanan.**

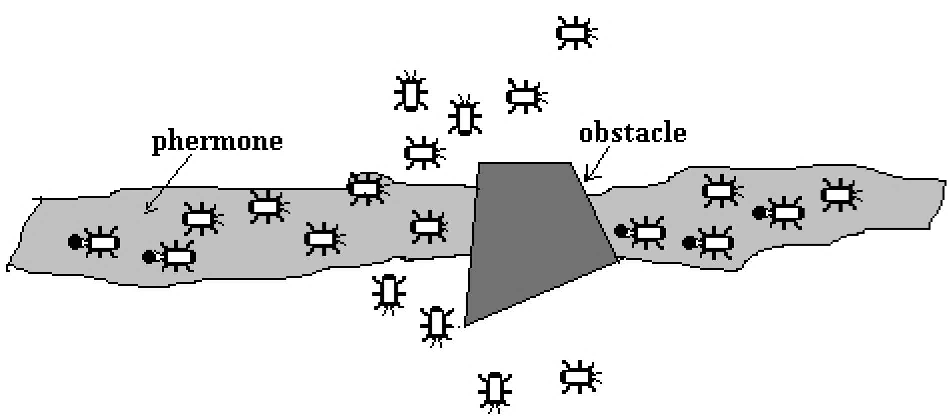
Ants deposit chemicals called pheromones, which have an odour, when they move. It is the pheromone trail that helps them find their way back. Ants are also programmed to follow a pheromone trail, choosing a stronger pheromone deposit over a weaker one. This helps the ants in a nest to select the more successful, and usually shorter path to a source of food.



though shortsighted, they can navigate long distances

Finding the way

When ants set out to forage, they first move aimlessly till one of them finds a morsel to carry back to the nest. The ant then follows the ‘twice traversed’ path back to bring more. Other ants are attracted by the slightly stronger pheromone trail and they also join the train. More ants mean more pheromone deposit and all the ants are soon hard at work.



ants fan out to find new paths

Accidental modifications of the path could result in shorter distances. Shorter distance means faster trips and stronger pheromone trails. The path would thus soon settle down to become the shortest possible.

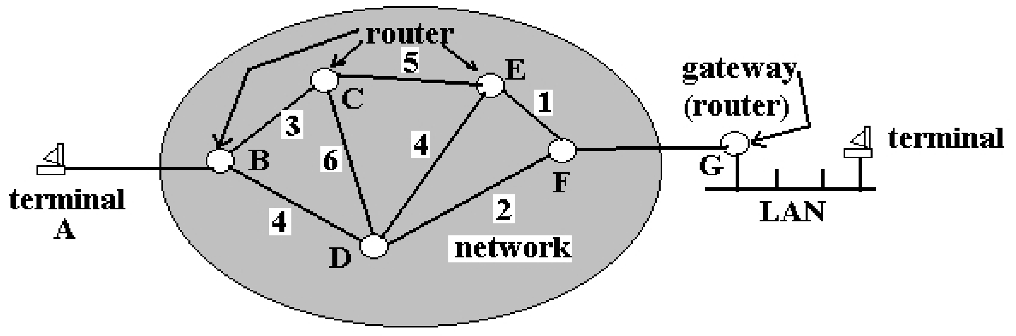
If an obstacle should suddenly appear in the path, then the ants again wander aimlessly, to find the trail again, or another source of food. Well, of the many that may find a new way, the ones that found and used the shortest path would leave the strongest trail, and the ants would get to work again.

Congestion control

The selection of the path by smell allows quick reaction to changes. If there were two paths to the same source of food, the more efficient path would attract more followers. As this path got crowded and speeds came down, the quantity of pheromone deposited would also reduce. The less crowded path, or a newly discovered path or source, would soon have more pheromone and adherents would switch!

The Internet

The great success of the Internet is because messages have a whole selection of possible paths to get from source to destination. Typically, a message sent out from a computer is pushed on to a network of interconnected ‘routers’. Routers (pronounced ‘*root*er’, as it selects the ‘route’ and not ‘*rowt*er’, please) are computers connected to more outgoing lines and have a mechanism to select the path along which to send a message that has been received.



Data going via B-D-F may shift to B-D-E-F or B-C-E-F (equal) if D-F fails

In place of the smell of pheromones, computers use a measurement of how efficiently a message can go from one router to the next. And starting from this information, computers build up charts of which lines to use for particular destinations. Every few seconds, computers share these charts with their immediate neighbours. Each neighbour can then check which of its neighbours has the shortest path to the same destination and update its own plans of the best path to follow.

Discovering a path

If a new destination turns up, a query is sent to all neighbours, who send the query on, to more neighbours and so on. When the destination is found, a return message retraces its steps and a path is established. More than one path is established and computers can switch from one to another if the best should get corrupted.

To make sure that the Internet is not flooded with unsuccessful queries, the queries have a built in ‘time to live’. This makes sure that they get dropped if they do not reach the destination within a set number of hops.

Like ants, which are shortsighted, computers too can only ‘see’ as far as the next node in the network.