

# Swarm Series – Part 1 – Swarm Engineering

## Pre-work

Flocking is one of the most famous Swarm Algorithms.

1. Watch this video to understand what we mean by flocking:  
<https://www.youtube.com/watch?v=XV9wOTqOQw0>
2. Play around with [this online simulator](#) and try to understand what separation, alignment and cohesion mean.

## Exercise

List the Swarm Algorithms in the video in the table on the next page (you can copy this table onto a piece of paper or word doc). Pay attention to what the inspiration for the algorithm was (e.g. how ants collect food) and how the use cases in the real world are (e.g. how drones fly).

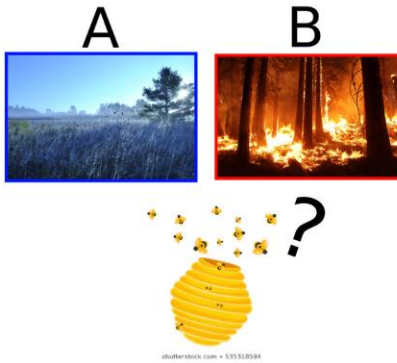
## Homework

1. Research some more swarm algorithm online (Wikipedia is a good place to start) and add them to the table. If you are stuck for ideas, try *decision making* or look at [this list of swarm behaviours](#).
2. Make a visualisation to explain one of the swarm algorithms in more detail (this is sometimes called an *infographic*). You can do this by hand, or on the computer (use whatever software you want, we recommend this free online design tool called [Canva](#)). An example of one we made on Hiving can be found on the last page of this document.

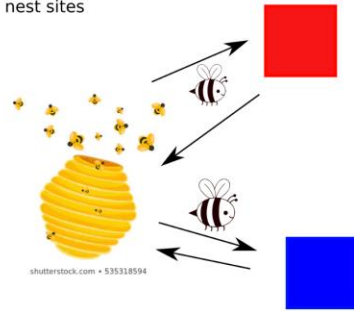


## Infographic – Bees Hiving

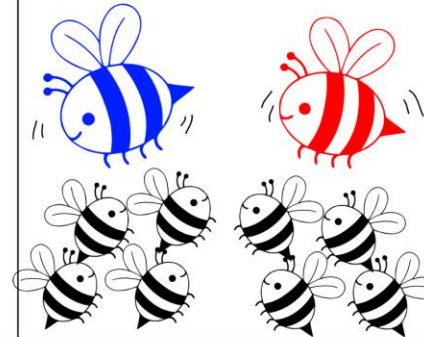
Bees occasionally need to move nests. This requires the hive to come to a consensus about which site to move to. Ideally this should be the best site available.



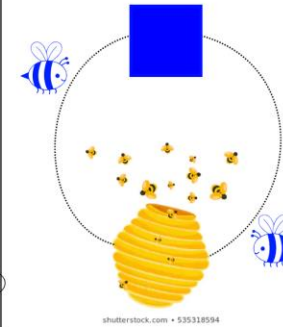
The process starts with a couple of scout bees exploring for possible nest sites.



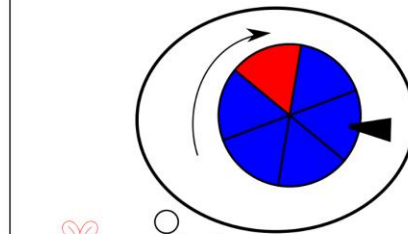
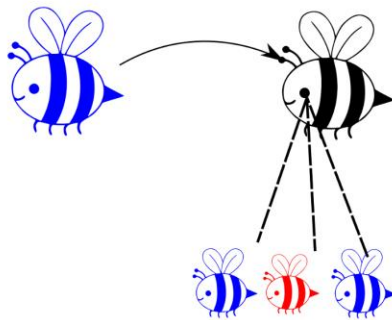
The returning bees advertise the quality of a nest site by performing a dance for a number of times proportional to the site quality. Bees which favour no site randomly sample the dancing bees to form their own opinion on which one they favour.



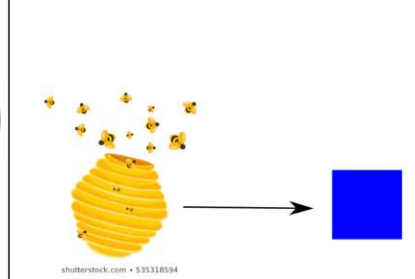
Once bees favour a nest site they will visit it and then return to the nest. On their return they perform a set of dances, again proportional to nest quality. They will then perform another round trip to the nest site and back to the swarm.



However after each round trip the number of dances they do will reduce until they no longer have a favoured option and will return to sampling dancing bees.



Because the quality of the nest sites is proportional to length of the dance it is more likely undecided bees will see the nest sites with higher quality.



Additionally since the bees return to their *no favoured site* state poorer nest sites are also slowly forgotten and eventually the entire swarm will converge to favouring the best available single site.