



SELF-ORGANISING PARTICLE SYSTEMS WITH DR ANDRÉA RICHA

TALKING POINTS

- 1) One of the advantages of a self-organising system over a single robot is that it is less likely to fail. Why is that? And can you give another advantage? (See *What are the advantages of self-organising systems?*)
- 2) Army ants and fire ants both display collective behaviours. Can you describe these behaviours and how they help the ants? (See *Introduction*)
- 3) How would a computer scientist describe a self-organising particle system (SOPS)? (See *What are self-organising particle systems (SOPS)?*)
- 4) What is an algorithm? What role do algorithms play in self-organising particle systems? (See *Introduction*)
- 5) Why is it difficult to carry out maintenance on the Forth Road Bridge in Scotland? What does the inspection team need to check in order to keep the bridge open to traffic? (See *Imagine this ...*)
- 6) What other objects and structures could self-organising particle systems be used to repair in the real world? What would be the advantages compared to how they are repaired today? (See *What would SOPS be like in the real world? and What could programmable matter be used for?*)
- 7) Describe how a self-organising particle system, made up of a collection of sensors, could be used to detect cancer. (See *How could self-organising particle systems save lives?*)
- 8) What needs to happen before it's possible to create self-organising particle systems made of simple robots? When do you think you'll see a self-organising particle system repairing a building? (Hint: there is no correct answer because no one knows!) (See *When will we see self-organising systems being used in the real world?*)

ACTIVITIES YOU CAN DO AT HOME, SCHOOL OR COLLEGE

KEEP UP APPEARANCES

Think of the biggest local landmark in your area. It could be a cathedral, a bridge or a tall building. Find four or five pictures of the landmark taken from different angles. Now, in groups in class, come up with a list of all the things that would need repairing on a regular basis.

HOW DO SWARMS WORK?

Watch the TEDEd video 'How do schools of fish swim in harmony?' by Nathan S Jacobs. Now try to answer the following questions: What are the two rules that each fish follows? What is the advantage to the fish to being part of the shoal? How is the human brain like a shoal of fish?

<https://ed.ted.com/lessons/how-do-schools-of-fish-swim-in-harmony-nathan-s-jacobs>

INSTRUCTING ROBOTS TO MAKE TOAST

Visit the BBC Bitesize website to learn about algorithms. Algorithms are sets of instructions for carrying out a task, just like recipes that tell you how to cook food. Read the algorithm for making a smoothie, then write one of your own describing how to make toast. Write 3-5 instructions, including one explaining what you should do if the bread pops up before it's properly toasted!

<https://www.bbc.com/bitesize/articles/zqrq7ty>

