

Swarming in fish

Complexity Mini project offered by Prof M S Turner

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There has been increasing interest in recent years in the collective motion of animals that gives rise to flocks or swarms. Similar phenomena occur in fish [1], insects, birds [3, 4] and animal herds [5] in general; humans [6] in particular. The possible technological applications are numerous ranging from pest control through crowd control [6], to robotics and beyond.

We have recently taken delivery of a large fish tank in which we plan to observe the behaviour of several hundred zebrafish *Danio rerio* using a static video camera. The goal of this project will be to record the passive behaviour of a shoal of zebrafish, to write a code to identify the positions of the dark fish against a light background from video data and then to analyse the behaviour of the swarm. This will involve first computing correlation functions, to obtain an understanding for the range and duration of interactions. We will then compare the observed behaviour with real models, e.g. [3, 5]. The student will gather their own data and write the code required to extract the positions of the fish, e.g. in Matlab. Some experience with computing is therefore required. The student will then learn to compute correlation functions and will compare these with those obtained in the literature models. The results will be very useful in understanding the mechanism for shoaling in fish. There are numerous avenues for a PhD for students with some affinity for computing (here experience with graphics rendering would be an advantage but is not necessary).



Figure 1: A shoal of fish forming a vortex (taken from <http://www.bluefront.org/>)

References

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