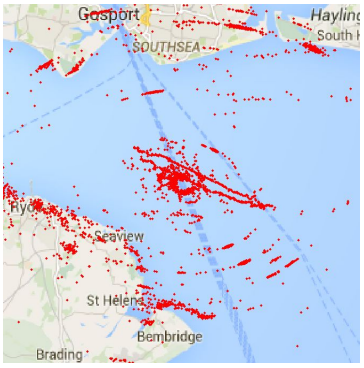
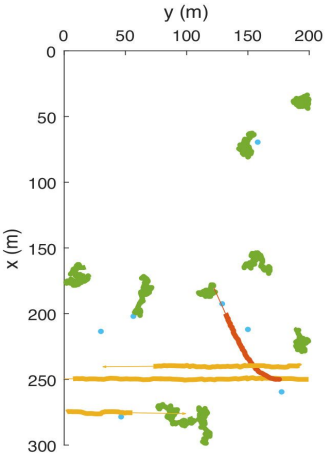
Internships: Extensions of a new multi-target tracking algorithm

Multi-target tracking is a complex problem that appears in many disciplines such as Robotics, Biology and Surveillance. It can be broadly defined as the problem of estimating the number of objects as well as their respective states (e.g. position, velocity) from the data delivered by one or several sensors. Both interns will focus on the extension of an existing multi-target tracking algorithm: the HISP filter[1].



Internship 1: The main objective of this internship is to adapt the HISP filter to the case of scanning sensors, such as most radars (see picture on the left for real radar data). The current version of the algorithm only covers the case of synchronous data as delivered for instance by cameras, where all data have the same time stamp in a scan (here, an image). A potential secondary objective will be to take into account the case of extended targets, i.e. when it is possible for a target to be observed several times by the sensor over a single revolution or in different cells at the same time for a non scanning sensor (e.g. cameras). There will be opportunities for testing the proposed solutions on real data.

Internship 2: Most targets of interest have complex trajectories and can make different types of manoeuvers. It is therefore necessary to include several evolution models in a tracking algorithm and to allow for switching between models at different times. The figure on the right shows tracking results from simulated sonar data where targets are classified via their evolution models (blue: static, green: Brownian motion, orange: constant velocity, red: manoeuvring). The objective will be to extend the HISP filter to switching models using, for instance, a jump Markov model.



Both interns will spend 3 months in the University of Warwick, UK, and 3 months in Naval Group in Nantes. A competitive scholarship will be given by Naval Group during the whole duration of the internship.

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[1] See https://ieeexplore.ieee.org/document/8429260 or https://arxiv.org/abs/1404.7408 for a preprint